Modeling Continuous Time Network Dynamics with ergmgp

Carter T. Butts

Contents

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This tutorial is a joint product of the Statnet Development Team:

Pavel N. Krivitsky (University of New South Wales)
Martina Morris (University of Washington)
Mark S. Handcock (University of California, Los Angeles)
Carter T. Butts (University of California, Irvine)
David R. Hunter (Penn State University)
Steven M. Goodreau (University of Washington)
Chad Klumb (University of Washington)
Skye Bender de-Moll (Oakland, CA)
Michał Bojanowski (Kozminski University, Poland)

The network modeling software demonstrated in this tutorial is authored by Carter Butts (`ergmgp`, `sna`) along with other members of the statnet development team (most notably `ergm`, `tsna`, `ndtv`, and `networkDynamic`).

The Statnet Project

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Section 0. Introduction to the Tutorial

This workshop and tutorial provide an introduction to statistical modeling of continuous time network dynamics using `statnet` software. This online tutorial is also designed for self-study, with example code and self-contained data. The `statnet` package we will be demonstrating is:

- `ergmgp` – modeling and simulation for relational event models

Additional background on the tools, modeling framework, and data used in this tutorial may be found in the references at the bottom of this document.

0.0 Prerequisites

This workshop assumes basic familiarity with **R**, experience with network concepts, terminology and data, and familiarity with the general framework for statistical modeling and inference. The topics discussed build on the exponential family random graph model (ERGM) framework, and knowledge of ERGMs (and the `ergm` package within `statnet`) is strongly recommended. Users of this tutorial who are new to ERGMs or to `statnet` may find the `ergm` tutorial to be helpful as background.

0.1 Software installation

Minimally, you will need to install the latest version of **R** (available here) and the `statnet` packages `ergmgp`, `sna`, `tsna`, and their dependencies (including `network`, `networkDynamic`, and `ergm`). These functions will automatically queue their dependencies for installation when installed. Installing `ndtv` for dynamic visualization is highly recommended.

The full set of `statnet` installation instructions with details can be found on the `statnet` workshop wiki.

If you have not already downloaded the `statnet` packages for this workshop, the quickest way to install these (and the other most commonly used packages from the `statnet` suite), is to open an R session and type:

```
install.packages(c("ergmgp","sna","tsna","ndtv"))
```

```
library(ergmgp)
```

```
Loading required package: network


'network' 1.19.0 (2024-12-08), part of the Statnet Project
* 'news(package="network")' for changes since last version
* 'citation("network")' for citation information
* 'https://statnet.org' for help, support, and other information

Loading required package: ergm


'ergm' 4.7.5 (2024-11-06), part of the Statnet Project
* 'news(package="ergm")' for changes since last version
* 'citation("ergm")' for citation information
* 'https://statnet.org' for help, support, and other information

'ergm' 4 is a major update that introduces some backwards-incompatible
changes. Please type 'news(package="ergm")' for a list of major
changes.

Loading required package: networkDynamic
```

```
'networkDynamic' 0.11.4 (2023-12-10?), part of the Statnet Project
* 'news(package="networkDynamic")' for changes since last version
* 'citation("networkDynamic")' for citation information
* 'https://statnet.org' for help, support, and other information
```

```
Loading required package: parallel
```

```
'ergmgp' 0.1-2 (2024-10-08), part of the Statnet Project
* 'news(package="ergmgp")' for changes since last version
* 'citation("ergmgp")' for citation information
* 'https://statnet.org' for help, support, and other information
```

```
library(sna)
```

```
Loading required package: statnet.common
```

```

Attaching package: 'statnet.common'
```

```
The following objects are masked from 'package:base':

    attr, order
```

```
sna: Tools for Social Network Analysis
Version 2.8 created on 2024-09-07.
copyright (c) 2005, Carter T. Butts, University of California-Irvine
 For citation information, type citation("sna").
 Type help(package="sna") to get started.
```

```
library(tsna)
library(ndtv)
```

```
Loading required package: animation
```

```
'ndtv' 0.13.4 (2024-06-30), part of the Statnet Project
* 'news(package="ndtv")' for changes since last version
* 'citation("ndtv")' for citation information
* 'https://statnet.org' for help, support, and other information
```

(Note that `ndtv` requires some additional software to function. If you are not using it for this tutorial, just leave out `ndtv` in the above commands. In that case, however, the dynamic visualization code included here will not work for you.)

You can check the version number with:

```
packageVersion("ergmgp")
```

```
[1] '0.1.2'
```

Throughout, we will set a random seed via `set.seed()` for commands in tutorial that require simulating random values—this is not necessary, but it ensures that you will get the same results as the online tutorial.

Section 1: Specifying ERGM Generating Processes with `ergmgp`

To begin, we provide some very brief background on what ERGM generating processes (EGPs) are, and how they are specified. Further information and technical details may be found in Butts (2024).

1.1 Refresher on ERGMs

Given a random graph Y on support $\mathbb{Y}$, we say that Y is expressed in exponential family random graph form when written as

$$\Pr(Y = y|\theta, X) = \frac{\exp(\theta^\intercal w(y, X))h(y)}{\sum_{y' \in \mathbb{Y}} \exp(\theta^\intercal w(y', X))h(y')}, \tag{1}$$

where $\theta \in \mathbb{R}^p$ is a vector of *parameters,* $w : \mathbb{Y}, X \mapsto \mathbb{R}^p$ is a vector of *statistics,* X is a set of exogenous *covariates,* and $h : \mathbb{Y} \mapsto \mathbb{R}_{\geq 0}$ is a *reference measure.* A specification of Y in terms of θ, t, and h is said to be an exponential family random graph model (or ERGM). The "parts" of an ERGM have particular significance. Broadly:

- The reference measure, h, defines the baseline behavior of the model as $\theta \to 0$. Notably, when $h(y) \propto 1$ (aka the counting measure) and $\mathbb{Y}$ is finite, this baseline is a uniform random graph on $\mathbb{Y}$. Other choices of h define different baselines.
- The statistics, w, define the "directions" in which the distribution of Y is biased relative to the baseline. For instance, including the edge count (w_e) in a model provides an opportunity for the number of edges (and hence the density) to be biased up or down relative to the baseline distribution.
- The parameters, θ, determine the strength and direction of the bias applied to w. In particular, for models like the above, $\mathbf{E}w_i(Y, X)$ is monotone increasing in θ_i; thus, increasing θ_i will increase the average value of its associated statistic, and increasing the magnitude of θ_i in a negative direction will decrease the average value of the associated statistic. $\theta_i = 0$ implies no bias relative to the baseline, given the other terms in the model

As this suggests, ERGMs provide a flexible "language" for describing graph distributions, but the content of what is "said" in any given case depends upon the choice of statistics (and reference measure). There is by now a considerable literature on ERGM specification, inference, and computation, to which we direct the interested reader; potentially useful reviews include Schweinberger et al. (2020) and Lusher et al. (2012). Within `statnet`, ERGM simulation and inference is handled by the `ergm` package; the associated tutorial and related references are recommended for more information on ERGMs within `statnet`.

1.1.1 Some Useful Notation for EGPs When defining EGPs, some additional ERGM-related notation is helpful. Note in particular that we can rewrite Eq. **??**eq:ergm) in log form as

$$\ln \Pr(Y = y|\theta, X) = q(y) - \ln Z \tag{2}$$

where

- $q(y) = \theta^\intercal w(y, X) + \ln h(y)$ is the *graph potential*, corresponding to the unnormalized log pmf of Y; and
- $Z = \sum_{y' \in \mathbb{Y}} \exp(q(y') + \ln h(y'))$ is the *normalizing factor* or *partition function*, which ensures that the distribution is normalized.

To foreshadow, in a dynamic process Y will tend to spend more time in states for which $q(Y)$ is large, versus states where $q(Y)$ is small. Note also that, although it depends on the model, Z does not depend on Y. As such, it will (for our purposes) often be possible to ignore it.

In discussing network dynamics, it is useful to have language to describe "neighborhoods" around a given graph, reflecting states to which the network may move. In this tutorial, we will always be limited to graphs or digraphs on n vertices, the set of which we denote as $\mathbb{Y}_n$. Within that set, we note several important neighborhoods:

- The set graphs that can be produced by adding or removing an edge to graph y is denoted $\mathcal{H}(y)$; these are the *Hamming neighbors* of y
  - The set of graphs that can be produced by *adding* a currently absent edge to y is further denoted $\mathcal{H}^+(y)$
  - The set of graphs that can be produced by *removing* a currently present edge to y is likewise denoted $\mathcal{H}^-(y)$

- The set of Hamming neighbors of y that are *uphill* to y on the potential surface is denoted $N^+(y)$, where $N^+(y) = \{y' \in \mathcal{H}(y) : g(y') \geq g(y)\}$; and
- The set of Hamming neighbors of y that are *downhill* from y on the potential surface is denoted $N^-(y)$, where $N^-(y) = \{y' \in \mathcal{H}(y) : g(y') < g(y)\}$

1.2 Introducing EGPs

As noted, the ERGMs provide a language for describing graph distributions, and an ERGM need not have any further interpretation. In many cases, however, we are interested in networks that arise from - or that can be usefully imagined as arising from - some underlying, dynamic process. A continuous time process whose states map to a graph set $\mathbb{Y}$, and which has a limiting stable or equilibrium distribution on $\mathbb{Y}$ that can be written in ERGM form (i.e., Eq. **??**eq:ergm)), is said to be an *ERGM generating process* or EGP for said ERGM. Since any fixed distribution on finite $\mathbb{Y}$ can be written in ERGM form, this implies that any continuous time graph process is technically an EGP; however, there is no simple way of obtaining the ERGM distribution for an arbitrary process, and such distributions need be neither tractable nor useful. Our interest is thus in families of EGPs that give rise to *known* ERGM distributions: i.e., EGPs that can be immediately and easily related to their equilibria.

Why do we care? If you are not moved by their intrinsic awesomeness, there are some more pragmatic motivations:

- Given a target ERGM (whether created *a priori* or inferred from data), EGPs give us a set of possibilities for dynamic processes that can give rise to it.
- Where we have substantive reason to believe that network dynamics happens to follow an EGP, we can then immediately determine its long-term behavior.
- Because, by construction, all EGPs have well-defined equilibrium distributions, they are good candidates for models of network dynamics that avoid certain types of pathologies (though, it should be noted, you may or may not like the behavior of the ERGM to which the process converges).
- Some EGPs provide continuous extensions of established discrete-time models (e.g., TERGMs and STERGMs), allowing many existing ideas about model parameterization to be leveraged while avoiding some of the pitfalls of discrete-time approximations.
- Likewise, other EGPs can be directly motivated from models of social or physical behavior, providing a connection to substantive theory in these areas.

Are you not entertained? Well, what here shall miss, our toil shall strive to mend. . . .

1.3 Supported EGP Families

Currently `ergmgp` supports eight different EGP families (chosen within `ergmgp` functions using the `process` argument). Each represents a distinct dynamic process with a known ERGM equilibrium. The processes may be informally described as follows:

- **Competing Rate SAOM (CRSAOM)**
  - Introduced by Snijders (2001) as a behavioral model for network change, the CRSAOM constitutes a process in which the transition rate from a current state y to a hypothetical target state y' is proportional to $\exp(q(y'))$. Thus, transitions are governed entirely by the favorability of the target state.
- **Longitudinal ERGM (LERGM)**
  - Introduced by Koskinen and Snijders (2007) as a general model for network change, transition rates from current state y to target state y' within a LERGM are logistic in the potential difference between y and y'. Transitions to less favorable states can thus become arbitrarily slow, while transitions to more favorable states have a "maximum speed" to which they converge as the potential difference grows. Originally introduced for its resemblance to a Gibbs sampler, the process can also be motivated in physical applications as a competing rate model under Arrhenius-like kinetics (Grazioli et al., 2019).
- **Change Inhibition Process (CI)**

  - Introduced in Butts (2024), transitions in a CI process occur at a constant rate when the target state y' is more favorable than the current state y, falling proportionally to $\exp(q(y') - q(y))$ when y' is less favorable. The "Metropolis" counterpart to the LERGM, structure in the CI process results from inhibition of unfavorable changes (rather than promotion of favorable ones).
- **Differential Stability Process (DS)**
  - Also introduced in Butts (2024), the DS process is distinctive in that transition rates from y to y' do not depend upon the potential of the target, instead being proportional to $\exp(-q(y))$; thus, transitions occur at random, but favorable states are "stickier" than unfavorable ones. The DS process is the "source" counterpart of the CRSAOM, and can be motivated as a "win-stay, lose-shift" model of change.
- *Continuum TERGMs*
  - **Continuum TERGM (CTERGM)**
    * Introduced in Butts (2025) as the continuum counterpart to the TERGMs (Henneke and Xing, 2007), changes from current state y to target state y' in a CTERGM occur with rates proportional to $\exp(q(b) - q(a))$. This resembles a LERGM transition, except that rates are (log) symmetric for uphill and downhill moves, and uphill rates do not saturate (there is no maximum change velocity).

  - *Separable Continuum STERGMs*
    * **Constant Dissolution CSTERGM (CDCSTERGM)**
      · This is the continuum form of the STERGM studied e.g. by Carnegie et al. (2015) in which edge formation is controlled by a general ERGM potential (as with a CTERGM) and dissolution occurs at a constant rate. This model is attractive both for simplicity and inferential tractability (since one needs only duration and cross-sectional data to identify the model).
    * **Constant Formation CSTERGM (CFCSTERGM)**
      · As with constant dissolution rate models, one can introduce models in which edges form at a constant rate, but are selectively retained (with this portion of the model behaving like a CTERGM); this was introduced in Butts (2025). The simplicity and inferential properties are the same as the CDCSTERGM, though the dynamics are obviously quite different.
    * **General CSTERGM (CSTERGM)**
      · This was introduced in Butts (2025) as the continuum counterparts to the STERGMs (Krivitsky and Handcock, 2014), representing the limit of the "infinitismal STERGMs" of Klumb et al. (2024). In this family, transitions from y to y_i follow a separable CTERGM-like structure with rate $\exp(q_f(y') - q_f(y))$ when the transition to y' involves adding an edge and rate $\exp(q_d(y') - q_d(y))$ when the transition involves edge removal. These models obviously take the CDCSTERGMs and CFCSTERGMs as special cases.

Technical details for these processes can be found in Butts (2025). The Appendix to this tutorial contains tables describing key properties of each process, including their rate function specifications and equilibrium distributions. Note that, while all of the above families have well-defined ERGM equilibria, specific models may become *kinetically trapped,* with dynamics that become effectively static over physically relevant timescales. By turns, some models may produce dynamics with extremely high transition rates, which may become computationally infeasible to simulate on reasonable timescales. As with ERGMs, it is thus important to attend to model definition when constructing EGPs, and to ensure that the model is fit for the purposes for which it is intended.

1.4 Specification Basics

EGPs within the `ergmgp` package are specified via their potentials (see Appendix), using `ergm` formulas. `ergm` formulas contain lists of model *terms* referring to graph statistics (i.e., w), connected by `+` signs (symbolizing their weighted addition within the ERGM formula, i.e., $\theta^\intercal w(y)$). Many terms contain additional arguments governing their function. The `ergm` package contains a wide range of standard terms, and new terms can be added by users; all work seamlessly with `ergm`-compatible functions, including those in `ergmgp`. See the `ergm`

documentation or tutorial for further details.

In addition to the formula defining the potential family, a coefficient vector is also required. These, too, follow standard `ergm` conventions (as we will see below).

For a small number of EGPs (specifically, those with separable formation and dissolution processes), separate potentials must be specified for formation and dissolution; this is done by passing a list of formulas and/or coefficients, as required. We shall see examples of this below.

It should be borne in mind that all of the various properties of ERGMs known and loved from the cross-sectional world are also applicable for EGPs (though they may manifest differently). In particular, a degenerate ERGM will also give to an EGP whose equilibrium behavior is degenerate. This might not be a bad thing, if one wants to investigate the character of dynamic processes that lead to degeneracy! But in general, it must be borne in mind that a model with unrealistic cross-sectional behavior will not suddenly become realistic because one has put dynamics on it.

Finally, another caution: just because an EGP can reproduce a given ERGM does not mean that a real-world network compatible with that network was produced by said EGP! In fact, *any of the EGPs supported by the* `ergmgp` *package can generate any regular ERGM.* So, if you have e.g. a competing rate SAOM that gives rise to an empirically estimated ERGM, that *per se* does not mean that the network in question arose from a SAOM-like decision process. Indeed, it could be equally well-explained by a change inhibition model, a differential stability model, a LERGM, or any of the other families in section 1.3. That's not a flaw of EGPs - it's a basic consequence of the fact that *cross-sectional structure does not determine dynamics.* This means that we need some other kind of information (e.g., substantive knowledge, prior theory, physical intuition, or direct measurement) to determine what kind of EGP to use. The good news is that some EGPs are typically more *a priori* plausible than others, and we can often pick one that makes sense on substantive grounds. (Inference for EGP families from dynamic data is possible, but not supported in `ergmgp` at this time.)

Section 2: Simulating Trajectories from an EGP

Let us now turn to practical matters. In this section, we'll see how to specify and simulate draws from EGPs, and how to extract information from those draws once we take them.

2.1 Basic Simulation with `simEGP`

Let's now try simulating a draw from our first EGP! We will begin with a minimal case: a CTERGM with a single (edge) parameter, under the counting measure. First, let's note some facts about this process:

- Given edge statistic w_e and parameter θ_e, this model has graph potential $q(y) = \theta_e w_e(y)$.
- The rate at which the EGP migrates from state y to Hamming neighbor y' is equal to $\exp(q(y') - q(y))$, and thus $\exp(\theta_e)$ when the transition would add an edge, and $\exp(-theta_e)$ when the transition would remove an edge.
- The EGP equilibrium is an ERGM distribution with sufficient statistic w_e and parameter $2\theta_e$.

This gives us a sense of what to expect. To carry out the simulation, we will use the `simEGP` function. `simEGP` is the most basic workhorse tool for simulation in `ergmgp`. Given a graph potential (defined via an ERGM formula and associated coefficients), `simEGP` will simulate a single trajectory from the specified EGP. Let's try our case, working with a fairly small, undirected network and simulating it for 100 units of time.

```
set.seed(1331)
net <- network.initialize(10, directed = FALSE)  #Initialize the network
simbg <- simEGP(form = net ~ edges, coef = log(1.5/(9-1.5))/2, time = 100,
    process = "CTERGM") #Run the simulation
```

```
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
event=0, t=0.000000, pot=(0.000000,0.000000)
event=100, t=3.202727, pot=(-6.437752,0.000000)
event=200, t=5.982151, pot=(-6.437752,0.000000)
```

```
event=300, t=9.174867, pot=(-8.047190,0.000000)
event=400, t=11.862279, pot=(-4.828314,0.000000)
event=500, t=14.903347, pot=(-8.047190,0.000000)
event=600, t=18.045407, pot=(-6.437752,0.000000)
event=700, t=21.203084, pot=(-4.828314,0.000000)
event=800, t=24.372466, pot=(-6.437752,0.000000)
event=900, t=27.452887, pot=(-6.437752,0.000000)
event=1000, t=30.385364, pot=(-4.828314,0.000000)
event=1100, t=32.575519, pot=(-8.047190,0.000000)
event=1200, t=36.417853, pot=(-6.437752,0.000000)
event=1300, t=39.209466, pot=(-3.218876,0.000000)
event=1400, t=41.987816, pot=(-6.437752,0.000000)
event=1500, t=44.920710, pot=(-4.828314,0.000000)
event=1600, t=48.135149, pot=(-3.218876,0.000000)
event=1700, t=51.803374, pot=(-9.656627,0.000000)
event=1800, t=55.135096, pot=(-6.437752,0.000000)
event=1900, t=57.678964, pot=(-8.047190,0.000000)
event=2000, t=60.515663, pot=(-4.828314,0.000000)
event=2100, t=63.625352, pot=(-9.656627,0.000000)
event=2200, t=66.243982, pot=(-6.437752,0.000000)
event=2300, t=68.960453, pot=(-4.828314,0.000000)
event=2400, t=71.816712, pot=(-6.437752,0.000000)
event=2500, t=75.477733, pot=(-4.828314,0.000000)
event=2600, t=78.447544, pot=(-8.047190,0.000000)
event=2700, t=81.608730, pot=(-6.437752,0.000000)
event=2800, t=84.551909, pot=(-6.437752,0.000000)
event=2900, t=88.150696, pot=(-4.828314,0.000000)
event=3000, t=91.070717, pot=(-4.828314,0.000000)
event=3100, t=93.382564, pot=(-3.218876,0.000000)
event=3200, t=96.037396, pot=(-4.828314,0.000000)
event=3300, t=98.678473, pot=(-9.656627,0.000000)
```

Success! But what did we do? Let's look at the output:

```
class(simbg)      # What is sim?
```

```
[1] "network"
```

```
simbg             # Examine the simulation output
```

```
 Network attributes:
  vertices = 10
  directed = FALSE
  hyper = FALSE
  loops = FALSE
  multiple = FALSE
  bipartite = FALSE
  Potential = -3.218876
  Time = 100
  Events = 3342
  total edges= 4
    missing edges= 0
    non-missing edges= 4

 Vertex attribute names:
    vertex.names
```

```
No edge attributes
```

As we can see, `simEGP` by default returns a `network` object containing the state of the system at the end of the trajectory. Although this is only one snapshot in time, we can see that some trace of the simulation history remains, in the form of additional network attributes. In particular, `Time` stores the time at which the snapshot was made, `Events` counts the total number of transition events prior to the observation time, and `Potential` returns the ERGM potential of the graph. (Below, we'll see how to obtain the entire event history.)

`simEGP` has quite a few options, for which one can get details via `help(simEGP)`. Several points, however, bear emphasis:

- The EGP to be used is specified by `form`, `coef`, and `process`:
  - `process` dictates which type of EGP is to be employed, with LERGM being the default.
  - `form` defines the graph potential that guides the EGP behavior. For most processes, this is a single ERGM formula, with the network on the left-hand side giving the initial state. However, for the CSTERGM process one must pass a `list` with two elements (respectively named "formation" and "dissolution") containing the respective formulas for the formation and dissolution models.
  - `coef` defines the coefficients for the graph potential. This is usually a single numeric vector. However, for the various separable models (CDCSTERGM, CFCSTERGM, CSTERGM), this must be a list with named elements "formation and"dissolution" containing the respective formation and dissolution coefficients.
- The length of the time to be simulated is determined by the `time`, `events`, and `rate.factor` arguments:
  - If `time` is provided, it takes precendence: the simulation will be run for `time` time units (not steps - bear in mind that dynamics are continuous), and the final state returned.
  - If `time` is not provided, the simulation will be run until `events` transitions occur, and the final state will be returned.
  - The phenomenological unit of simulation time is controlled by `rate.factor`, which scales the underlying rate at which dynamics occur (relative to the underlying process, and the EGP coefficients). E.g., setting `rate.factor=2` will result in dynamics that are twice as fast as baseline, while `rate.factor=0.5` will cut the rate in half. There is no intrinsic difference between changing `rate.factor` and multiplying `time` by the same quantity (i.e., 1 unit of time with `rate.factor=2` is the same as 2 units of time with `rate.factor=1`), but one or the another specification may be more convenient to work with in practice.

Let's look at another, more complex example, involving a continuum STERGM. Here, we'll consider a model in which tie formation is governed by a simple two-group mixing process in which intra-group ties form more rapidly than inter-group ties, and dissolution is governed by a triadic process in which ties embedded in a shared partnership decay more slowly than those that are not. We begin by creating a base network, which we initialize with a sparse random graph, assigning memberships at random:

```
set.seed(1331)
net <- network(rgraph(50, tp=1.5/49, mode="graph"), directed = FALSE)
net %v% "x" <- sample(0:1, 50, replace = TRUE)
```

We now proceed to simulation. Per the above, we specify our model by two ERGM formulas, one containing `edges+nodematch` (to cover the base rate of formation and the homophily effect) and the other containing `edges+esp(0)` (to cover the base rate of dissolution and the effect of shared partnerships). We also need two vectors of coefficients, for the same reason.

```
# Set things up
tgform <- list(                                # Create the formulas
  formation = net ~ edges + nodematch("x"),
  dissolution = net ~ edges + esp(0)
)
tgcoef <- list(
```

```
  formation = c(log(1.5/48.5), 3),
  dissolution = c(log(1/5), -3)
)
```

Let's break this down. In this EGP, the rate at which we move from state y to state y' by *adding* an edge is equal to $\exp(q_f(y') - q_f(y))$. The rate formula thus looks like:

$$\begin{aligned} R_{yy'} &= \exp[-3.48(\text{edges}(y') - \text{edges}(y)) + 3(\text{nodematch}_{\text{x}}(y') - \text{nodematch}_{\text{x}}(y))] \\ &= \begin{cases} 0.62 & \text{if} x_i = x_j \\ 0.03 & \text{otherwise} \end{cases} \end{aligned}$$

This implies that the waiting time for a tie to form is about 1.61 for within-group dyads, versus about 32 for between-group dyads. (Observe that we were able to simplify the above expression by exploiting the fact that y' by construction has one more edge than y.)

Now for dissolution. The rate at which we move from state y to y' by *removing* an edge is equal to $\exp(q_d(y') - q_d(y))$, leading to the formula

$$\begin{aligned} R_{yy'} &= \exp[-1.61(\text{edges}(y') - \text{edges}(y)) - 3(\text{ESP}_0(y') - \text{ESP}_0(y))] \\ &= \exp[1.61 - 3(\text{ESP}_0(y') - \text{ESP}_0(y))] \end{aligned}$$

Since the change in ESP count varies with graph structure (as well as the edge that is being toggled), we can immediately see that this corresponds to a *dependence model* in the network equilibrium. Dynamically, we can see that the rate at which an edge will be removed will depend on how many ESP(0) structures are created or destroyed. For toggles resulting in, respectively, +2, +1, 0, -1, or -1 ESP(0)s, we will obtain rate values of approximately 0.01, 0.25, 5, and 100; equivalently, the expected waiting times for an edge producing such ESP(0) changes to decay (assuming nothing else interrupts) are approximately 81, 4, 0.20, and 0.01. (Observe that we cannot remove more than one ESP(0) by removing an edge, though we can create quite a few.) We can thus see that edges involved in triangles are much more stable than e.g. pendant edges, bolstering locally cohesive structures. Note also the behavior of the edge coefficient: larger (more positive) numbers imply lower dissolution rates. This is because q_d describes how "favorable" a network is to the dissolution process, and larger edge coefficients imply that networks with more edges are more favorable; this manifests as a lower rate of tie decay.

Given the setup, let's run the model! We will simulate the system for 100 time steps, collecting the final step; the command then looks like so:

```
# Run the simulation (this one takes a while!)
set.seed(1331)
simtg <- simEGP(form = tgform, coef = tgcoef, time = 100, process = "CSTERGM")
```

```
Initializing simulation: max events=inf, max time=100.000000, initial pot=(-92.804934,-221.471896)
event=0, t=0.000000, pot=(-92.804934,-221.471896)
event=100, t=0.065663, pot=(-8.856592,-18.656627)
event=200, t=0.214689, pot=(-12.808790,-21.875503)
event=300, t=0.327061, pot=(-13.760987,-31.094379)
event=400, t=0.473658, pot=(-12.808790,-21.875503)
event=500, t=0.611501, pot=(-13.760987,-31.094379)
event=600, t=0.735162, pot=(-14.713184,-31.313255)
event=700, t=0.896287, pot=(-17.713184,-31.313255)
event=800, t=1.025057, pot=(-11.713184,-28.313255)
event=900, t=1.152006, pot=(-13.617579,-34.751007)
```

```
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event=1100, t=1.426772, pot=(-13.617579,-34.751007)
event=1200, t=1.550706, pot=(-15.521974,-53.188758)
event=1300, t=1.693314, pot=(-15.521974,-53.188758)
event=1400, t=1.835471, pot=(-13.617579,-37.751007)
event=1500, t=1.972594, pot=(-12.665382,-28.532131)
event=1600, t=2.156943, pot=(-13.617579,-37.751007)
event=1700, t=2.293386, pot=(-13.617579,-37.751007)
event=1800, t=2.444075, pot=(-11.713184,-19.313255)
event=1900, t=2.605378, pot=(-16.617579,-37.751007)
event=2000, t=2.718488, pot=(-14.569776,-40.969882)
event=2100, t=2.860735, pot=(-14.569776,-37.969882)
event=2200, t=3.009601, pot=(-15.521974,-50.188758)
event=2300, t=3.114045, pot=(-13.617579,-37.751007)
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event=2500, t=3.367090, pot=(-13.617579,-31.751007)
event=2600, t=3.500491, pot=(-15.521974,-47.188758)
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event=2800, t=3.781288, pot=(-13.617579,-31.751007)
event=2900, t=3.912737, pot=(-17.569776,-43.969882)
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event=3500, t=4.745693, pot=(-18.521974,-56.188758)
event=3600, t=4.872102, pot=(-18.521974,-56.188758)
event=3700, t=4.988385, pot=(-14.569776,-46.969882)
event=3800, t=5.115327, pot=(-13.617579,-37.751007)
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event=4000, t=5.371837, pot=(-14.569776,-40.969882)
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event=4400, t=5.911725, pot=(-21.378566,-65.845386)
event=4500, t=6.031979, pot=(-16.474171,-44.407634)
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event=4800, t=6.445370, pot=(-14.569776,-28.969882)
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event=5400, t=7.204160, pot=(-19.330763,-60.064262)
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event=5600, t=7.468698, pot=(-21.235158,-75.502013)
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event=5800, t=7.696822, pot=(-20.282961,-60.283137)
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event=8000, t=10.667332, pot=(-20.948342,-79.815268)
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event=54600, t=76.316122, pot=(-39.183500,-137.317281)
event=54700, t=76.463018, pot=(-42.183500,-137.317281)
event=54800, t=76.604861, pot=(-39.992290,-150.192785)
event=54900, t=76.727027, pot=(-37.135698,-143.536157)
```

```
event=55000, t=76.859657, pot=(-28.565921,-105.566275)
event=55100, t=77.026381, pot=(-29.518119,-105.785151)
event=55200, t=77.202207, pot=(-30.470316,-106.004026)
event=55300, t=77.362863, pot=(-33.326908,-130.660654)
event=55400, t=77.532441, pot=(-31.422514,-118.222902)
event=55500, t=77.698453, pot=(-30.470316,-115.004026)
event=55600, t=77.832950, pot=(-31.422514,-118.222902)
event=55700, t=77.949499, pot=(-30.470316,-118.004026)
event=55800, t=78.062153, pot=(-31.422514,-115.222902)
event=55900, t=78.201195, pot=(-30.613724,-99.347399)
event=56000, t=78.338592, pot=(-30.470316,-115.004026)
event=56100, t=78.489801, pot=(-30.470316,-115.004026)
event=56200, t=78.611207, pot=(-30.470316,-112.004026)
event=56300, t=78.769809, pot=(-31.422514,-112.222902)
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event=56500, t=79.037816, pot=(-39.183500,-146.317281)
event=56600, t=79.174276, pot=(-42.992290,-144.192785)
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event=56900, t=79.588365, pot=(-32.374711,-118.441778)
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event=57400, t=80.383525, pot=(-30.470316,-112.004026)
event=57500, t=80.528358, pot=(-33.470316,-118.004026)
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event=58300, t=81.630957, pot=(-24.757132,-89.690771)
event=58400, t=81.772306, pot=(-23.804934,-80.471896)
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event=59100, t=82.784294, pot=(-23.804934,-92.471896)
event=59200, t=82.936224, pot=(-26.804934,-95.471896)
event=59300, t=83.078817, pot=(-24.757132,-95.690771)
event=59400, t=83.201431, pot=(-23.804934,-86.471896)
event=59500, t=83.388303, pot=(-23.804934,-92.471896)
event=59600, t=83.523150, pot=(-26.661527,-102.128523)
event=59700, t=83.667897, pot=(-28.565921,-99.566275)
event=59800, t=83.820268, pot=(-29.518119,-99.785151)
event=59900, t=83.951086, pot=(-30.470316,-118.004026)
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event=60100, t=84.223128, pot=(-28.565921,-111.566275)
event=60200, t=84.379145, pot=(-26.661527,-105.128523)
event=60300, t=84.500478, pot=(-24.757132,-95.690771)
```

```
event=60400, t=84.630796, pot=(-25.709329,-101.909647)
event=60500, t=84.761838, pot=(-25.709329,-101.909647)
event=60600, t=84.874331, pot=(-22.852737,-80.253020)
event=60700, t=85.027403, pot=(-26.661527,-99.128523)
event=60800, t=85.153363, pot=(-25.709329,-95.909647)
event=60900, t=85.318659, pot=(-26.661527,-99.128523)
event=61000, t=85.464454, pot=(-24.757132,-98.690771)
event=61100, t=85.598197, pot=(-22.852737,-86.253020)
event=61200, t=85.766811, pot=(-24.900540,-89.034144)
event=61300, t=85.890273, pot=(-22.852737,-86.253020)
event=61400, t=86.002177, pot=(-23.804934,-89.471896)
event=61500, t=86.137291, pot=(-23.804934,-89.471896)
event=61600, t=86.295982, pot=(-22.852737,-83.253020)
event=61700, t=86.387655, pot=(-24.757132,-89.690771)
event=61800, t=86.526615, pot=(-26.661527,-102.128523)
event=61900, t=86.660342, pot=(-31.565921,-105.566275)
event=62000, t=86.822998, pot=(-27.613724,-108.347399)
event=62100, t=86.936822, pot=(-24.757132,-95.690771)
event=62200, t=87.087027, pot=(-26.661527,-102.128523)
event=62300, t=87.228144, pot=(-26.804934,-86.471896)
event=62400, t=87.359536, pot=(-23.804934,-92.471896)
event=62500, t=87.483651, pot=(-23.804934,-92.471896)
event=62600, t=87.619778, pot=(-25.709329,-101.909647)
event=62700, t=87.759301, pot=(-24.757132,-101.690771)
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event=62900, t=87.989212, pot=(-28.565921,-117.566275)
event=63000, t=88.116781, pot=(-24.757132,-86.690771)
event=63100, t=88.272379, pot=(-28.565921,-114.566275)
event=63200, t=88.432152, pot=(-24.757132,-86.690771)
event=63300, t=88.577727, pot=(-25.709329,-95.909647)
event=63400, t=88.696916, pot=(-26.661527,-99.128523)
event=63500, t=88.849556, pot=(-34.565921,-102.566275)
event=63600, t=88.988976, pot=(-29.518119,-105.785151)
event=63700, t=89.130323, pot=(-32.518119,-108.785151)
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event=63900, t=89.392215, pot=(-30.613724,-96.347399)
event=64000, t=89.562144, pot=(-24.757132,-89.690771)
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event=64200, t=89.846249, pot=(-40.279106,-124.879530)
event=64300, t=90.010223, pot=(-33.326908,-118.660654)
event=64400, t=90.150520, pot=(-31.422514,-112.222902)
event=64500, t=90.327202, pot=(-34.422514,-121.222902)
event=64600, t=90.442400, pot=(-34.279106,-130.879530)
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event=64800, t=90.755415, pot=(-35.374711,-118.441778)
event=64900, t=90.930197, pot=(-38.231303,-128.098406)
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event=65100, t=91.184961, pot=(-35.374711,-124.441778)
event=65200, t=91.307012, pot=(-29.518119,-111.785151)
event=65300, t=91.508209, pot=(-32.518119,-108.785151)
event=65400, t=91.631531, pot=(-32.374711,-118.441778)
event=65500, t=91.777161, pot=(-33.326908,-118.660654)
event=65600, t=91.931377, pot=(-33.470316,-112.004026)
event=65700, t=92.072760, pot=(-29.518119,-102.785151)
```

```
event=65800, t=92.241432, pot=(-32.374711,-124.441778)
event=65900, t=92.355022, pot=(-32.374711,-118.441778)
event=66000, t=92.483563, pot=(-32.374711,-115.441778)
event=66100, t=92.618213, pot=(-33.326908,-124.660654)
event=66200, t=92.758947, pot=(-33.326908,-118.660654)
event=66300, t=92.912856, pot=(-34.422514,-118.222902)
event=66400, t=93.037390, pot=(-31.422514,-121.222902)
event=66500, t=93.152120, pot=(-32.374711,-127.441778)
event=66600, t=93.255750, pot=(-26.661527,-96.128523)
event=66700, t=93.397301, pot=(-30.470316,-124.004026)
event=66800, t=93.546115, pot=(-29.661527,-96.128523)
event=66900, t=93.680437, pot=(-30.470316,-121.004026)
event=67000, t=93.804882, pot=(-27.613724,-96.347399)
event=67100, t=93.943021, pot=(-33.470316,-118.004026)
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event=67300, t=94.206603, pot=(-26.661527,-99.128523)
event=67400, t=94.347010, pot=(-26.804934,-83.471896)
event=67500, t=94.472683, pot=(-23.804934,-92.471896)
event=67600, t=94.606816, pot=(-27.613724,-108.347399)
event=67700, t=94.710430, pot=(-24.757132,-92.690771)
event=67800, t=94.878058, pot=(-26.661527,-102.128523)
event=67900, t=94.991160, pot=(-26.661527,-102.128523)
event=68000, t=95.114773, pot=(-27.613724,-108.347399)
event=68100, t=95.276729, pot=(-26.661527,-105.128523)
event=68200, t=95.412567, pot=(-22.852737,-89.253020)
event=68300, t=95.547686, pot=(-20.948342,-79.815268)
event=68400, t=95.668310, pot=(-22.996145,-73.596392)
event=68500, t=95.803210, pot=(-21.900540,-89.034144)
event=68600, t=95.931125, pot=(-19.996145,-73.596392)
event=68700, t=96.063872, pot=(-20.948342,-91.815268)
event=68800, t=96.174733, pot=(-23.948342,-73.815268)
event=68900, t=96.293642, pot=(-21.900540,-80.034144)
event=69000, t=96.470375, pot=(-22.852737,-107.253020)
event=69100, t=96.607420, pot=(-19.996145,-76.596392)
event=69200, t=96.771896, pot=(-23.804934,-98.471896)
event=69300, t=96.907397, pot=(-21.900540,-83.034144)
event=69400, t=97.073663, pot=(-20.948342,-85.815268)
event=69500, t=97.208322, pot=(-19.043948,-67.377516)
event=69600, t=97.381131, pot=(-19.043948,-67.377516)
event=69700, t=97.508333, pot=(-21.900540,-89.034144)
event=69800, t=97.644238, pot=(-22.852737,-86.253020)
event=69900, t=97.779703, pot=(-24.757132,-95.690771)
event=70000, t=97.899898, pot=(-24.757132,-95.690771)
event=70100, t=98.053000, pot=(-28.565921,-129.566275)
event=70200, t=98.197423, pot=(-30.613724,-114.347399)
event=70300, t=98.302067, pot=(-28.565921,-108.566275)
event=70400, t=98.450749, pot=(-26.661527,-102.128523)
event=70500, t=98.583241, pot=(-27.613724,-120.347399)
event=70600, t=98.747021, pot=(-21.900540,-83.034144)
event=70700, t=98.901402, pot=(-23.948342,-85.815268)
event=70800, t=99.040527, pot=(-24.757132,-104.690771)
event=70900, t=99.167847, pot=(-21.900540,-80.034144)
event=71000, t=99.311231, pot=(-26.804934,-98.471896)
event=71100, t=99.450357, pot=(-22.852737,-77.253020)
```

```
event=71200, t=99.617780, pot=(-23.804934,-89.471896)
event=71300, t=99.767288, pot=(-23.804934,-89.471896)
event=71400, t=99.911731, pot=(-25.709329,-92.909647)
```

```
simtg
```

```
 Network attributes:
  vertices = 50
  directed = FALSE
  hyper = FALSE
  loops = FALSE
  multiple = FALSE
  bipartite = FALSE
  Potential = -30.13763 -100.738
  Time = 100
  Events = 71481
  total edges= 57
    missing edges= 0
    non-missing edges= 57

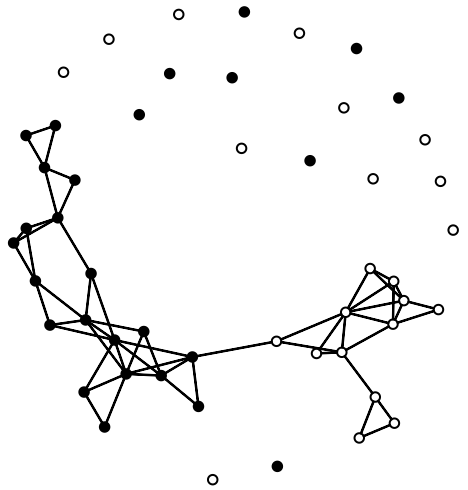
 Vertex attribute names:
    vertex.names x

No edge attributes
```

Observe that the graph potential now has two components, one for the formation process and the other for the dissolution process.

Let's look at what the simulation produced:

```
plot(simtg, vertex.col="x")   # Plot the simulated network
```



The result is quite striking: we have a network that is globally sparse, but where there is density there is considerable cohesion (in the form of local triangulation). These dense regions tend to be strongly homophilous. Why is that? We saw above that edges in the EGP form fairly infrequently, but the rate is much higher within-group: thus, homophilous ties form at a higher rate than cross-group ties. Dissolution, by contrast, is driven by embeddedness within triangles, with edges with at least one shared partner dissolving approximately 20 times more slowly than those without. Taken together, the formation model tends to create homophilous ties, while the dissolution model tends to prune back whatever is not cohesively connected. This leads to a sparse network whose connected portions are still locally cohesive, and that are strongly concentrated within groups (because you have a much better chance of getting shared partners where the formation rate is higher).

Note that, because this is an EGP, we can write the equilibrium graph distribution in ERGM form. Specifically, the ERGM potential is equal to $q_f(Y) + q_d(Y)$, giving us (in `ergm` formula form):

$$\text{net} \sim -5.09\text{edges} + 3\text{nodematch("x")} - 3\text{esp}(0)$$

As promised, this is an inhomogeneous dependence model, with homophilous ties being favored and unbuttressed ties (ESP(0)s) being disfavored. What would have happened if we had e.g. also had an effect for ESP(0)s in our formation model? The answer is that the ERGM coefficient would be the sum of the two coefficients. So, if it were e.g. also unfavorable to *form* ESP(0)s, they would be even more disfavored in equilibrium. On the other hand, if it were favorable to form ESP(0)s (positive coefficient in the formation model), then the two processes would partially cancel each other, and the equilibrium ESP(0) effect would reflect their sum. It also follows that we cannot know, from a given ERGM generated by a CSTERGM, the exact formation and dissolution rates that produced it: we can only know how the rates balance out. To break symmetry for this class of EGPs, we require additional information on the dynamics.

2.2 Getting Fancier with `simEGPTraj`

`simEGP` is the workhorse simulation routine, but is a bit bare-bones; often, it is useful to work with `simEGPTraj`, a convenience function that automates some very common use cases for EGP simulation. Among its virtues, `simEGPTraj` can

- Simulate multiple trajectores from the same model (in parallel, if desired), returning the accumulated results;
- Simulate "checkpointed" trajectories, where states of a single trajectory are recorded at several checkpoints (defined either by time or number of events); and
- Preprocess trajectories so that only network statistics (and not the networks themselves) are stored and returned.

The arguments to `simEGPTraj` are largely similar to `simEGP`, with some particularly notable additions:

- The `checkpoints` argument indicates the number of points at which the trajectory should be measured (in addition to the initial state, which is always returned). These are by default evenly spaced in time or event count (depending on how the endpoint for the simulation was chosen). Logarithmically spaced checkpoints can be chosen using `log.sampling==TRUE`. One snapshot is returned for each checkpoint, for each simulated trajectory.
- The `trajectories` argument indicates how many trajectories to draw from the selected model; all have the same start point. The `mc.cores` argument can be used to split simulation across multiple cores.
- The `statsonly` argument can be set to `TRUE` to return only the model statistics at each checkpoint (rather than the networks themselves). This can save memory when working with large systems, and/or large numbers of checkpoints. The `monitor` argument - which works precisely like the equivalent argument to `ergm` - can be used to introduce additional statistics to track beyond those appearing in the graph potential.

Let's consider a simple example, returning to our original CTERGM. Let's run our simulation 100 times, keeping only the statistics and the default single changepoint.

```
set.seed(1331)
net <- network.initialize(10, directed = FALSE)
simbg <- simEGPTraj(form = net ~ edges, coef = log(1.5/(9-1.5))/2, time = 100,
    process = "CTERGM", trajectories = 100, statsonly = TRUE)
```

```
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
event=0, t=0.000000, pot=(0.000000,0.000000)
event=100, t=3.202727, pot=(-6.437752,0.000000)
event=200, t=5.982151, pot=(-6.437752,0.000000)
event=300, t=9.174867, pot=(-8.047190,0.000000)
event=400, t=11.862279, pot=(-4.828314,0.000000)
event=500, t=14.903347, pot=(-8.047190,0.000000)
event=600, t=18.045407, pot=(-6.437752,0.000000)
event=700, t=21.203084, pot=(-4.828314,0.000000)
event=800, t=24.372466, pot=(-6.437752,0.000000)
event=900, t=27.452887, pot=(-6.437752,0.000000)
event=1000, t=30.385364, pot=(-4.828314,0.000000)
event=1100, t=32.575519, pot=(-8.047190,0.000000)
event=1200, t=36.417853, pot=(-6.437752,0.000000)
event=1300, t=39.209466, pot=(-3.218876,0.000000)
event=1400, t=41.987816, pot=(-6.437752,0.000000)
event=1500, t=44.920710, pot=(-4.828314,0.000000)
event=1600, t=48.135149, pot=(-3.218876,0.000000)
event=1700, t=51.803374, pot=(-9.656627,0.000000)
event=1800, t=55.135096, pot=(-6.437752,0.000000)
event=1900, t=57.678964, pot=(-8.047190,0.000000)
```

```
event=2000, t=60.515663, pot=(-4.828314,0.000000)
event=2100, t=63.625352, pot=(-9.656627,0.000000)
event=2200, t=66.243982, pot=(-6.437752,0.000000)
event=2300, t=68.960453, pot=(-4.828314,0.000000)
event=2400, t=71.816712, pot=(-6.437752,0.000000)
event=2500, t=75.477733, pot=(-4.828314,0.000000)
event=2600, t=78.447544, pot=(-8.047190,0.000000)
event=2700, t=81.608730, pot=(-6.437752,0.000000)
event=2800, t=84.551909, pot=(-6.437752,0.000000)
event=2900, t=88.150696, pot=(-4.828314,0.000000)
event=3000, t=91.070717, pot=(-4.828314,0.000000)
event=3100, t=93.382564, pot=(-3.218876,0.000000)
event=3200, t=96.037396, pot=(-4.828314,0.000000)
event=3300, t=98.678473, pot=(-9.656627,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
event=0, t=0.000000, pot=(0.000000,0.000000)
event=100, t=3.686766, pot=(-6.437752,0.000000)
event=200, t=6.679933, pot=(-8.047190,0.000000)
event=300, t=9.232389, pot=(-6.437752,0.000000)
event=400, t=12.092924, pot=(-8.047190,0.000000)
event=500, t=15.000405, pot=(-6.437752,0.000000)
event=600, t=17.946760, pot=(-3.218876,0.000000)
event=700, t=21.446633, pot=(-8.047190,0.000000)
event=800, t=24.184429, pot=(-8.047190,0.000000)
event=900, t=27.397144, pot=(-4.828314,0.000000)
event=1000, t=30.457003, pot=(-8.047190,0.000000)
event=1100, t=33.129701, pot=(-8.047190,0.000000)
event=1200, t=35.842673, pot=(-8.047190,0.000000)
event=1300, t=38.626923, pot=(-8.047190,0.000000)
event=1400, t=42.256925, pot=(-8.047190,0.000000)
event=1500, t=44.920274, pot=(-6.437752,0.000000)
event=1600, t=48.345111, pot=(-6.437752,0.000000)
event=1700, t=51.284006, pot=(-4.828314,0.000000)
event=1800, t=53.970826, pot=(-8.047190,0.000000)
event=1900, t=56.445656, pot=(-8.047190,0.000000)
event=2000, t=59.193322, pot=(-3.218876,0.000000)
event=2100, t=62.097522, pot=(-6.437752,0.000000)
event=2200, t=65.158893, pot=(-9.656627,0.000000)
event=2300, t=68.149068, pot=(-4.828314,0.000000)
event=2400, t=70.955217, pot=(-6.437752,0.000000)
event=2500, t=74.221375, pot=(-6.437752,0.000000)
event=2600, t=77.412914, pot=(-3.218876,0.000000)
event=2700, t=80.555646, pot=(-4.828314,0.000000)
event=2800, t=83.279384, pot=(-4.828314,0.000000)
event=2900, t=86.041891, pot=(-6.437752,0.000000)
event=3000, t=89.110157, pot=(-8.047190,0.000000)
event=3100, t=91.718923, pot=(-3.218876,0.000000)
event=3200, t=94.871884, pot=(-4.828314,0.000000)
event=3300, t=97.981753, pot=(-8.047190,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
event=0, t=0.000000, pot=(0.000000,0.000000)
event=100, t=3.157320, pot=(-6.437752,0.000000)
event=200, t=5.921278, pot=(-3.218876,0.000000)
event=300, t=8.986491, pot=(-11.266065,0.000000)
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event=400, t=11.418809, pot=(-6.437752,0.000000)
event=500, t=14.447668, pot=(-6.437752,0.000000)
event=600, t=17.120711, pot=(-6.437752,0.000000)
event=700, t=20.024738, pot=(-9.656627,0.000000)
event=800, t=23.240665, pot=(-4.828314,0.000000)
event=900, t=26.191416, pot=(-8.047190,0.000000)
event=1000, t=29.100144, pot=(-4.828314,0.000000)
event=1100, t=31.662904, pot=(-4.828314,0.000000)
event=1200, t=34.785798, pot=(-6.437752,0.000000)
event=1300, t=38.048286, pot=(-11.266065,0.000000)
event=1400, t=41.149322, pot=(-6.437752,0.000000)
event=1500, t=43.739737, pot=(-8.047190,0.000000)
event=1600, t=47.046213, pot=(-6.437752,0.000000)
event=1700, t=50.109481, pot=(-4.828314,0.000000)
event=1800, t=52.926565, pot=(-3.218876,0.000000)
event=1900, t=56.150377, pot=(-4.828314,0.000000)
event=2000, t=59.575744, pot=(-6.437752,0.000000)
event=2100, t=63.165372, pot=(-4.828314,0.000000)
event=2200, t=66.314818, pot=(-4.828314,0.000000)
event=2300, t=69.454888, pot=(-4.828314,0.000000)
event=2400, t=72.159565, pot=(-3.218876,0.000000)
event=2500, t=74.985846, pot=(-3.218876,0.000000)
event=2600, t=78.507775, pot=(-4.828314,0.000000)
event=2700, t=81.723591, pot=(-6.437752,0.000000)
event=2800, t=84.615955, pot=(-8.047190,0.000000)
event=2900, t=88.009772, pot=(-8.047190,0.000000)
event=3000, t=91.151221, pot=(-3.218876,0.000000)
event=3100, t=94.256392, pot=(-6.437752,0.000000)
event=3200, t=97.449363, pot=(-9.656627,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
event=0, t=0.000000, pot=(0.000000,0.000000)
event=100, t=3.362365, pot=(-3.218876,0.000000)
event=200, t=6.830839, pot=(-6.437752,0.000000)
event=300, t=9.695187, pot=(-4.828314,0.000000)
event=400, t=12.836782, pot=(-3.218876,0.000000)
event=500, t=16.004023, pot=(-4.828314,0.000000)
event=600, t=18.782193, pot=(-8.047190,0.000000)
event=700, t=21.722068, pot=(-4.828314,0.000000)
event=800, t=24.482268, pot=(-9.656627,0.000000)
event=900, t=27.316463, pot=(-8.047190,0.000000)
event=1000, t=30.381739, pot=(-4.828314,0.000000)
event=1100, t=34.520023, pot=(-3.218876,0.000000)
event=1200, t=37.614534, pot=(-4.828314,0.000000)
event=1300, t=40.786423, pot=(-4.828314,0.000000)
event=1400, t=43.607467, pot=(-9.656627,0.000000)
event=1500, t=46.719308, pot=(-6.437752,0.000000)
event=1600, t=49.565247, pot=(-4.828314,0.000000)
event=1700, t=52.799100, pot=(-8.047190,0.000000)
event=1800, t=56.769513, pot=(-8.047190,0.000000)
event=1900, t=60.281314, pot=(-4.828314,0.000000)
event=2000, t=62.537117, pot=(-3.218876,0.000000)
event=2100, t=65.206990, pot=(-9.656627,0.000000)
event=2200, t=68.372670, pot=(-9.656627,0.000000)
event=2300, t=71.296729, pot=(-6.437752,0.000000)
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event=2400, t=73.753432, pot=(-3.218876,0.000000)
event=2500, t=77.241463, pot=(-1.609438,0.000000)
event=2600, t=80.199515, pot=(-8.047190,0.000000)
event=2700, t=83.457563, pot=(-3.218876,0.000000)
event=2800, t=86.295063, pot=(-8.047190,0.000000)
event=2900, t=90.012623, pot=(-6.437752,0.000000)
event=3000, t=93.171158, pot=(-11.266065,0.000000)
event=3100, t=96.997979, pot=(-4.828314,0.000000)
event=3200, t=99.832074, pot=(-6.437752,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=100, t=2.849819, pot=(-8.047190,0.000000)
event=200, t=5.857713, pot=(-8.047190,0.000000)
event=300, t=8.816723, pot=(-8.047190,0.000000)
event=400, t=11.367994, pot=(-8.047190,0.000000)
event=500, t=14.497331, pot=(-4.828314,0.000000)
event=600, t=16.968204, pot=(-8.047190,0.000000)
event=700, t=20.014772, pot=(-8.047190,0.000000)
event=800, t=23.309418, pot=(-6.437752,0.000000)
event=900, t=26.744711, pot=(-6.437752,0.000000)
event=1000, t=29.611241, pot=(-6.437752,0.000000)
event=1100, t=32.339430, pot=(-4.828314,0.000000)
event=1200, t=34.467112, pot=(-8.047190,0.000000)
event=1300, t=37.433015, pot=(-8.047190,0.000000)
event=1400, t=40.383285, pot=(-6.437752,0.000000)
event=1500, t=43.490149, pot=(-4.828314,0.000000)
event=1600, t=46.109733, pot=(-9.656627,0.000000)
event=1700, t=49.727039, pot=(-8.047190,0.000000)
event=1800, t=52.232315, pot=(-6.437752,0.000000)
event=1900, t=55.487825, pot=(-3.218876,0.000000)
event=2000, t=58.381074, pot=(-9.656627,0.000000)
event=2100, t=61.317425, pot=(-8.047190,0.000000)
event=2200, t=64.595132, pot=(-8.047190,0.000000)
event=2300, t=67.357470, pot=(-6.437752,0.000000)
event=2400, t=70.089557, pot=(-9.656627,0.000000)
event=2500, t=73.297498, pot=(-4.828314,0.000000)
event=2600, t=76.241033, pot=(-6.437752,0.000000)
event=2700, t=79.694579, pot=(-3.218876,0.000000)
event=2800, t=82.193068, pot=(-4.828314,0.000000)
event=2900, t=84.833094, pot=(-4.828314,0.000000)
event=3000, t=87.849988, pot=(-6.437752,0.000000)
event=3100, t=90.711949, pot=(-3.218876,0.000000)
event=3200, t=93.371006, pot=(-4.828314,0.000000)
event=3300, t=95.832899, pot=(-9.656627,0.000000)
event=3400, t=98.718990, pot=(-6.437752,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
event=0, t=0.000000, pot=(0.000000,0.000000)
event=100, t=3.891162, pot=(-6.437752,0.000000)
event=200, t=6.669099, pot=(-6.437752,0.000000)
event=300, t=9.405932, pot=(-6.437752,0.000000)
event=400, t=12.363307, pot=(-6.437752,0.000000)
event=500, t=15.521354, pot=(-8.047190,0.000000)
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event=700, t=21.163950, pot=(-4.828314,0.000000)
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event=800, t=24.363587, pot=(-8.047190,0.000000)
event=900, t=27.196614, pot=(-4.828314,0.000000)
event=1000, t=30.788187, pot=(-4.828314,0.000000)
event=1100, t=33.746813, pot=(-4.828314,0.000000)
event=1200, t=36.657239, pot=(-4.828314,0.000000)
event=1300, t=40.131733, pot=(-4.828314,0.000000)
event=1400, t=43.566385, pot=(-4.828314,0.000000)
event=1500, t=46.338332, pot=(-3.218876,0.000000)
event=1600, t=49.356434, pot=(-4.828314,0.000000)
event=1700, t=52.202431, pot=(-8.047190,0.000000)
event=1800, t=55.483492, pot=(-4.828314,0.000000)
event=1900, t=58.690345, pot=(-9.656627,0.000000)
event=2000, t=61.737266, pot=(-8.047190,0.000000)
event=2100, t=64.349198, pot=(-3.218876,0.000000)
event=2200, t=67.147828, pot=(-8.047190,0.000000)
event=2300, t=70.541765, pot=(-6.437752,0.000000)
event=2400, t=73.172429, pot=(-9.656627,0.000000)
event=2500, t=75.808083, pot=(-4.828314,0.000000)
event=2600, t=78.892556, pot=(-4.828314,0.000000)
event=2700, t=82.355118, pot=(-3.218876,0.000000)
event=2800, t=85.717836, pot=(-6.437752,0.000000)
event=2900, t=88.874173, pot=(-4.828314,0.000000)
event=3000, t=92.051223, pot=(-4.828314,0.000000)
event=3100, t=95.431979, pot=(-3.218876,0.000000)
event=3200, t=99.250901, pot=(-3.218876,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=200, t=6.823470, pot=(-4.828314,0.000000)
event=300, t=9.909726, pot=(-6.437752,0.000000)
event=400, t=13.068510, pot=(-4.828314,0.000000)
event=500, t=16.407387, pot=(-6.437752,0.000000)
event=600, t=19.522353, pot=(-8.047190,0.000000)
event=700, t=22.241533, pot=(-3.218876,0.000000)
event=800, t=25.423471, pot=(-4.828314,0.000000)
event=900, t=28.202838, pot=(-3.218876,0.000000)
event=1000, t=30.787469, pot=(-8.047190,0.000000)
event=1100, t=34.016075, pot=(-4.828314,0.000000)
event=1200, t=36.972951, pot=(-6.437752,0.000000)
event=1300, t=39.725484, pot=(-8.047190,0.000000)
event=1400, t=42.799949, pot=(-4.828314,0.000000)
event=1500, t=46.459941, pot=(-8.047190,0.000000)
event=1600, t=49.380072, pot=(-6.437752,0.000000)
event=1700, t=52.087854, pot=(-6.437752,0.000000)
event=1800, t=54.648372, pot=(-8.047190,0.000000)
event=1900, t=57.346705, pot=(-4.828314,0.000000)
event=2000, t=60.283556, pot=(-4.828314,0.000000)
event=2100, t=62.387609, pot=(-9.656627,0.000000)
event=2200, t=65.343945, pot=(-6.437752,0.000000)
event=2300, t=68.916424, pot=(-6.437752,0.000000)
event=2400, t=71.585846, pot=(-8.047190,0.000000)
event=2500, t=74.659897, pot=(-6.437752,0.000000)
event=2600, t=77.715130, pot=(-6.437752,0.000000)
event=2700, t=80.300341, pot=(-8.047190,0.000000)
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event=2800, t=82.962100, pot=(-6.437752,0.000000)
event=2900, t=85.894082, pot=(-6.437752,0.000000)
event=3000, t=89.499584, pot=(-4.828314,0.000000)
event=3100, t=92.545489, pot=(-3.218876,0.000000)
event=3200, t=95.567963, pot=(-8.047190,0.000000)
event=3300, t=98.732457, pot=(-4.828314,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
event=0, t=0.000000, pot=(0.000000,0.000000)
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event=200, t=5.481991, pot=(-6.437752,0.000000)
event=300, t=8.577185, pot=(-9.656627,0.000000)
event=400, t=11.853111, pot=(-6.437752,0.000000)
event=500, t=15.214945, pot=(-6.437752,0.000000)
event=600, t=18.122180, pot=(-9.656627,0.000000)
event=700, t=20.719871, pot=(-8.047190,0.000000)
event=800, t=23.381933, pot=(-6.437752,0.000000)
event=900, t=26.257098, pot=(-4.828314,0.000000)
event=1000, t=29.663348, pot=(-9.656627,0.000000)
event=1100, t=32.616846, pot=(-6.437752,0.000000)
event=1200, t=35.541459, pot=(-6.437752,0.000000)
event=1300, t=38.825347, pot=(-8.047190,0.000000)
event=1400, t=41.893629, pot=(-8.047190,0.000000)
event=1500, t=45.064846, pot=(-4.828314,0.000000)
event=1600, t=47.667596, pot=(-11.266065,0.000000)
event=1700, t=50.700567, pot=(-4.828314,0.000000)
event=1800, t=53.431770, pot=(-3.218876,0.000000)
event=1900, t=56.144291, pot=(-8.047190,0.000000)
event=2000, t=59.319714, pot=(-8.047190,0.000000)
event=2100, t=62.260020, pot=(-4.828314,0.000000)
event=2200, t=64.978088, pot=(-6.437752,0.000000)
event=2300, t=68.014871, pot=(-1.609438,0.000000)
event=2400, t=71.116659, pot=(-4.828314,0.000000)
event=2500, t=74.397720, pot=(-4.828314,0.000000)
event=2600, t=77.643872, pot=(-4.828314,0.000000)
event=2700, t=80.168927, pot=(-4.828314,0.000000)
event=2800, t=82.956438, pot=(-6.437752,0.000000)
event=2900, t=86.591998, pot=(-4.828314,0.000000)
event=3000, t=89.294532, pot=(-6.437752,0.000000)
event=3100, t=92.538380, pot=(-4.828314,0.000000)
event=3200, t=94.995417, pot=(-8.047190,0.000000)
event=3300, t=97.463063, pot=(-3.218876,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=100, t=3.227677, pot=(-3.218876,0.000000)
event=200, t=6.392927, pot=(-8.047190,0.000000)
event=300, t=9.428787, pot=(-6.437752,0.000000)
event=400, t=12.542265, pot=(-6.437752,0.000000)
event=500, t=14.823824, pot=(-8.047190,0.000000)
event=600, t=17.690035, pot=(-4.828314,0.000000)
event=700, t=22.087364, pot=(-4.828314,0.000000)
event=800, t=24.981373, pot=(-9.656627,0.000000)
event=900, t=27.584881, pot=(-8.047190,0.000000)
event=1000, t=30.940011, pot=(-4.828314,0.000000)
event=1100, t=34.218744, pot=(-4.828314,0.000000)
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event=1200, t=36.968683, pot=(-4.828314,0.000000)
event=1300, t=40.343999, pot=(-8.047190,0.000000)
event=1400, t=43.339246, pot=(-4.828314,0.000000)
event=1500, t=46.159092, pot=(-8.047190,0.000000)
event=1600, t=49.309573, pot=(-9.656627,0.000000)
event=1700, t=53.297918, pot=(-6.437752,0.000000)
event=1800, t=56.481101, pot=(-8.047190,0.000000)
event=1900, t=59.496736, pot=(-4.828314,0.000000)
event=2000, t=61.892152, pot=(-8.047190,0.000000)
event=2100, t=64.928339, pot=(-4.828314,0.000000)
event=2200, t=68.219485, pot=(-4.828314,0.000000)
event=2300, t=70.464160, pot=(-6.437752,0.000000)
event=2400, t=73.546865, pot=(-8.047190,0.000000)
event=2500, t=76.616319, pot=(-6.437752,0.000000)
event=2600, t=79.487355, pot=(-4.828314,0.000000)
event=2700, t=82.191552, pot=(-9.656627,0.000000)
event=2800, t=85.293523, pot=(-8.047190,0.000000)
event=2900, t=88.878705, pot=(-6.437752,0.000000)
event=3000, t=91.713994, pot=(-4.828314,0.000000)
event=3100, t=94.951945, pot=(-6.437752,0.000000)
event=3200, t=98.010076, pot=(-8.047190,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=100, t=3.066936, pot=(-6.437752,0.000000)
event=200, t=5.852900, pot=(-8.047190,0.000000)
event=300, t=8.557954, pot=(-4.828314,0.000000)
event=400, t=11.249863, pot=(-6.437752,0.000000)
event=500, t=14.256182, pot=(-6.437752,0.000000)
event=600, t=17.746977, pot=(-6.437752,0.000000)
event=700, t=20.777201, pot=(-3.218876,0.000000)
event=800, t=24.201038, pot=(-6.437752,0.000000)
event=900, t=26.962676, pot=(-9.656627,0.000000)
event=1000, t=30.087882, pot=(-3.218876,0.000000)
event=1100, t=33.113539, pot=(-3.218876,0.000000)
event=1200, t=35.935263, pot=(-4.828314,0.000000)
event=1300, t=39.249261, pot=(-8.047190,0.000000)
event=1400, t=42.381351, pot=(-4.828314,0.000000)
event=1500, t=46.103730, pot=(-6.437752,0.000000)
event=1600, t=49.032138, pot=(-8.047190,0.000000)
event=1700, t=51.604027, pot=(-6.437752,0.000000)
event=1800, t=54.839615, pot=(-4.828314,0.000000)
event=1900, t=57.583271, pot=(-3.218876,0.000000)
event=2000, t=60.573240, pot=(-9.656627,0.000000)
event=2100, t=63.527160, pot=(-8.047190,0.000000)
event=2200, t=66.464241, pot=(-4.828314,0.000000)
event=2300, t=69.112461, pot=(-4.828314,0.000000)
event=2400, t=71.873290, pot=(-9.656627,0.000000)
event=2500, t=75.015895, pot=(-8.047190,0.000000)
event=2600, t=77.423820, pot=(-3.218876,0.000000)
event=2700, t=81.057815, pot=(-4.828314,0.000000)
event=2800, t=83.562131, pot=(-3.218876,0.000000)
event=2900, t=87.233478, pot=(-1.609438,0.000000)
event=3000, t=90.389042, pot=(-4.828314,0.000000)
event=3100, t=93.488755, pot=(-6.437752,0.000000)
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event=3200, t=96.993139, pot=(-6.437752,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=300, t=9.745325, pot=(-6.437752,0.000000)
event=400, t=12.624400, pot=(-8.047190,0.000000)
event=500, t=15.369578, pot=(-9.656627,0.000000)
event=600, t=17.861857, pot=(-6.437752,0.000000)
event=700, t=20.926251, pot=(-9.656627,0.000000)
event=800, t=23.378171, pot=(-8.047190,0.000000)
event=900, t=26.275231, pot=(-1.609438,0.000000)
event=1000, t=29.362571, pot=(-6.437752,0.000000)
event=1100, t=32.581750, pot=(-6.437752,0.000000)
event=1200, t=35.305277, pot=(-4.828314,0.000000)
event=1300, t=38.005867, pot=(-8.047190,0.000000)
event=1400, t=41.215682, pot=(-4.828314,0.000000)
event=1500, t=43.954457, pot=(-4.828314,0.000000)
event=1600, t=47.396337, pot=(-3.218876,0.000000)
event=1700, t=50.311507, pot=(-6.437752,0.000000)
event=1800, t=52.966646, pot=(-6.437752,0.000000)
event=1900, t=56.091750, pot=(-6.437752,0.000000)
event=2000, t=59.179019, pot=(-4.828314,0.000000)
event=2100, t=62.528989, pot=(-4.828314,0.000000)
event=2200, t=65.444890, pot=(-4.828314,0.000000)
event=2300, t=67.893075, pot=(-9.656627,0.000000)
event=2400, t=70.741007, pot=(-4.828314,0.000000)
event=2500, t=73.825026, pot=(-8.047190,0.000000)
event=2600, t=76.998428, pot=(-9.656627,0.000000)
event=2700, t=80.346428, pot=(-6.437752,0.000000)
event=2800, t=82.778423, pot=(-6.437752,0.000000)
event=2900, t=85.700040, pot=(-8.047190,0.000000)
event=3000, t=88.801159, pot=(-8.047190,0.000000)
event=3100, t=92.011304, pot=(-8.047190,0.000000)
event=3200, t=94.492137, pot=(-4.828314,0.000000)
event=3300, t=98.024647, pot=(-6.437752,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=200, t=5.890375, pot=(-6.437752,0.000000)
event=300, t=8.980687, pot=(-4.828314,0.000000)
event=400, t=11.616762, pot=(-4.828314,0.000000)
event=500, t=14.767730, pot=(-6.437752,0.000000)
event=600, t=18.299792, pot=(-6.437752,0.000000)
event=700, t=21.210072, pot=(-6.437752,0.000000)
event=800, t=25.133169, pot=(-3.218876,0.000000)
event=900, t=28.486747, pot=(-4.828314,0.000000)
event=1000, t=31.630336, pot=(-6.437752,0.000000)
event=1100, t=34.309048, pot=(-6.437752,0.000000)
event=1200, t=37.115960, pot=(-4.828314,0.000000)
event=1300, t=40.299874, pot=(-4.828314,0.000000)
event=1400, t=43.415987, pot=(-3.218876,0.000000)
event=1500, t=46.034185, pot=(-4.828314,0.000000)
event=1600, t=48.671141, pot=(-9.656627,0.000000)
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event=1700, t=51.977432, pot=(-6.437752,0.000000)
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event=1900, t=58.454582, pot=(-6.437752,0.000000)
event=2000, t=61.255277, pot=(-4.828314,0.000000)
event=2100, t=65.177529, pot=(-8.047190,0.000000)
event=2200, t=68.374180, pot=(-8.047190,0.000000)
event=2300, t=71.034290, pot=(-6.437752,0.000000)
event=2400, t=73.946281, pot=(-4.828314,0.000000)
event=2500, t=77.101479, pot=(-6.437752,0.000000)
event=2600, t=79.776897, pot=(-6.437752,0.000000)
event=2700, t=82.477699, pot=(-8.047190,0.000000)
event=2800, t=85.212974, pot=(-9.656627,0.000000)
event=2900, t=88.020275, pot=(-6.437752,0.000000)
event=3000, t=92.078041, pot=(-4.828314,0.000000)
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event=3200, t=97.302712, pot=(-4.828314,0.000000)
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event=400, t=11.613457, pot=(-8.047190,0.000000)
event=500, t=15.306412, pot=(-6.437752,0.000000)
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event=800, t=24.379418, pot=(-6.437752,0.000000)
event=900, t=27.274506, pot=(-4.828314,0.000000)
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event=1100, t=32.567515, pot=(-4.828314,0.000000)
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event=1300, t=38.488227, pot=(-6.437752,0.000000)
event=1400, t=41.774268, pot=(-3.218876,0.000000)
event=1500, t=44.730421, pot=(-11.266065,0.000000)
event=1600, t=46.860508, pot=(-6.437752,0.000000)
event=1700, t=49.524280, pot=(-6.437752,0.000000)
event=1800, t=52.911053, pot=(-4.828314,0.000000)
event=1900, t=56.320158, pot=(-4.828314,0.000000)
event=2000, t=59.288021, pot=(-6.437752,0.000000)
event=2100, t=62.061368, pot=(-8.047190,0.000000)
event=2200, t=64.849044, pot=(-9.656627,0.000000)
event=2300, t=67.132661, pot=(-6.437752,0.000000)
event=2400, t=70.254177, pot=(-6.437752,0.000000)
event=2500, t=72.839171, pot=(-9.656627,0.000000)
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event=2700, t=78.494567, pot=(-6.437752,0.000000)
event=2800, t=81.029591, pot=(-9.656627,0.000000)
event=2900, t=83.800319, pot=(-9.656627,0.000000)
event=3000, t=86.325147, pot=(-8.047190,0.000000)
event=3100, t=89.166616, pot=(-8.047190,0.000000)
event=3200, t=91.631671, pot=(-3.218876,0.000000)
event=3300, t=95.101745, pot=(-3.218876,0.000000)
event=3400, t=97.952477, pot=(-6.437752,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=400, t=10.608700, pot=(-6.437752,0.000000)
event=500, t=13.718977, pot=(-11.266065,0.000000)
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event=700, t=19.506970, pot=(-6.437752,0.000000)
event=800, t=22.579132, pot=(-8.047190,0.000000)
event=900, t=25.501720, pot=(-6.437752,0.000000)
event=1000, t=29.077816, pot=(-6.437752,0.000000)
event=1100, t=33.316499, pot=(-3.218876,0.000000)
event=1200, t=36.625623, pot=(-8.047190,0.000000)
event=1300, t=39.814259, pot=(-6.437752,0.000000)
event=1400, t=42.875243, pot=(-8.047190,0.000000)
event=1500, t=46.398169, pot=(-4.828314,0.000000)
event=1600, t=49.539312, pot=(-8.047190,0.000000)
event=1700, t=52.185573, pot=(-9.656627,0.000000)
event=1800, t=55.416996, pot=(-4.828314,0.000000)
event=1900, t=58.473628, pot=(-6.437752,0.000000)
event=2000, t=61.517105, pot=(-6.437752,0.000000)
event=2100, t=63.825018, pot=(-4.828314,0.000000)
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event=2400, t=72.650030, pot=(-9.656627,0.000000)
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event=2700, t=81.329071, pot=(-9.656627,0.000000)
event=2800, t=84.094875, pot=(-11.266065,0.000000)
event=2900, t=87.086103, pot=(-14.484941,0.000000)
event=3000, t=90.006916, pot=(-9.656627,0.000000)
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Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=700, t=21.035003, pot=(-9.656627,0.000000)
event=800, t=23.568793, pot=(-6.437752,0.000000)
event=900, t=26.834538, pot=(-1.609438,0.000000)
event=1000, t=30.191661, pot=(-4.828314,0.000000)
event=1100, t=33.543346, pot=(-6.437752,0.000000)
event=1200, t=36.249063, pot=(-9.656627,0.000000)
event=1300, t=39.380116, pot=(-8.047190,0.000000)
event=1400, t=42.606876, pot=(-4.828314,0.000000)
event=1500, t=46.284022, pot=(-3.218876,0.000000)
event=1600, t=49.412232, pot=(-8.047190,0.000000)
event=1700, t=52.625398, pot=(-4.828314,0.000000)
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event=1900, t=58.358731, pot=(-6.437752,0.000000)
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event=2200, t=67.062564, pot=(-6.437752,0.000000)
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event=2500, t=75.477828, pot=(-8.047190,0.000000)
event=2600, t=78.505456, pot=(-6.437752,0.000000)
event=2700, t=81.243760, pot=(-6.437752,0.000000)
event=2800, t=84.184405, pot=(-8.047190,0.000000)
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Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=300, t=8.743021, pot=(-6.437752,0.000000)
event=400, t=11.123485, pot=(-8.047190,0.000000)
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event=1300, t=38.405898, pot=(-8.047190,0.000000)
event=1400, t=41.448195, pot=(-6.437752,0.000000)
event=1500, t=44.109868, pot=(-4.828314,0.000000)
event=1600, t=46.528185, pot=(-6.437752,0.000000)
event=1700, t=49.840119, pot=(-4.828314,0.000000)
event=1800, t=52.562511, pot=(-6.437752,0.000000)
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event=2000, t=58.771246, pot=(-4.828314,0.000000)
event=2100, t=62.192587, pot=(-4.828314,0.000000)
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event=2300, t=68.128723, pot=(-6.437752,0.000000)
event=2400, t=70.737619, pot=(-6.437752,0.000000)
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event=2700, t=78.675031, pot=(-6.437752,0.000000)
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event=2900, t=84.254824, pot=(-4.828314,0.000000)
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event=1600, t=46.820670, pot=(-9.656627,0.000000)
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event=1900, t=55.241742, pot=(-4.828314,0.000000)
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event=300, t=8.049432, pot=(-6.437752,0.000000)
event=400, t=10.924945, pot=(-8.047190,0.000000)
event=500, t=13.582121, pot=(-6.437752,0.000000)
event=600, t=16.304742, pot=(-6.437752,0.000000)
event=700, t=19.454319, pot=(-4.828314,0.000000)
event=800, t=22.390894, pot=(-8.047190,0.000000)
event=900, t=25.440392, pot=(-1.609438,0.000000)
event=1000, t=28.182838, pot=(-8.047190,0.000000)
event=1100, t=31.602014, pot=(-4.828314,0.000000)
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event=1500, t=43.659457, pot=(-4.828314,0.000000)
event=1600, t=46.602733, pot=(-6.437752,0.000000)
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event=2000, t=57.442039, pot=(-4.828314,0.000000)
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event=2600, t=76.537106, pot=(-4.828314,0.000000)
event=2700, t=79.777602, pot=(-8.047190,0.000000)
event=2800, t=82.561231, pot=(-11.266065,0.000000)
event=2900, t=85.558899, pot=(-6.437752,0.000000)
event=3000, t=88.062442, pot=(-6.437752,0.000000)
event=3100, t=91.122035, pot=(-6.437752,0.000000)
event=3200, t=94.678458, pot=(-6.437752,0.000000)
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event=1000, t=28.780780, pot=(-3.218876,0.000000)
event=1100, t=31.444794, pot=(-8.047190,0.000000)
event=1200, t=34.723836, pot=(-11.266065,0.000000)
event=1300, t=36.873427, pot=(-4.828314,0.000000)
event=1400, t=39.915806, pot=(-4.828314,0.000000)
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event=2200, t=63.564138, pot=(-3.218876,0.000000)
event=2300, t=67.412325, pot=(-6.437752,0.000000)
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event=2500, t=73.067792, pot=(-6.437752,0.000000)
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event=3100, t=92.298893, pot=(-8.047190,0.000000)
event=3200, t=95.868734, pot=(-4.828314,0.000000)
event=3300, t=98.919845, pot=(-6.437752,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=400, t=12.543367, pot=(-8.047190,0.000000)
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event=800, t=24.943977, pot=(-6.437752,0.000000)
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event=1000, t=30.579288, pot=(-8.047190,0.000000)
event=1100, t=34.093187, pot=(-4.828314,0.000000)
event=1200, t=36.975551, pot=(-4.828314,0.000000)
event=1300, t=39.756410, pot=(-8.047190,0.000000)
event=1400, t=42.901321, pot=(-4.828314,0.000000)
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event=1600, t=49.489733, pot=(-4.828314,0.000000)
event=1700, t=52.161254, pot=(-4.828314,0.000000)
event=1800, t=54.558796, pot=(-4.828314,0.000000)
event=1900, t=57.606880, pot=(-6.437752,0.000000)
event=2000, t=60.363718, pot=(-9.656627,0.000000)
event=2100, t=63.383216, pot=(-8.047190,0.000000)
event=2200, t=66.705735, pot=(-6.437752,0.000000)
event=2300, t=70.142144, pot=(-8.047190,0.000000)
event=2400, t=73.563156, pot=(-4.828314,0.000000)
event=2500, t=77.174292, pot=(-4.828314,0.000000)
event=2600, t=80.098679, pot=(-4.828314,0.000000)
event=2700, t=83.302359, pot=(-6.437752,0.000000)
event=2800, t=86.962484, pot=(-3.218876,0.000000)
event=2900, t=90.227868, pot=(-6.437752,0.000000)
event=3000, t=93.108629, pot=(-6.437752,0.000000)
event=3100, t=96.127248, pot=(-6.437752,0.000000)
event=3200, t=99.464170, pot=(-3.218876,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=200, t=5.844693, pot=(-4.828314,0.000000)
event=300, t=8.611410, pot=(-6.437752,0.000000)
event=400, t=11.741740, pot=(-6.437752,0.000000)
event=500, t=14.814218, pot=(-6.437752,0.000000)
event=600, t=17.628410, pot=(-6.437752,0.000000)
event=700, t=21.029031, pot=(-11.266065,0.000000)
event=800, t=24.463150, pot=(-4.828314,0.000000)
event=900, t=27.433130, pot=(-3.218876,0.000000)
event=1000, t=30.048974, pot=(-6.437752,0.000000)
event=1100, t=33.214602, pot=(-4.828314,0.000000)
event=1200, t=36.681413, pot=(-8.047190,0.000000)
event=1300, t=39.775597, pot=(-3.218876,0.000000)
event=1400, t=42.603639, pot=(-9.656627,0.000000)
event=1500, t=45.063487, pot=(-4.828314,0.000000)
event=1600, t=47.796636, pot=(-8.047190,0.000000)
event=1700, t=51.384810, pot=(-6.437752,0.000000)
event=1800, t=54.568784, pot=(-4.828314,0.000000)
event=1900, t=57.145920, pot=(-6.437752,0.000000)
event=2000, t=60.343524, pot=(-8.047190,0.000000)
event=2100, t=63.565137, pot=(-6.437752,0.000000)
event=2200, t=66.713296, pot=(-4.828314,0.000000)
event=2300, t=69.811669, pot=(-6.437752,0.000000)
event=2400, t=72.748846, pot=(-6.437752,0.000000)
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event=2500, t=75.809422, pot=(-12.875503,0.000000)
event=2600, t=79.228536, pot=(-6.437752,0.000000)
event=2700, t=83.156848, pot=(-9.656627,0.000000)
event=2800, t=85.781491, pot=(-6.437752,0.000000)
event=2900, t=88.848339, pot=(-6.437752,0.000000)
event=3000, t=92.136805, pot=(-4.828314,0.000000)
event=3100, t=95.369870, pot=(-4.828314,0.000000)
event=3200, t=97.669337, pot=(-9.656627,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=200, t=6.469930, pot=(-4.828314,0.000000)
event=300, t=9.111815, pot=(-9.656627,0.000000)
event=400, t=12.169082, pot=(-8.047190,0.000000)
event=500, t=14.499172, pot=(-8.047190,0.000000)
event=600, t=17.593317, pot=(-8.047190,0.000000)
event=700, t=20.111946, pot=(-6.437752,0.000000)
event=800, t=22.972244, pot=(-6.437752,0.000000)
event=900, t=25.713393, pot=(-9.656627,0.000000)
event=1000, t=28.399983, pot=(-8.047190,0.000000)
event=1100, t=30.742887, pot=(-3.218876,0.000000)
event=1200, t=34.152312, pot=(-4.828314,0.000000)
event=1300, t=37.172916, pot=(-9.656627,0.000000)
event=1400, t=39.851801, pot=(-4.828314,0.000000)
event=1500, t=42.412537, pot=(-3.218876,0.000000)
event=1600, t=46.248079, pot=(-6.437752,0.000000)
event=1700, t=49.261005, pot=(-8.047190,0.000000)
event=1800, t=51.911590, pot=(-9.656627,0.000000)
event=1900, t=54.612800, pot=(-6.437752,0.000000)
event=2000, t=58.123284, pot=(-9.656627,0.000000)
event=2100, t=61.192997, pot=(-6.437752,0.000000)
event=2200, t=65.112511, pot=(-4.828314,0.000000)
event=2300, t=68.126555, pot=(-4.828314,0.000000)
event=2400, t=71.066417, pot=(-6.437752,0.000000)
event=2500, t=74.453483, pot=(-6.437752,0.000000)
event=2600, t=77.579773, pot=(-8.047190,0.000000)
event=2700, t=80.358245, pot=(-8.047190,0.000000)
event=2800, t=83.102634, pot=(-6.437752,0.000000)
event=2900, t=86.278805, pot=(-8.047190,0.000000)
event=3000, t=88.914144, pot=(-6.437752,0.000000)
event=3100, t=91.961850, pot=(-6.437752,0.000000)
event=3200, t=94.851053, pot=(-6.437752,0.000000)
event=3300, t=98.010547, pot=(-6.437752,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=200, t=5.417198, pot=(-3.218876,0.000000)
event=300, t=8.709769, pot=(-6.437752,0.000000)
event=400, t=12.122499, pot=(-4.828314,0.000000)
event=500, t=15.190288, pot=(-6.437752,0.000000)
event=600, t=18.782560, pot=(0.000000,0.000000)
event=700, t=21.921813, pot=(-4.828314,0.000000)
event=800, t=25.946945, pot=(-4.828314,0.000000)
event=900, t=28.930011, pot=(-4.828314,0.000000)
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event=1000, t=32.379563, pot=(-9.656627,0.000000)
event=1100, t=35.498280, pot=(-8.047190,0.000000)
event=1200, t=37.879536, pot=(-4.828314,0.000000)
event=1300, t=40.733009, pot=(-8.047190,0.000000)
event=1400, t=43.873878, pot=(-6.437752,0.000000)
event=1500, t=47.320076, pot=(-6.437752,0.000000)
event=1600, t=50.193255, pot=(-6.437752,0.000000)
event=1700, t=53.698325, pot=(-6.437752,0.000000)
event=1800, t=56.621051, pot=(-4.828314,0.000000)
event=1900, t=59.173616, pot=(-6.437752,0.000000)
event=2000, t=62.568435, pot=(-6.437752,0.000000)
event=2100, t=65.744357, pot=(-6.437752,0.000000)
event=2200, t=68.532400, pot=(-6.437752,0.000000)
event=2300, t=71.832444, pot=(-3.218876,0.000000)
event=2400, t=74.547779, pot=(-9.656627,0.000000)
event=2500, t=77.217209, pot=(-8.047190,0.000000)
event=2600, t=80.561925, pot=(-8.047190,0.000000)
event=2700, t=83.549033, pot=(-4.828314,0.000000)
event=2800, t=86.262196, pot=(-8.047190,0.000000)
event=2900, t=89.301384, pot=(-9.656627,0.000000)
event=3000, t=92.248609, pot=(-9.656627,0.000000)
event=3100, t=95.190849, pot=(-4.828314,0.000000)
event=3200, t=98.134649, pot=(-8.047190,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=200, t=6.729695, pot=(-6.437752,0.000000)
event=300, t=9.973994, pot=(-11.266065,0.000000)
event=400, t=12.438761, pot=(-3.218876,0.000000)
event=500, t=15.888680, pot=(-8.047190,0.000000)
event=600, t=18.699564, pot=(-6.437752,0.000000)
event=700, t=21.362947, pot=(-4.828314,0.000000)
event=800, t=24.477728, pot=(-8.047190,0.000000)
event=900, t=27.472115, pot=(-6.437752,0.000000)
event=1000, t=30.628786, pot=(-6.437752,0.000000)
event=1100, t=34.045323, pot=(-3.218876,0.000000)
event=1200, t=36.819312, pot=(-8.047190,0.000000)
event=1300, t=39.550401, pot=(-4.828314,0.000000)
event=1400, t=42.813898, pot=(-8.047190,0.000000)
event=1500, t=46.327210, pot=(-1.609438,0.000000)
event=1600, t=49.031367, pot=(-4.828314,0.000000)
event=1700, t=52.201029, pot=(-4.828314,0.000000)
event=1800, t=54.954003, pot=(-6.437752,0.000000)
event=1900, t=58.262019, pot=(-4.828314,0.000000)
event=2000, t=60.916174, pot=(-8.047190,0.000000)
event=2100, t=64.008092, pot=(-11.266065,0.000000)
event=2200, t=66.926656, pot=(-4.828314,0.000000)
event=2300, t=69.769546, pot=(-9.656627,0.000000)
event=2400, t=73.208262, pot=(-1.609438,0.000000)
event=2500, t=76.147010, pot=(-4.828314,0.000000)
event=2600, t=79.499131, pot=(-8.047190,0.000000)
event=2700, t=82.275829, pot=(-4.828314,0.000000)
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event=2900, t=89.171129, pot=(-12.875503,0.000000)
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event=3200, t=98.999060, pot=(-4.828314,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=200, t=6.544994, pot=(-4.828314,0.000000)
event=300, t=10.015575, pot=(-4.828314,0.000000)
event=400, t=12.861942, pot=(-4.828314,0.000000)
event=500, t=16.102091, pot=(-11.266065,0.000000)
event=600, t=18.699213, pot=(-4.828314,0.000000)
event=700, t=21.696319, pot=(-6.437752,0.000000)
event=800, t=24.605809, pot=(-6.437752,0.000000)
event=900, t=27.263432, pot=(-1.609438,0.000000)
event=1000, t=30.254683, pot=(-4.828314,0.000000)
event=1100, t=33.406279, pot=(-8.047190,0.000000)
event=1200, t=36.190674, pot=(-4.828314,0.000000)
event=1300, t=39.059466, pot=(-6.437752,0.000000)
event=1400, t=41.831680, pot=(-3.218876,0.000000)
event=1500, t=44.468707, pot=(-8.047190,0.000000)
event=1600, t=47.052091, pot=(-6.437752,0.000000)
event=1700, t=50.299703, pot=(-8.047190,0.000000)
event=1800, t=52.838018, pot=(-9.656627,0.000000)
event=1900, t=55.552856, pot=(-4.828314,0.000000)
event=2000, t=58.622289, pot=(-3.218876,0.000000)
event=2100, t=61.709391, pot=(-8.047190,0.000000)
event=2200, t=64.134991, pot=(-8.047190,0.000000)
event=2300, t=67.194478, pot=(-1.609438,0.000000)
event=2400, t=69.818562, pot=(-6.437752,0.000000)
event=2500, t=72.876169, pot=(-8.047190,0.000000)
event=2600, t=75.460106, pot=(-8.047190,0.000000)
event=2700, t=78.397072, pot=(-4.828314,0.000000)
event=2800, t=80.780019, pot=(-9.656627,0.000000)
event=2900, t=84.110188, pot=(-8.047190,0.000000)
event=3000, t=86.822295, pot=(-8.047190,0.000000)
event=3100, t=89.351151, pot=(-4.828314,0.000000)
event=3200, t=92.194321, pot=(-6.437752,0.000000)
event=3300, t=95.067175, pot=(-6.437752,0.000000)
event=3400, t=97.803138, pot=(-9.656627,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=200, t=6.461142, pot=(-6.437752,0.000000)
event=300, t=9.016773, pot=(-4.828314,0.000000)
event=400, t=11.753029, pot=(-6.437752,0.000000)
event=500, t=14.662215, pot=(-6.437752,0.000000)
event=600, t=18.146584, pot=(-8.047190,0.000000)
event=700, t=20.838089, pot=(-4.828314,0.000000)
event=800, t=23.653500, pot=(-6.437752,0.000000)
event=900, t=26.562317, pot=(-4.828314,0.000000)
event=1000, t=28.650693, pot=(-9.656627,0.000000)
event=1100, t=31.631391, pot=(-4.828314,0.000000)
event=1200, t=34.121581, pot=(-8.047190,0.000000)
event=1300, t=37.903789, pot=(-6.437752,0.000000)
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event=1400, t=40.779154, pot=(-8.047190,0.000000)
event=1500, t=43.745483, pot=(-4.828314,0.000000)
event=1600, t=46.422938, pot=(-4.828314,0.000000)
event=1700, t=49.484675, pot=(-8.047190,0.000000)
event=1800, t=52.143622, pot=(-4.828314,0.000000)
event=1900, t=54.396202, pot=(-9.656627,0.000000)
event=2000, t=57.456252, pot=(-6.437752,0.000000)
event=2100, t=60.034508, pot=(-4.828314,0.000000)
event=2200, t=62.831634, pot=(-6.437752,0.000000)
event=2300, t=65.294614, pot=(-3.218876,0.000000)
event=2400, t=68.908865, pot=(-4.828314,0.000000)
event=2500, t=70.864458, pot=(-8.047190,0.000000)
event=2600, t=73.848674, pot=(-4.828314,0.000000)
event=2700, t=76.409278, pot=(-4.828314,0.000000)
event=2800, t=79.791561, pot=(-6.437752,0.000000)
event=2900, t=83.208743, pot=(-1.609438,0.000000)
event=3000, t=86.321143, pot=(-4.828314,0.000000)
event=3100, t=90.340832, pot=(-3.218876,0.000000)
event=3200, t=93.161311, pot=(-6.437752,0.000000)
event=3300, t=96.108411, pot=(-8.047190,0.000000)
event=3400, t=98.973762, pot=(-4.828314,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=200, t=6.170013, pot=(-4.828314,0.000000)
event=300, t=9.757304, pot=(-6.437752,0.000000)
event=400, t=13.070664, pot=(-6.437752,0.000000)
event=500, t=15.818110, pot=(-6.437752,0.000000)
event=600, t=18.458304, pot=(-9.656627,0.000000)
event=700, t=22.167912, pot=(-11.266065,0.000000)
event=800, t=24.766536, pot=(-4.828314,0.000000)
event=900, t=27.696092, pot=(-8.047190,0.000000)
event=1000, t=31.121182, pot=(-8.047190,0.000000)
event=1100, t=33.801794, pot=(-4.828314,0.000000)
event=1200, t=37.148849, pot=(-6.437752,0.000000)
event=1300, t=40.402519, pot=(-6.437752,0.000000)
event=1400, t=43.474499, pot=(-4.828314,0.000000)
event=1500, t=47.370021, pot=(-8.047190,0.000000)
event=1600, t=50.764586, pot=(-3.218876,0.000000)
event=1700, t=53.667603, pot=(-3.218876,0.000000)
event=1800, t=57.074745, pot=(-4.828314,0.000000)
event=1900, t=60.215247, pot=(-6.437752,0.000000)
event=2000, t=63.277524, pot=(-4.828314,0.000000)
event=2100, t=66.111030, pot=(-6.437752,0.000000)
event=2200, t=68.675094, pot=(-4.828314,0.000000)
event=2300, t=71.706793, pot=(-9.656627,0.000000)
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event=2500, t=78.595861, pot=(-6.437752,0.000000)
event=2600, t=81.670319, pot=(-6.437752,0.000000)
event=2700, t=85.004300, pot=(-8.047190,0.000000)
event=2800, t=87.639449, pot=(-8.047190,0.000000)
event=2900, t=90.898735, pot=(-4.828314,0.000000)
event=3000, t=93.870982, pot=(-6.437752,0.000000)
event=3100, t=96.603412, pot=(-4.828314,0.000000)
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event=3200, t=99.996604, pot=(-3.218876,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=200, t=5.199452, pot=(-8.047190,0.000000)
event=300, t=7.933957, pot=(-3.218876,0.000000)
event=400, t=10.832426, pot=(-4.828314,0.000000)
event=500, t=13.409500, pot=(-6.437752,0.000000)
event=600, t=16.145742, pot=(-8.047190,0.000000)
event=700, t=19.276054, pot=(-4.828314,0.000000)
event=800, t=22.434731, pot=(-9.656627,0.000000)
event=900, t=25.298217, pot=(-3.218876,0.000000)
event=1000, t=28.474592, pot=(-4.828314,0.000000)
event=1100, t=31.639138, pot=(-6.437752,0.000000)
event=1200, t=34.386121, pot=(-6.437752,0.000000)
event=1300, t=37.306830, pot=(-6.437752,0.000000)
event=1400, t=39.940002, pot=(-8.047190,0.000000)
event=1500, t=42.807074, pot=(-9.656627,0.000000)
event=1600, t=45.630039, pot=(-4.828314,0.000000)
event=1700, t=48.527081, pot=(-6.437752,0.000000)
event=1800, t=51.753117, pot=(-8.047190,0.000000)
event=1900, t=54.838199, pot=(-9.656627,0.000000)
event=2000, t=58.387004, pot=(-4.828314,0.000000)
event=2100, t=61.454410, pot=(-4.828314,0.000000)
event=2200, t=64.300880, pot=(-6.437752,0.000000)
event=2300, t=67.173990, pot=(-6.437752,0.000000)
event=2400, t=70.385303, pot=(-9.656627,0.000000)
event=2500, t=73.361937, pot=(-8.047190,0.000000)
event=2600, t=76.324993, pot=(-9.656627,0.000000)
event=2700, t=80.060160, pot=(-6.437752,0.000000)
event=2800, t=82.694377, pot=(-6.437752,0.000000)
event=2900, t=85.427739, pot=(-6.437752,0.000000)
event=3000, t=88.646396, pot=(-4.828314,0.000000)
event=3100, t=90.905624, pot=(-4.828314,0.000000)
event=3200, t=94.175545, pot=(-3.218876,0.000000)
event=3300, t=97.817416, pot=(-8.047190,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=200, t=5.762389, pot=(-8.047190,0.000000)
event=300, t=8.798768, pot=(-6.437752,0.000000)
event=400, t=11.452804, pot=(-6.437752,0.000000)
event=500, t=13.661842, pot=(-9.656627,0.000000)
event=600, t=16.817930, pot=(-4.828314,0.000000)
event=700, t=19.960534, pot=(-6.437752,0.000000)
event=800, t=23.660467, pot=(-8.047190,0.000000)
event=900, t=25.897820, pot=(-9.656627,0.000000)
event=1000, t=29.404721, pot=(-4.828314,0.000000)
event=1100, t=32.297006, pot=(-6.437752,0.000000)
event=1200, t=35.701337, pot=(-3.218876,0.000000)
event=1300, t=38.683094, pot=(-4.828314,0.000000)
event=1400, t=41.063428, pot=(-6.437752,0.000000)
event=1500, t=44.299118, pot=(-4.828314,0.000000)
event=1600, t=47.469371, pot=(-4.828314,0.000000)
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event=1700, t=50.821629, pot=(-8.047190,0.000000)
event=1800, t=53.662684, pot=(-8.047190,0.000000)
event=1900, t=56.698452, pot=(-6.437752,0.000000)
event=2000, t=59.430998, pot=(-4.828314,0.000000)
event=2100, t=62.422862, pot=(-4.828314,0.000000)
event=2200, t=65.542753, pot=(-9.656627,0.000000)
event=2300, t=68.832000, pot=(-3.218876,0.000000)
event=2400, t=72.046497, pot=(-6.437752,0.000000)
event=2500, t=75.163876, pot=(-4.828314,0.000000)
event=2600, t=77.764485, pot=(-4.828314,0.000000)
event=2700, t=81.221718, pot=(-4.828314,0.000000)
event=2800, t=84.353195, pot=(-3.218876,0.000000)
event=2900, t=87.170526, pot=(-6.437752,0.000000)
event=3000, t=89.867359, pot=(-4.828314,0.000000)
event=3100, t=92.811327, pot=(-8.047190,0.000000)
event=3200, t=96.031760, pot=(-4.828314,0.000000)
event=3300, t=99.248682, pot=(-9.656627,0.000000)
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event=200, t=5.902697, pot=(-9.656627,0.000000)
event=300, t=8.893268, pot=(-8.047190,0.000000)
event=400, t=11.692897, pot=(-8.047190,0.000000)
event=500, t=14.057314, pot=(-8.047190,0.000000)
event=600, t=16.879971, pot=(-4.828314,0.000000)
event=700, t=20.244083, pot=(-6.437752,0.000000)
event=800, t=22.898842, pot=(-6.437752,0.000000)
event=900, t=26.162635, pot=(-4.828314,0.000000)
event=1000, t=29.258888, pot=(-6.437752,0.000000)
event=1100, t=32.483575, pot=(-9.656627,0.000000)
event=1200, t=35.673385, pot=(-6.437752,0.000000)
event=1300, t=38.267766, pot=(-9.656627,0.000000)
event=1400, t=41.816258, pot=(-4.828314,0.000000)
event=1500, t=44.456054, pot=(-6.437752,0.000000)
event=1600, t=47.515264, pot=(-6.437752,0.000000)
event=1700, t=50.724807, pot=(-8.047190,0.000000)
event=1800, t=53.796508, pot=(-6.437752,0.000000)
event=1900, t=56.637890, pot=(-8.047190,0.000000)
event=2000, t=59.808401, pot=(-4.828314,0.000000)
event=2100, t=62.551542, pot=(-6.437752,0.000000)
event=2200, t=65.028940, pot=(-6.437752,0.000000)
event=2300, t=68.172478, pot=(-4.828314,0.000000)
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event=2500, t=74.172494, pot=(-8.047190,0.000000)
event=2600, t=76.681725, pot=(-4.828314,0.000000)
event=2700, t=79.927646, pot=(-8.047190,0.000000)
event=2800, t=82.315056, pot=(-6.437752,0.000000)
event=2900, t=85.156059, pot=(-11.266065,0.000000)
event=3000, t=88.313792, pot=(-3.218876,0.000000)
event=3100, t=90.787357, pot=(-9.656627,0.000000)
event=3200, t=93.583577, pot=(-6.437752,0.000000)
event=3300, t=96.205228, pot=(-8.047190,0.000000)
event=3400, t=99.298531, pot=(-6.437752,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=200, t=6.777606, pot=(-3.218876,0.000000)
event=300, t=9.459418, pot=(-8.047190,0.000000)
event=400, t=12.520437, pot=(-6.437752,0.000000)
event=500, t=15.030370, pot=(-8.047190,0.000000)
event=600, t=18.210913, pot=(-6.437752,0.000000)
event=700, t=21.233699, pot=(-6.437752,0.000000)
event=800, t=24.267134, pot=(-9.656627,0.000000)
event=900, t=27.714192, pot=(-1.609438,0.000000)
event=1000, t=30.443706, pot=(-6.437752,0.000000)
event=1100, t=32.978457, pot=(-6.437752,0.000000)
event=1200, t=35.794141, pot=(-8.047190,0.000000)
event=1300, t=38.194483, pot=(-8.047190,0.000000)
event=1400, t=40.906813, pot=(-6.437752,0.000000)
event=1500, t=43.495403, pot=(-6.437752,0.000000)
event=1600, t=46.426077, pot=(-3.218876,0.000000)
event=1700, t=49.861338, pot=(-3.218876,0.000000)
event=1800, t=53.240045, pot=(-4.828314,0.000000)
event=1900, t=56.620642, pot=(-8.047190,0.000000)
event=2000, t=60.142220, pot=(-8.047190,0.000000)
event=2100, t=62.561039, pot=(-6.437752,0.000000)
event=2200, t=65.478082, pot=(-8.047190,0.000000)
event=2300, t=68.952056, pot=(-6.437752,0.000000)
event=2400, t=71.977230, pot=(-6.437752,0.000000)
event=2500, t=75.141686, pot=(-8.047190,0.000000)
event=2600, t=77.776120, pot=(-9.656627,0.000000)
event=2700, t=79.888880, pot=(-4.828314,0.000000)
event=2800, t=82.823536, pot=(-6.437752,0.000000)
event=2900, t=85.541279, pot=(-6.437752,0.000000)
event=3000, t=88.351919, pot=(-4.828314,0.000000)
event=3100, t=91.183116, pot=(-6.437752,0.000000)
event=3200, t=94.261737, pot=(-9.656627,0.000000)
event=3300, t=97.766314, pot=(-3.218876,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=200, t=6.250706, pot=(-6.437752,0.000000)
event=300, t=9.357064, pot=(-4.828314,0.000000)
event=400, t=12.240712, pot=(-4.828314,0.000000)
event=500, t=14.789022, pot=(-8.047190,0.000000)
event=600, t=17.657377, pot=(-6.437752,0.000000)
event=700, t=20.645784, pot=(-8.047190,0.000000)
event=800, t=23.800882, pot=(-4.828314,0.000000)
event=900, t=27.013317, pot=(-6.437752,0.000000)
event=1000, t=30.069986, pot=(-9.656627,0.000000)
event=1100, t=32.647615, pot=(-6.437752,0.000000)
event=1200, t=35.777373, pot=(-6.437752,0.000000)
event=1300, t=38.094114, pot=(-8.047190,0.000000)
event=1400, t=41.466183, pot=(-4.828314,0.000000)
event=1500, t=43.848555, pot=(-4.828314,0.000000)
event=1600, t=47.015847, pot=(-6.437752,0.000000)
event=1700, t=49.973871, pot=(-8.047190,0.000000)
event=1800, t=53.326859, pot=(-3.218876,0.000000)
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event=1900, t=56.468930, pot=(-9.656627,0.000000)
event=2000, t=58.821490, pot=(-8.047190,0.000000)
event=2100, t=61.143586, pot=(-4.828314,0.000000)
event=2200, t=64.789374, pot=(-6.437752,0.000000)
event=2300, t=67.500545, pot=(-6.437752,0.000000)
event=2400, t=70.612481, pot=(-3.218876,0.000000)
event=2500, t=73.380567, pot=(-4.828314,0.000000)
event=2600, t=77.050811, pot=(-3.218876,0.000000)
event=2700, t=80.213466, pot=(-8.047190,0.000000)
event=2800, t=83.691567, pot=(-8.047190,0.000000)
event=2900, t=86.948679, pot=(-6.437752,0.000000)
event=3000, t=90.210813, pot=(-8.047190,0.000000)
event=3100, t=93.237832, pot=(-4.828314,0.000000)
event=3200, t=96.203588, pot=(-9.656627,0.000000)
event=3300, t=99.301650, pot=(-8.047190,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=300, t=9.043450, pot=(-3.218876,0.000000)
event=400, t=11.851155, pot=(-9.656627,0.000000)
event=500, t=15.287160, pot=(-4.828314,0.000000)
event=600, t=18.443800, pot=(-6.437752,0.000000)
event=700, t=21.315279, pot=(-3.218876,0.000000)
event=800, t=24.367506, pot=(-9.656627,0.000000)
event=900, t=26.924902, pot=(-8.047190,0.000000)
event=1000, t=29.594584, pot=(-3.218876,0.000000)
event=1100, t=32.311139, pot=(-6.437752,0.000000)
event=1200, t=36.429185, pot=(-6.437752,0.000000)
event=1300, t=39.089810, pot=(-6.437752,0.000000)
event=1400, t=42.290897, pot=(-3.218876,0.000000)
event=1500, t=45.516530, pot=(-4.828314,0.000000)
event=1600, t=49.057345, pot=(-8.047190,0.000000)
event=1700, t=51.971511, pot=(-6.437752,0.000000)
event=1800, t=55.131924, pot=(-4.828314,0.000000)
event=1900, t=58.239169, pot=(-4.828314,0.000000)
event=2000, t=61.343759, pot=(-8.047190,0.000000)
event=2100, t=64.420638, pot=(-4.828314,0.000000)
event=2200, t=67.276542, pot=(-9.656627,0.000000)
event=2300, t=69.748775, pot=(-4.828314,0.000000)
event=2400, t=72.903920, pot=(-4.828314,0.000000)
event=2500, t=76.256060, pot=(-6.437752,0.000000)
event=2600, t=79.163447, pot=(-6.437752,0.000000)
event=2700, t=81.697790, pot=(-6.437752,0.000000)
event=2800, t=84.808201, pot=(-6.437752,0.000000)
event=2900, t=87.516994, pot=(-6.437752,0.000000)
event=3000, t=89.819568, pot=(-4.828314,0.000000)
event=3100, t=92.836236, pot=(-6.437752,0.000000)
event=3200, t=95.921418, pot=(-6.437752,0.000000)
event=3300, t=99.580317, pot=(-3.218876,0.000000)
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event=200, t=6.669868, pot=(-8.047190,0.000000)
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event=300, t=9.407552, pot=(-11.266065,0.000000)
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event=600, t=17.855659, pot=(-6.437752,0.000000)
event=700, t=20.924602, pot=(-8.047190,0.000000)
event=800, t=23.225249, pot=(-6.437752,0.000000)
event=900, t=26.259234, pot=(-4.828314,0.000000)
event=1000, t=29.623056, pot=(-4.828314,0.000000)
event=1100, t=32.669680, pot=(-6.437752,0.000000)
event=1200, t=35.541390, pot=(-3.218876,0.000000)
event=1300, t=38.137902, pot=(-4.828314,0.000000)
event=1400, t=40.814399, pot=(-6.437752,0.000000)
event=1500, t=43.710786, pot=(-8.047190,0.000000)
event=1600, t=46.656916, pot=(-6.437752,0.000000)
event=1700, t=49.666303, pot=(-4.828314,0.000000)
event=1800, t=52.301110, pot=(-4.828314,0.000000)
event=1900, t=55.531775, pot=(-4.828314,0.000000)
event=2000, t=59.083981, pot=(-8.047190,0.000000)
event=2100, t=62.455091, pot=(-6.437752,0.000000)
event=2200, t=65.883289, pot=(-4.828314,0.000000)
event=2300, t=68.821061, pot=(-6.437752,0.000000)
event=2400, t=72.275772, pot=(-4.828314,0.000000)
event=2500, t=74.538134, pot=(-6.437752,0.000000)
event=2600, t=77.028125, pot=(-6.437752,0.000000)
event=2700, t=79.808959, pot=(-11.266065,0.000000)
event=2800, t=82.865576, pot=(-4.828314,0.000000)
event=2900, t=85.900591, pot=(-4.828314,0.000000)
event=3000, t=89.016993, pot=(-6.437752,0.000000)
event=3100, t=91.847613, pot=(-6.437752,0.000000)
event=3200, t=94.821317, pot=(-4.828314,0.000000)
event=3300, t=97.973491, pot=(-6.437752,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=300, t=9.644534, pot=(-4.828314,0.000000)
event=400, t=12.687128, pot=(-8.047190,0.000000)
event=500, t=15.673726, pot=(-4.828314,0.000000)
event=600, t=18.583037, pot=(-8.047190,0.000000)
event=700, t=21.869710, pot=(-4.828314,0.000000)
event=800, t=24.469381, pot=(-4.828314,0.000000)
event=900, t=27.638309, pot=(-4.828314,0.000000)
event=1000, t=30.563153, pot=(-4.828314,0.000000)
event=1100, t=33.595723, pot=(-6.437752,0.000000)
event=1200, t=37.436804, pot=(-6.437752,0.000000)
event=1300, t=40.425457, pot=(-8.047190,0.000000)
event=1400, t=43.355803, pot=(-8.047190,0.000000)
event=1500, t=46.288113, pot=(-9.656627,0.000000)
event=1600, t=48.996971, pot=(-4.828314,0.000000)
event=1700, t=51.660343, pot=(-8.047190,0.000000)
event=1800, t=54.433330, pot=(-4.828314,0.000000)
event=1900, t=57.497176, pot=(-4.828314,0.000000)
event=2000, t=60.767872, pot=(-8.047190,0.000000)
event=2100, t=63.549283, pot=(-6.437752,0.000000)
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event=2200, t=66.081107, pot=(-6.437752,0.000000)
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event=2600, t=78.667191, pot=(-4.828314,0.000000)
event=2700, t=82.043010, pot=(-8.047190,0.000000)
event=2800, t=85.224554, pot=(-11.266065,0.000000)
event=2900, t=88.224955, pot=(-3.218876,0.000000)
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event=3100, t=94.493525, pot=(-6.437752,0.000000)
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Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=300, t=9.884775, pot=(-6.437752,0.000000)
event=400, t=12.310432, pot=(-3.218876,0.000000)
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event=700, t=21.194951, pot=(-6.437752,0.000000)
event=800, t=24.364904, pot=(-4.828314,0.000000)
event=900, t=26.723086, pot=(-8.047190,0.000000)
event=1000, t=29.612155, pot=(-4.828314,0.000000)
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event=1500, t=43.817194, pot=(-4.828314,0.000000)
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event=2000, t=59.097498, pot=(-9.656627,0.000000)
event=2100, t=61.689600, pot=(-8.047190,0.000000)
event=2200, t=64.461419, pot=(-6.437752,0.000000)
event=2300, t=67.547211, pot=(-4.828314,0.000000)
event=2400, t=70.116842, pot=(-6.437752,0.000000)
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event=2600, t=75.621929, pot=(-6.437752,0.000000)
event=2700, t=78.511889, pot=(-6.437752,0.000000)
event=2800, t=81.501859, pot=(-4.828314,0.000000)
event=2900, t=85.073977, pot=(-8.047190,0.000000)
event=3000, t=87.575437, pot=(-3.218876,0.000000)
event=3100, t=90.670687, pot=(-3.218876,0.000000)
event=3200, t=93.325731, pot=(-4.828314,0.000000)
event=3300, t=96.410868, pot=(-4.828314,0.000000)
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Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=300, t=8.818163, pot=(-6.437752,0.000000)
event=400, t=11.670952, pot=(-3.218876,0.000000)
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event=500, t=14.653269, pot=(-6.437752,0.000000)
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event=800, t=23.835068, pot=(-8.047190,0.000000)
event=900, t=27.528997, pot=(-6.437752,0.000000)
event=1000, t=30.654050, pot=(-6.437752,0.000000)
event=1100, t=33.669045, pot=(-4.828314,0.000000)
event=1200, t=37.178460, pot=(-6.437752,0.000000)
event=1300, t=40.137826, pot=(-12.875503,0.000000)
event=1400, t=43.247952, pot=(-6.437752,0.000000)
event=1500, t=46.363884, pot=(-4.828314,0.000000)
event=1600, t=49.128797, pot=(-3.218876,0.000000)
event=1700, t=52.461085, pot=(-4.828314,0.000000)
event=1800, t=55.628562, pot=(-4.828314,0.000000)
event=1900, t=58.620799, pot=(-6.437752,0.000000)
event=2000, t=62.182299, pot=(-4.828314,0.000000)
event=2100, t=65.226623, pot=(-8.047190,0.000000)
event=2200, t=68.233020, pot=(-6.437752,0.000000)
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event=2400, t=73.700581, pot=(-6.437752,0.000000)
event=2500, t=76.985452, pot=(-3.218876,0.000000)
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event=2700, t=83.023707, pot=(-9.656627,0.000000)
event=2800, t=86.032710, pot=(-4.828314,0.000000)
event=2900, t=88.882914, pot=(-6.437752,0.000000)
event=3000, t=91.719114, pot=(-8.047190,0.000000)
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Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=300, t=9.218642, pot=(-8.047190,0.000000)
event=400, t=12.206078, pot=(-4.828314,0.000000)
event=500, t=15.409463, pot=(-6.437752,0.000000)
event=600, t=18.465019, pot=(-4.828314,0.000000)
event=700, t=21.594102, pot=(-4.828314,0.000000)
event=800, t=24.600913, pot=(-6.437752,0.000000)
event=900, t=27.227598, pot=(-9.656627,0.000000)
event=1000, t=30.004772, pot=(-8.047190,0.000000)
event=1100, t=32.907862, pot=(-9.656627,0.000000)
event=1200, t=35.646289, pot=(-6.437752,0.000000)
event=1300, t=39.028977, pot=(-6.437752,0.000000)
event=1400, t=42.265069, pot=(-8.047190,0.000000)
event=1500, t=45.142443, pot=(-6.437752,0.000000)
event=1600, t=48.493927, pot=(-6.437752,0.000000)
event=1700, t=50.826147, pot=(-8.047190,0.000000)
event=1800, t=53.884066, pot=(-4.828314,0.000000)
event=1900, t=56.576819, pot=(-8.047190,0.000000)
event=2000, t=59.404995, pot=(-4.828314,0.000000)
event=2100, t=62.385584, pot=(-6.437752,0.000000)
event=2200, t=65.050922, pot=(-6.437752,0.000000)
event=2300, t=68.031030, pot=(-4.828314,0.000000)
event=2400, t=71.345157, pot=(-6.437752,0.000000)
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event=2500, t=74.298559, pot=(-8.047190,0.000000)
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event=2800, t=83.718990, pot=(-9.656627,0.000000)
event=2900, t=86.436251, pot=(-6.437752,0.000000)
event=3000, t=89.441298, pot=(-8.047190,0.000000)
event=3100, t=92.196039, pot=(-8.047190,0.000000)
event=3200, t=95.124218, pot=(-6.437752,0.000000)
event=3300, t=98.413398, pot=(-6.437752,0.000000)
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event=400, t=12.331311, pot=(-4.828314,0.000000)
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event=700, t=20.600785, pot=(-6.437752,0.000000)
event=800, t=23.121168, pot=(-4.828314,0.000000)
event=900, t=26.277989, pot=(-4.828314,0.000000)
event=1000, t=29.223913, pot=(-4.828314,0.000000)
event=1100, t=32.250437, pot=(-6.437752,0.000000)
event=1200, t=34.878773, pot=(-3.218876,0.000000)
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event=1800, t=53.158580, pot=(-4.828314,0.000000)
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event=2400, t=71.070731, pot=(-6.437752,0.000000)
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event=2600, t=77.785769, pot=(-4.828314,0.000000)
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event=2900, t=87.237800, pot=(-4.828314,0.000000)
event=3000, t=90.880603, pot=(-8.047190,0.000000)
event=3100, t=93.840589, pot=(-4.828314,0.000000)
event=3200, t=97.483389, pot=(-6.437752,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=200, t=6.251044, pot=(-8.047190,0.000000)
event=300, t=9.478629, pot=(-6.437752,0.000000)
event=400, t=11.953826, pot=(-6.437752,0.000000)
event=500, t=14.801281, pot=(-1.609438,0.000000)
event=600, t=17.481259, pot=(-8.047190,0.000000)
event=700, t=20.556111, pot=(-8.047190,0.000000)
event=800, t=23.448307, pot=(-3.218876,0.000000)
event=900, t=26.818523, pot=(-3.218876,0.000000)
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event=1400, t=40.725331, pot=(-9.656627,0.000000)
event=1500, t=43.718706, pot=(-9.656627,0.000000)
event=1600, t=46.289919, pot=(-1.609438,0.000000)
event=1700, t=49.157387, pot=(-4.828314,0.000000)
event=1800, t=52.598961, pot=(-8.047190,0.000000)
event=1900, t=55.184532, pot=(-8.047190,0.000000)
event=2000, t=58.602733, pot=(-8.047190,0.000000)
event=2100, t=60.920988, pot=(-4.828314,0.000000)
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event=2300, t=68.251284, pot=(-4.828314,0.000000)
event=2400, t=71.246841, pot=(-4.828314,0.000000)
event=2500, t=74.388754, pot=(-4.828314,0.000000)
event=2600, t=77.033755, pot=(-6.437752,0.000000)
event=2700, t=79.343257, pot=(-8.047190,0.000000)
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event=3000, t=88.331739, pot=(-4.828314,0.000000)
event=3100, t=91.300411, pot=(-4.828314,0.000000)
event=3200, t=93.559505, pot=(-8.047190,0.000000)
event=3300, t=96.490348, pot=(-4.828314,0.000000)
event=3400, t=99.246335, pot=(-8.047190,0.000000)
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event=300, t=8.841564, pot=(-4.828314,0.000000)
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event=600, t=17.467879, pot=(-9.656627,0.000000)
event=700, t=19.747160, pot=(-3.218876,0.000000)
event=800, t=23.649799, pot=(-3.218876,0.000000)
event=900, t=26.080594, pot=(-12.875503,0.000000)
event=1000, t=29.072729, pot=(-3.218876,0.000000)
event=1100, t=32.347575, pot=(-6.437752,0.000000)
event=1200, t=35.283351, pot=(-4.828314,0.000000)
event=1300, t=37.939612, pot=(-6.437752,0.000000)
event=1400, t=41.134169, pot=(-6.437752,0.000000)
event=1500, t=45.009587, pot=(-3.218876,0.000000)
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event=1700, t=52.453499, pot=(-9.656627,0.000000)
event=1800, t=55.520951, pot=(-6.437752,0.000000)
event=1900, t=58.252483, pot=(-9.656627,0.000000)
event=2000, t=60.973465, pot=(-4.828314,0.000000)
event=2100, t=63.778460, pot=(-6.437752,0.000000)
event=2200, t=66.850381, pot=(-9.656627,0.000000)
event=2300, t=69.527422, pot=(-8.047190,0.000000)
event=2400, t=72.546093, pot=(-8.047190,0.000000)
event=2500, t=75.897580, pot=(-6.437752,0.000000)
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event=2700, t=81.378817, pot=(-6.437752,0.000000)
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event=3000, t=90.736534, pot=(-3.218876,0.000000)
event=3100, t=93.452958, pot=(-4.828314,0.000000)
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event=3300, t=99.170936, pot=(-6.437752,0.000000)
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event=300, t=9.147692, pot=(-4.828314,0.000000)
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event=500, t=14.873271, pot=(-6.437752,0.000000)
event=600, t=18.369885, pot=(-8.047190,0.000000)
event=700, t=21.348106, pot=(-3.218876,0.000000)
event=800, t=24.467628, pot=(-6.437752,0.000000)
event=900, t=28.296161, pot=(-6.437752,0.000000)
event=1000, t=31.400692, pot=(-9.656627,0.000000)
event=1100, t=34.060764, pot=(-4.828314,0.000000)
event=1200, t=37.067419, pot=(-9.656627,0.000000)
event=1300, t=39.706677, pot=(-3.218876,0.000000)
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event=1500, t=44.980160, pot=(-4.828314,0.000000)
event=1600, t=48.269543, pot=(-8.047190,0.000000)
event=1700, t=51.646155, pot=(-4.828314,0.000000)
event=1800, t=54.296192, pot=(-6.437752,0.000000)
event=1900, t=57.402738, pot=(-8.047190,0.000000)
event=2000, t=59.909197, pot=(-9.656627,0.000000)
event=2100, t=62.582550, pot=(-4.828314,0.000000)
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event=2300, t=68.609269, pot=(-8.047190,0.000000)
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event=2600, t=77.230745, pot=(-11.266065,0.000000)
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event=2900, t=87.223982, pot=(-6.437752,0.000000)
event=3000, t=90.167364, pot=(-8.047190,0.000000)
event=3100, t=92.555459, pot=(-4.828314,0.000000)
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Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=400, t=12.516964, pot=(-3.218876,0.000000)
event=500, t=15.220815, pot=(-8.047190,0.000000)
event=600, t=17.783500, pot=(-3.218876,0.000000)
event=700, t=21.677375, pot=(-8.047190,0.000000)
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event=1100, t=34.197966, pot=(-4.828314,0.000000)
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event=1500, t=45.359408, pot=(-6.437752,0.000000)
event=1600, t=47.914266, pot=(-3.218876,0.000000)
event=1700, t=50.714441, pot=(-9.656627,0.000000)
event=1800, t=54.209889, pot=(-4.828314,0.000000)
event=1900, t=56.695547, pot=(-8.047190,0.000000)
event=2000, t=59.635612, pot=(-4.828314,0.000000)
event=2100, t=62.588644, pot=(-6.437752,0.000000)
event=2200, t=65.740535, pot=(-4.828314,0.000000)
event=2300, t=68.824802, pot=(-6.437752,0.000000)
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event=2500, t=75.453877, pot=(-6.437752,0.000000)
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event=2700, t=81.894852, pot=(-8.047190,0.000000)
event=2800, t=85.049747, pot=(-6.437752,0.000000)
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Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=400, t=12.604071, pot=(-6.437752,0.000000)
event=500, t=15.325579, pot=(-8.047190,0.000000)
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event=700, t=21.287372, pot=(-4.828314,0.000000)
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event=1000, t=30.098154, pot=(-4.828314,0.000000)
event=1100, t=33.162664, pot=(-4.828314,0.000000)
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event=1700, t=49.869475, pot=(-8.047190,0.000000)
event=1800, t=51.833546, pot=(-11.266065,0.000000)
event=1900, t=54.250566, pot=(-8.047190,0.000000)
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event=2100, t=59.143736, pot=(-6.437752,0.000000)
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Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=3000, t=91.908965, pot=(-4.828314,0.000000)
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event=3200, t=97.635323, pot=(-8.047190,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=300, t=8.164512, pot=(-6.437752,0.000000)
event=400, t=10.862134, pot=(-9.656627,0.000000)
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event=1000, t=27.961965, pot=(-6.437752,0.000000)
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event=1500, t=41.491713, pot=(-6.437752,0.000000)
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event=2100, t=59.360168, pot=(-9.656627,0.000000)
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event=2700, t=76.167079, pot=(-3.218876,0.000000)
event=2800, t=78.793465, pot=(-4.828314,0.000000)
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event=3000, t=84.461767, pot=(-4.828314,0.000000)
event=3100, t=87.894213, pot=(-3.218876,0.000000)
event=3200, t=91.004411, pot=(-9.656627,0.000000)
event=3300, t=93.547399, pot=(-6.437752,0.000000)
event=3400, t=96.441571, pot=(-4.828314,0.000000)
event=3500, t=99.561397, pot=(-6.437752,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
event=0, t=0.000000, pot=(0.000000,0.000000)
event=100, t=3.784055, pot=(-6.437752,0.000000)
event=200, t=6.951811, pot=(-9.656627,0.000000)
event=300, t=9.969623, pot=(-8.047190,0.000000)
event=400, t=13.313305, pot=(-6.437752,0.000000)
event=500, t=16.145608, pot=(-9.656627,0.000000)
event=600, t=18.782075, pot=(-6.437752,0.000000)
event=700, t=21.472013, pot=(-4.828314,0.000000)
event=800, t=24.209948, pot=(-6.437752,0.000000)
event=900, t=27.124392, pot=(-3.218876,0.000000)
event=1000, t=30.807179, pot=(-4.828314,0.000000)
event=1100, t=34.618942, pot=(-4.828314,0.000000)
event=1200, t=38.102009, pot=(-9.656627,0.000000)
event=1300, t=41.303469, pot=(-6.437752,0.000000)
event=1400, t=43.812914, pot=(-8.047190,0.000000)
event=1500, t=46.963858, pot=(-4.828314,0.000000)
event=1600, t=50.461393, pot=(-6.437752,0.000000)
event=1700, t=52.970545, pot=(-3.218876,0.000000)
event=1800, t=56.095546, pot=(-6.437752,0.000000)
event=1900, t=58.933350, pot=(-8.047190,0.000000)
event=2000, t=62.796122, pot=(-4.828314,0.000000)
event=2100, t=66.768410, pot=(-3.218876,0.000000)
event=2200, t=69.385456, pot=(-4.828314,0.000000)
event=2300, t=72.683084, pot=(-4.828314,0.000000)
event=2400, t=76.112048, pot=(-4.828314,0.000000)
event=2500, t=78.831470, pot=(-4.828314,0.000000)
event=2600, t=81.628251, pot=(-8.047190,0.000000)
event=2700, t=84.785885, pot=(-6.437752,0.000000)
event=2800, t=87.876349, pot=(-8.047190,0.000000)
event=2900, t=90.374304, pot=(-6.437752,0.000000)
event=3000, t=93.340249, pot=(-6.437752,0.000000)
event=3100, t=96.234699, pot=(-4.828314,0.000000)
event=3200, t=99.621578, pot=(-4.828314,0.000000)
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Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
event=0, t=0.000000, pot=(0.000000,0.000000)
event=100, t=2.606051, pot=(-9.656627,0.000000)
event=200, t=5.187274, pot=(-4.828314,0.000000)
event=300, t=8.886388, pot=(-3.218876,0.000000)
event=400, t=11.565255, pot=(-3.218876,0.000000)
event=500, t=14.845332, pot=(-4.828314,0.000000)
event=600, t=17.858754, pot=(-6.437752,0.000000)
event=700, t=21.705797, pot=(-4.828314,0.000000)
event=800, t=25.044999, pot=(-8.047190,0.000000)
event=900, t=28.078280, pot=(-6.437752,0.000000)
event=1000, t=30.805339, pot=(-8.047190,0.000000)
event=1100, t=34.141488, pot=(-6.437752,0.000000)
event=1200, t=37.178553, pot=(-4.828314,0.000000)
event=1300, t=39.696010, pot=(-8.047190,0.000000)
event=1400, t=42.471425, pot=(-6.437752,0.000000)
event=1500, t=46.099301, pot=(-9.656627,0.000000)
event=1600, t=49.624921, pot=(-6.437752,0.000000)
event=1700, t=53.378221, pot=(-6.437752,0.000000)
event=1800, t=56.826160, pot=(-6.437752,0.000000)
event=1900, t=59.893946, pot=(-4.828314,0.000000)
event=2000, t=62.487703, pot=(-8.047190,0.000000)
event=2100, t=65.521666, pot=(-6.437752,0.000000)
event=2200, t=68.609769, pot=(-3.218876,0.000000)
event=2300, t=71.814769, pot=(-8.047190,0.000000)
event=2400, t=74.421513, pot=(-8.047190,0.000000)
event=2500, t=77.819628, pot=(-6.437752,0.000000)
event=2600, t=80.615960, pot=(-4.828314,0.000000)
event=2700, t=83.617650, pot=(-4.828314,0.000000)
event=2800, t=86.361938, pot=(-6.437752,0.000000)
event=2900, t=89.442416, pot=(-9.656627,0.000000)
event=3000, t=92.033270, pot=(-6.437752,0.000000)
event=3100, t=95.382895, pot=(-4.828314,0.000000)
event=3200, t=98.631477, pot=(-4.828314,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
event=0, t=0.000000, pot=(0.000000,0.000000)
event=100, t=3.726949, pot=(-6.437752,0.000000)
event=200, t=6.026010, pot=(-6.437752,0.000000)
event=300, t=8.919538, pot=(-9.656627,0.000000)
event=400, t=11.695174, pot=(-6.437752,0.000000)
event=500, t=14.985872, pot=(-4.828314,0.000000)
event=600, t=18.477562, pot=(-6.437752,0.000000)
event=700, t=21.224668, pot=(-6.437752,0.000000)
event=800, t=24.501277, pot=(-4.828314,0.000000)
event=900, t=27.248381, pot=(-4.828314,0.000000)
event=1000, t=30.095482, pot=(-4.828314,0.000000)
event=1100, t=32.932851, pot=(-6.437752,0.000000)
event=1200, t=35.469054, pot=(-4.828314,0.000000)
event=1300, t=38.790034, pot=(-4.828314,0.000000)
event=1400, t=41.645994, pot=(-6.437752,0.000000)
event=1500, t=44.400409, pot=(-4.828314,0.000000)
event=1600, t=48.005095, pot=(-4.828314,0.000000)
event=1700, t=50.780882, pot=(-9.656627,0.000000)
event=1800, t=53.561879, pot=(-8.047190,0.000000)
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event=1900, t=56.167121, pot=(-6.437752,0.000000)
event=2000, t=58.390322, pot=(-3.218876,0.000000)
event=2100, t=61.832858, pot=(-4.828314,0.000000)
event=2200, t=64.450686, pot=(-6.437752,0.000000)
event=2300, t=67.253277, pot=(-9.656627,0.000000)
event=2400, t=69.909240, pot=(-8.047190,0.000000)
event=2500, t=72.021600, pot=(-8.047190,0.000000)
event=2600, t=74.421842, pot=(-6.437752,0.000000)
event=2700, t=77.610488, pot=(-4.828314,0.000000)
event=2800, t=80.693550, pot=(-3.218876,0.000000)
event=2900, t=83.678910, pot=(-11.266065,0.000000)
event=3000, t=86.514897, pot=(-8.047190,0.000000)
event=3100, t=89.093442, pot=(-6.437752,0.000000)
event=3200, t=92.012430, pot=(-9.656627,0.000000)
event=3300, t=94.625382, pot=(-4.828314,0.000000)
event=3400, t=97.950285, pot=(-3.218876,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
event=0, t=0.000000, pot=(0.000000,0.000000)
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event=200, t=6.326572, pot=(-6.437752,0.000000)
event=300, t=9.419697, pot=(-9.656627,0.000000)
event=400, t=12.543103, pot=(-8.047190,0.000000)
event=500, t=15.354241, pot=(-8.047190,0.000000)
event=600, t=18.596247, pot=(-4.828314,0.000000)
event=700, t=21.980112, pot=(-8.047190,0.000000)
event=800, t=25.511344, pot=(-4.828314,0.000000)
event=900, t=28.607389, pot=(-4.828314,0.000000)
event=1000, t=31.308409, pot=(-3.218876,0.000000)
event=1100, t=34.734101, pot=(-6.437752,0.000000)
event=1200, t=37.025557, pot=(-8.047190,0.000000)
event=1300, t=39.197676, pot=(-4.828314,0.000000)
event=1400, t=41.925508, pot=(-8.047190,0.000000)
event=1500, t=45.622404, pot=(-8.047190,0.000000)
event=1600, t=49.111914, pot=(-6.437752,0.000000)
event=1700, t=51.872272, pot=(-8.047190,0.000000)
event=1800, t=54.546491, pot=(-4.828314,0.000000)
event=1900, t=57.309065, pot=(-4.828314,0.000000)
event=2000, t=60.156055, pot=(-4.828314,0.000000)
event=2100, t=62.312690, pot=(-6.437752,0.000000)
event=2200, t=65.097677, pot=(-8.047190,0.000000)
event=2300, t=68.128223, pot=(-8.047190,0.000000)
event=2400, t=71.155633, pot=(-3.218876,0.000000)
event=2500, t=73.908536, pot=(-4.828314,0.000000)
event=2600, t=77.064868, pot=(-3.218876,0.000000)
event=2700, t=80.044332, pot=(-4.828314,0.000000)
event=2800, t=83.258219, pot=(-9.656627,0.000000)
event=2900, t=86.261300, pot=(-8.047190,0.000000)
event=3000, t=89.024216, pot=(-8.047190,0.000000)
event=3100, t=92.119920, pot=(0.000000,0.000000)
event=3200, t=95.173887, pot=(-3.218876,0.000000)
event=3300, t=98.069520, pot=(-6.437752,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=100, t=3.224261, pot=(-8.047190,0.000000)
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event=200, t=6.155165, pot=(-3.218876,0.000000)
event=300, t=9.533528, pot=(-4.828314,0.000000)
event=400, t=12.467957, pot=(-3.218876,0.000000)
event=500, t=15.066005, pot=(-9.656627,0.000000)
event=600, t=18.121727, pot=(-6.437752,0.000000)
event=700, t=21.142916, pot=(-4.828314,0.000000)
event=800, t=23.645389, pot=(-4.828314,0.000000)
event=900, t=26.389675, pot=(-3.218876,0.000000)
event=1000, t=29.667570, pot=(-3.218876,0.000000)
event=1100, t=32.828744, pot=(-8.047190,0.000000)
event=1200, t=35.615637, pot=(-8.047190,0.000000)
event=1300, t=38.442187, pot=(-6.437752,0.000000)
event=1400, t=41.564745, pot=(-8.047190,0.000000)
event=1500, t=44.355948, pot=(-4.828314,0.000000)
event=1600, t=47.304773, pot=(-8.047190,0.000000)
event=1700, t=50.036383, pot=(-3.218876,0.000000)
event=1800, t=53.157880, pot=(-8.047190,0.000000)
event=1900, t=56.441083, pot=(-3.218876,0.000000)
event=2000, t=59.054883, pot=(-4.828314,0.000000)
event=2100, t=61.874666, pot=(-6.437752,0.000000)
event=2200, t=64.914550, pot=(-4.828314,0.000000)
event=2300, t=67.852239, pot=(-4.828314,0.000000)
event=2400, t=70.964473, pot=(-4.828314,0.000000)
event=2500, t=73.731680, pot=(-4.828314,0.000000)
event=2600, t=77.201279, pot=(-4.828314,0.000000)
event=2700, t=80.527602, pot=(-6.437752,0.000000)
event=2800, t=83.346120, pot=(-8.047190,0.000000)
event=2900, t=86.931687, pot=(-6.437752,0.000000)
event=3000, t=89.507261, pot=(-8.047190,0.000000)
event=3100, t=92.978538, pot=(-4.828314,0.000000)
event=3200, t=95.843774, pot=(-6.437752,0.000000)
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Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=200, t=5.300597, pot=(-4.828314,0.000000)
event=300, t=8.269879, pot=(-3.218876,0.000000)
event=400, t=11.063701, pot=(-4.828314,0.000000)
event=500, t=13.880334, pot=(-8.047190,0.000000)
event=600, t=16.709992, pot=(-6.437752,0.000000)
event=700, t=19.706857, pot=(-6.437752,0.000000)
event=800, t=22.458134, pot=(-4.828314,0.000000)
event=900, t=25.469132, pot=(-6.437752,0.000000)
event=1000, t=28.673064, pot=(-6.437752,0.000000)
event=1100, t=31.816581, pot=(-9.656627,0.000000)
event=1200, t=34.270921, pot=(-8.047190,0.000000)
event=1300, t=37.002461, pot=(-9.656627,0.000000)
event=1400, t=40.311831, pot=(-3.218876,0.000000)
event=1500, t=43.357085, pot=(-1.609438,0.000000)
event=1600, t=46.726685, pot=(-4.828314,0.000000)
event=1700, t=49.942390, pot=(-6.437752,0.000000)
event=1800, t=52.896579, pot=(-4.828314,0.000000)
event=1900, t=55.867850, pot=(-11.266065,0.000000)
event=2000, t=58.259219, pot=(-8.047190,0.000000)
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event=2100, t=60.796262, pot=(-6.437752,0.000000)
event=2200, t=64.223620, pot=(-6.437752,0.000000)
event=2300, t=67.082839, pot=(-9.656627,0.000000)
event=2400, t=69.948621, pot=(-8.047190,0.000000)
event=2500, t=73.476921, pot=(-4.828314,0.000000)
event=2600, t=76.720681, pot=(-8.047190,0.000000)
event=2700, t=80.023520, pot=(-4.828314,0.000000)
event=2800, t=83.111492, pot=(-4.828314,0.000000)
event=2900, t=86.942505, pot=(-3.218876,0.000000)
event=3000, t=89.646113, pot=(-6.437752,0.000000)
event=3100, t=92.491353, pot=(-9.656627,0.000000)
event=3200, t=95.598439, pot=(-6.437752,0.000000)
event=3300, t=98.145720, pot=(-8.047190,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=100, t=3.652494, pot=(-1.609438,0.000000)
event=200, t=7.354785, pot=(-6.437752,0.000000)
event=300, t=10.150456, pot=(-6.437752,0.000000)
event=400, t=13.737365, pot=(-8.047190,0.000000)
event=500, t=16.456697, pot=(-9.656627,0.000000)
event=600, t=19.275553, pot=(-9.656627,0.000000)
event=700, t=21.672386, pot=(-4.828314,0.000000)
event=800, t=24.555820, pot=(-9.656627,0.000000)
event=900, t=27.799560, pot=(-6.437752,0.000000)
event=1000, t=31.160447, pot=(-11.266065,0.000000)
event=1100, t=34.345713, pot=(-9.656627,0.000000)
event=1200, t=37.353074, pot=(-1.609438,0.000000)
event=1300, t=40.043236, pot=(-4.828314,0.000000)
event=1400, t=42.826601, pot=(-12.875503,0.000000)
event=1500, t=46.173210, pot=(-9.656627,0.000000)
event=1600, t=49.529240, pot=(-8.047190,0.000000)
event=1700, t=52.363518, pot=(-8.047190,0.000000)
event=1800, t=55.758155, pot=(-8.047190,0.000000)
event=1900, t=59.048722, pot=(-8.047190,0.000000)
event=2000, t=62.172990, pot=(-4.828314,0.000000)
event=2100, t=65.198075, pot=(-4.828314,0.000000)
event=2200, t=68.176769, pot=(-11.266065,0.000000)
event=2300, t=70.485232, pot=(-8.047190,0.000000)
event=2400, t=72.948918, pot=(-8.047190,0.000000)
event=2500, t=75.898434, pot=(-8.047190,0.000000)
event=2600, t=78.838781, pot=(-11.266065,0.000000)
event=2700, t=81.772612, pot=(-3.218876,0.000000)
event=2800, t=84.973833, pot=(-4.828314,0.000000)
event=2900, t=87.511642, pot=(-8.047190,0.000000)
event=3000, t=90.500981, pot=(-9.656627,0.000000)
event=3100, t=93.853257, pot=(-4.828314,0.000000)
event=3200, t=96.535819, pot=(-3.218876,0.000000)
event=3300, t=99.935249, pot=(-4.828314,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
event=0, t=0.000000, pot=(0.000000,0.000000)
event=100, t=2.657280, pot=(-4.828314,0.000000)
event=200, t=6.016213, pot=(-3.218876,0.000000)
event=300, t=9.212620, pot=(-6.437752,0.000000)
event=400, t=12.745356, pot=(-4.828314,0.000000)
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event=500, t=15.760244, pot=(-6.437752,0.000000)
event=600, t=18.741721, pot=(-3.218876,0.000000)
event=700, t=21.408990, pot=(-4.828314,0.000000)
event=800, t=24.579116, pot=(-6.437752,0.000000)
event=900, t=28.168439, pot=(-6.437752,0.000000)
event=1000, t=31.109188, pot=(-6.437752,0.000000)
event=1100, t=33.621862, pot=(-8.047190,0.000000)
event=1200, t=36.636173, pot=(-6.437752,0.000000)
event=1300, t=39.303251, pot=(-6.437752,0.000000)
event=1400, t=42.111181, pot=(-3.218876,0.000000)
event=1500, t=44.761098, pot=(-8.047190,0.000000)
event=1600, t=47.956085, pot=(-3.218876,0.000000)
event=1700, t=51.391298, pot=(-4.828314,0.000000)
event=1800, t=53.680648, pot=(-6.437752,0.000000)
event=1900, t=56.832895, pot=(-4.828314,0.000000)
event=2000, t=59.776885, pot=(-4.828314,0.000000)
event=2100, t=62.965400, pot=(-8.047190,0.000000)
event=2200, t=66.087369, pot=(-4.828314,0.000000)
event=2300, t=69.293668, pot=(-4.828314,0.000000)
event=2400, t=72.334811, pot=(-8.047190,0.000000)
event=2500, t=75.438467, pot=(-8.047190,0.000000)
event=2600, t=78.396817, pot=(-8.047190,0.000000)
event=2700, t=81.800065, pot=(-8.047190,0.000000)
event=2800, t=84.371871, pot=(-3.218876,0.000000)
event=2900, t=87.556627, pot=(-4.828314,0.000000)
event=3000, t=90.324551, pot=(-3.218876,0.000000)
event=3100, t=93.211583, pot=(-8.047190,0.000000)
event=3200, t=97.081743, pot=(-9.656627,0.000000)
event=3300, t=99.408808, pot=(-6.437752,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=100, t=3.210288, pot=(-4.828314,0.000000)
event=200, t=6.229994, pot=(-6.437752,0.000000)
event=300, t=9.157461, pot=(-6.437752,0.000000)
event=400, t=12.276118, pot=(-3.218876,0.000000)
event=500, t=15.666905, pot=(-8.047190,0.000000)
event=600, t=18.774115, pot=(-4.828314,0.000000)
event=700, t=21.786339, pot=(-6.437752,0.000000)
event=800, t=24.700793, pot=(-9.656627,0.000000)
event=900, t=27.657069, pot=(-8.047190,0.000000)
event=1000, t=30.638267, pot=(-8.047190,0.000000)
event=1100, t=33.448922, pot=(-4.828314,0.000000)
event=1200, t=36.221789, pot=(-3.218876,0.000000)
event=1300, t=38.682872, pot=(-6.437752,0.000000)
event=1400, t=41.477643, pot=(-9.656627,0.000000)
event=1500, t=44.250392, pot=(-8.047190,0.000000)
event=1600, t=46.951326, pot=(-4.828314,0.000000)
event=1700, t=49.345335, pot=(-11.266065,0.000000)
event=1800, t=52.651884, pot=(-6.437752,0.000000)
event=1900, t=55.827415, pot=(-4.828314,0.000000)
event=2000, t=58.574921, pot=(-6.437752,0.000000)
event=2100, t=61.607667, pot=(-4.828314,0.000000)
event=2200, t=64.978940, pot=(-3.218876,0.000000)
event=2300, t=68.435062, pot=(-6.437752,0.000000)
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event=2700, t=80.586231, pot=(-4.828314,0.000000)
event=2800, t=83.413883, pot=(-6.437752,0.000000)
event=2900, t=86.585494, pot=(-4.828314,0.000000)
event=3000, t=89.928551, pot=(-8.047190,0.000000)
event=3100, t=92.642796, pot=(-6.437752,0.000000)
event=3200, t=95.673509, pot=(-8.047190,0.000000)
event=3300, t=98.371127, pot=(-3.218876,0.000000)
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event=300, t=9.466911, pot=(-4.828314,0.000000)
event=400, t=12.511964, pot=(-6.437752,0.000000)
event=500, t=15.205193, pot=(-9.656627,0.000000)
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event=1000, t=29.522310, pot=(-4.828314,0.000000)
event=1100, t=32.786479, pot=(-4.828314,0.000000)
event=1200, t=35.128113, pot=(-6.437752,0.000000)
event=1300, t=38.329757, pot=(-6.437752,0.000000)
event=1400, t=40.774859, pot=(-9.656627,0.000000)
event=1500, t=43.460251, pot=(-11.266065,0.000000)
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event=1700, t=48.687028, pot=(-4.828314,0.000000)
event=1800, t=51.657234, pot=(-6.437752,0.000000)
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event=2700, t=79.804752, pot=(-6.437752,0.000000)
event=2800, t=83.427693, pot=(-6.437752,0.000000)
event=2900, t=86.446336, pot=(-4.828314,0.000000)
event=3000, t=89.722898, pot=(-6.437752,0.000000)
event=3100, t=92.508537, pot=(-6.437752,0.000000)
event=3200, t=95.561489, pot=(-6.437752,0.000000)
event=3300, t=98.172815, pot=(-8.047190,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=200, t=6.769804, pot=(-8.047190,0.000000)
event=300, t=9.639987, pot=(-6.437752,0.000000)
event=400, t=12.469569, pot=(-6.437752,0.000000)
event=500, t=15.967300, pot=(-4.828314,0.000000)
event=600, t=19.089498, pot=(-11.266065,0.000000)
event=700, t=21.289894, pot=(-6.437752,0.000000)
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event=900, t=27.733528, pot=(-4.828314,0.000000)
event=1000, t=30.536777, pot=(-6.437752,0.000000)
event=1100, t=33.475512, pot=(-3.218876,0.000000)
event=1200, t=36.565954, pot=(-9.656627,0.000000)
event=1300, t=39.637075, pot=(-4.828314,0.000000)
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event=1500, t=45.392999, pot=(-4.828314,0.000000)
event=1600, t=48.094278, pot=(-11.266065,0.000000)
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event=1900, t=57.037877, pot=(-8.047190,0.000000)
event=2000, t=60.409804, pot=(-6.437752,0.000000)
event=2100, t=63.260269, pot=(-4.828314,0.000000)
event=2200, t=65.855188, pot=(-6.437752,0.000000)
event=2300, t=68.200427, pot=(-8.047190,0.000000)
event=2400, t=71.151739, pot=(-8.047190,0.000000)
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event=2600, t=76.785575, pot=(-9.656627,0.000000)
event=2700, t=79.298888, pot=(-8.047190,0.000000)
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event=2900, t=85.475537, pot=(-6.437752,0.000000)
event=3000, t=88.590034, pot=(-3.218876,0.000000)
event=3100, t=91.765115, pot=(-6.437752,0.000000)
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event=3300, t=98.155590, pot=(-4.828314,0.000000)
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event=300, t=8.029109, pot=(-3.218876,0.000000)
event=400, t=11.586056, pot=(-4.828314,0.000000)
event=500, t=15.695380, pot=(-4.828314,0.000000)
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event=800, t=24.776882, pot=(-8.047190,0.000000)
event=900, t=27.454341, pot=(-4.828314,0.000000)
event=1000, t=30.355413, pot=(-6.437752,0.000000)
event=1100, t=33.050209, pot=(-6.437752,0.000000)
event=1200, t=36.149093, pot=(-3.218876,0.000000)
event=1300, t=38.930331, pot=(-8.047190,0.000000)
event=1400, t=41.542615, pot=(-4.828314,0.000000)
event=1500, t=44.352704, pot=(-4.828314,0.000000)
event=1600, t=47.320578, pot=(-4.828314,0.000000)
event=1700, t=50.103854, pot=(-6.437752,0.000000)
event=1800, t=52.794120, pot=(-3.218876,0.000000)
event=1900, t=55.374672, pot=(-4.828314,0.000000)
event=2000, t=58.656176, pot=(-8.047190,0.000000)
event=2100, t=60.779681, pot=(-6.437752,0.000000)
event=2200, t=63.639039, pot=(-4.828314,0.000000)
event=2300, t=66.809972, pot=(-4.828314,0.000000)
event=2400, t=70.318752, pot=(-6.437752,0.000000)
event=2500, t=73.175903, pot=(-8.047190,0.000000)
event=2600, t=76.157832, pot=(-3.218876,0.000000)
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event=3000, t=87.621708, pot=(-8.047190,0.000000)
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Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=300, t=8.737440, pot=(-6.437752,0.000000)
event=400, t=12.301738, pot=(-6.437752,0.000000)
event=500, t=14.947347, pot=(-9.656627,0.000000)
event=600, t=17.951260, pot=(-9.656627,0.000000)
event=700, t=20.962699, pot=(-6.437752,0.000000)
event=800, t=24.039208, pot=(-3.218876,0.000000)
event=900, t=27.195258, pot=(-4.828314,0.000000)
event=1000, t=29.979100, pot=(-6.437752,0.000000)
event=1100, t=33.494764, pot=(-4.828314,0.000000)
event=1200, t=36.160072, pot=(-8.047190,0.000000)
event=1300, t=39.322534, pot=(-6.437752,0.000000)
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event=1500, t=45.619731, pot=(-4.828314,0.000000)
event=1600, t=48.464099, pot=(-3.218876,0.000000)
event=1700, t=51.881415, pot=(-8.047190,0.000000)
event=1800, t=54.735001, pot=(-6.437752,0.000000)
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event=2000, t=60.579871, pot=(-6.437752,0.000000)
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event=2900, t=86.494264, pot=(-4.828314,0.000000)
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event=600, t=17.946170, pot=(-4.828314,0.000000)
event=700, t=21.189733, pot=(-3.218876,0.000000)
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event=900, t=27.490403, pot=(-6.437752,0.000000)
event=1000, t=30.368894, pot=(-3.218876,0.000000)
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event=1400, t=42.521273, pot=(-8.047190,0.000000)
event=1500, t=45.716143, pot=(-4.828314,0.000000)
event=1600, t=48.785208, pot=(-6.437752,0.000000)
event=1700, t=52.023114, pot=(-4.828314,0.000000)
event=1800, t=54.958748, pot=(-4.828314,0.000000)
event=1900, t=57.816106, pot=(-6.437752,0.000000)
event=2000, t=60.720161, pot=(-8.047190,0.000000)
event=2100, t=63.303720, pot=(-6.437752,0.000000)
event=2200, t=66.429380, pot=(-6.437752,0.000000)
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event=2700, t=80.365013, pot=(-3.218876,0.000000)
event=2800, t=83.441770, pot=(-4.828314,0.000000)
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Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=300, t=8.866316, pot=(-4.828314,0.000000)
event=400, t=11.614582, pot=(-6.437752,0.000000)
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event=800, t=23.099798, pot=(-6.437752,0.000000)
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event=1300, t=38.519231, pot=(-8.047190,0.000000)
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event=2300, t=68.134205, pot=(-8.047190,0.000000)
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Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=500, t=15.624211, pot=(-4.828314,0.000000)
event=600, t=18.363811, pot=(-3.218876,0.000000)
event=700, t=21.507650, pot=(-8.047190,0.000000)
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event=2100, t=62.885950, pot=(-9.656627,0.000000)
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event=2700, t=80.063532, pot=(-6.437752,0.000000)
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event=3000, t=88.655701, pot=(-4.828314,0.000000)
event=3100, t=91.549372, pot=(-11.266065,0.000000)
event=3200, t=93.885492, pot=(-6.437752,0.000000)
event=3300, t=96.753354, pot=(-4.828314,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=300, t=9.728610, pot=(-4.828314,0.000000)
event=400, t=12.441083, pot=(-4.828314,0.000000)
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event=700, t=21.273896, pot=(-9.656627,0.000000)
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event=1200, t=36.528387, pot=(-6.437752,0.000000)
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event=2000, t=60.656798, pot=(-8.047190,0.000000)
event=2100, t=63.667377, pot=(-4.828314,0.000000)
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event=2500, t=75.048545, pot=(-4.828314,0.000000)
event=2600, t=78.535074, pot=(-4.828314,0.000000)
event=2700, t=81.574661, pot=(-8.047190,0.000000)
event=2800, t=85.030985, pot=(-4.828314,0.000000)
event=2900, t=87.744165, pot=(-3.218876,0.000000)
event=3000, t=90.575429, pot=(-3.218876,0.000000)
event=3100, t=93.763246, pot=(-6.437752,0.000000)
event=3200, t=96.804986, pot=(-6.437752,0.000000)
event=3300, t=99.729657, pot=(-4.828314,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=300, t=9.747661, pot=(-8.047190,0.000000)
event=400, t=12.609535, pot=(-4.828314,0.000000)
event=500, t=17.252302, pot=(-6.437752,0.000000)
event=600, t=20.726450, pot=(-6.437752,0.000000)
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event=1000, t=32.041048, pot=(-4.828314,0.000000)
event=1100, t=34.889956, pot=(-6.437752,0.000000)
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event=1400, t=44.149273, pot=(-4.828314,0.000000)
event=1500, t=47.154198, pot=(-4.828314,0.000000)
event=1600, t=50.303956, pot=(-6.437752,0.000000)
event=1700, t=52.909368, pot=(-6.437752,0.000000)
event=1800, t=55.509211, pot=(-8.047190,0.000000)
event=1900, t=58.486039, pot=(-4.828314,0.000000)
event=2000, t=61.072554, pot=(-8.047190,0.000000)
event=2100, t=64.062580, pot=(-6.437752,0.000000)
event=2200, t=66.207542, pot=(-4.828314,0.000000)
event=2300, t=69.219359, pot=(-4.828314,0.000000)
event=2400, t=71.895536, pot=(-6.437752,0.000000)
event=2500, t=74.736968, pot=(-4.828314,0.000000)
event=2600, t=77.165813, pot=(-3.218876,0.000000)
event=2700, t=80.053679, pot=(-6.437752,0.000000)
event=2800, t=82.468590, pot=(-9.656627,0.000000)
event=2900, t=85.684773, pot=(-3.218876,0.000000)
event=3000, t=88.840356, pot=(-4.828314,0.000000)
event=3100, t=92.131333, pot=(-8.047190,0.000000)
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event=3200, t=94.651149, pot=(-8.047190,0.000000)
event=3300, t=97.983974, pot=(-4.828314,0.000000)
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event=100, t=3.165636, pot=(-8.047190,0.000000)
event=200, t=6.452483, pot=(-9.656627,0.000000)
event=300, t=9.694379, pot=(-4.828314,0.000000)
event=400, t=12.730397, pot=(-9.656627,0.000000)
event=500, t=15.217299, pot=(-8.047190,0.000000)
event=600, t=18.566870, pot=(-4.828314,0.000000)
event=700, t=21.708321, pot=(-4.828314,0.000000)
event=800, t=24.963253, pot=(-4.828314,0.000000)
event=900, t=27.240987, pot=(-9.656627,0.000000)
event=1000, t=29.989809, pot=(-4.828314,0.000000)
event=1100, t=32.534746, pot=(-4.828314,0.000000)
event=1200, t=35.186733, pot=(-9.656627,0.000000)
event=1300, t=37.834601, pot=(-9.656627,0.000000)
event=1400, t=40.892188, pot=(-4.828314,0.000000)
event=1500, t=44.097731, pot=(-4.828314,0.000000)
event=1600, t=47.049250, pot=(-9.656627,0.000000)
event=1700, t=49.961059, pot=(-4.828314,0.000000)
event=1800, t=52.565601, pot=(-4.828314,0.000000)
event=1900, t=55.872373, pot=(-1.609438,0.000000)
event=2000, t=59.348870, pot=(-3.218876,0.000000)
event=2100, t=62.234677, pot=(-4.828314,0.000000)
event=2200, t=64.999408, pot=(-4.828314,0.000000)
event=2300, t=67.943640, pot=(-8.047190,0.000000)
event=2400, t=70.715735, pot=(-8.047190,0.000000)
event=2500, t=73.745439, pot=(-6.437752,0.000000)
event=2600, t=76.499700, pot=(-4.828314,0.000000)
event=2700, t=79.635981, pot=(-4.828314,0.000000)
event=2800, t=82.715034, pot=(-3.218876,0.000000)
event=2900, t=85.788734, pot=(-6.437752,0.000000)
event=3000, t=88.838859, pot=(-6.437752,0.000000)
event=3100, t=92.050684, pot=(-6.437752,0.000000)
event=3200, t=94.701679, pot=(-8.047190,0.000000)
event=3300, t=97.446098, pot=(-8.047190,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=200, t=5.483319, pot=(-3.218876,0.000000)
event=300, t=7.785944, pot=(-3.218876,0.000000)
event=400, t=10.933864, pot=(-8.047190,0.000000)
event=500, t=14.055072, pot=(-6.437752,0.000000)
event=600, t=16.801507, pot=(-9.656627,0.000000)
event=700, t=19.645292, pot=(-4.828314,0.000000)
event=800, t=22.747646, pot=(-6.437752,0.000000)
event=900, t=26.161675, pot=(-8.047190,0.000000)
event=1000, t=29.846085, pot=(-6.437752,0.000000)
event=1100, t=33.332586, pot=(-8.047190,0.000000)
event=1200, t=36.285517, pot=(-4.828314,0.000000)
event=1300, t=39.375780, pot=(-3.218876,0.000000)
event=1400, t=42.745892, pot=(-3.218876,0.000000)
event=1500, t=45.725616, pot=(-3.218876,0.000000)
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event=1600, t=48.842763, pot=(-4.828314,0.000000)
event=1700, t=51.755149, pot=(-9.656627,0.000000)
event=1800, t=54.561930, pot=(-4.828314,0.000000)
event=1900, t=57.144094, pot=(-9.656627,0.000000)
event=2000, t=59.866362, pot=(-6.437752,0.000000)
event=2100, t=62.872128, pot=(-3.218876,0.000000)
event=2200, t=66.369105, pot=(-6.437752,0.000000)
event=2300, t=69.214930, pot=(-4.828314,0.000000)
event=2400, t=73.234093, pot=(-1.609438,0.000000)
event=2500, t=75.813920, pot=(-4.828314,0.000000)
event=2600, t=79.009773, pot=(-3.218876,0.000000)
event=2700, t=81.474112, pot=(-4.828314,0.000000)
event=2800, t=84.485177, pot=(-3.218876,0.000000)
event=2900, t=86.894280, pot=(-4.828314,0.000000)
event=3000, t=89.658314, pot=(-6.437752,0.000000)
event=3100, t=92.705434, pot=(-8.047190,0.000000)
event=3200, t=95.543193, pot=(-8.047190,0.000000)
event=3300, t=98.267075, pot=(-6.437752,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
event=0, t=0.000000, pot=(0.000000,0.000000)
event=100, t=3.087587, pot=(-4.828314,0.000000)
event=200, t=6.161305, pot=(-3.218876,0.000000)
event=300, t=9.665781, pot=(-4.828314,0.000000)
event=400, t=12.112559, pot=(-8.047190,0.000000)
event=500, t=15.418120, pot=(-3.218876,0.000000)
event=600, t=18.128946, pot=(-3.218876,0.000000)
event=700, t=21.484431, pot=(-6.437752,0.000000)
event=800, t=23.973473, pot=(-4.828314,0.000000)
event=900, t=26.724267, pot=(-4.828314,0.000000)
event=1000, t=29.703261, pot=(-8.047190,0.000000)
event=1100, t=33.585085, pot=(-6.437752,0.000000)
event=1200, t=35.891203, pot=(-9.656627,0.000000)
event=1300, t=39.369896, pot=(-8.047190,0.000000)
event=1400, t=42.712797, pot=(-6.437752,0.000000)
event=1500, t=45.387351, pot=(-6.437752,0.000000)
event=1600, t=48.454572, pot=(-9.656627,0.000000)
event=1700, t=50.670995, pot=(-9.656627,0.000000)
event=1800, t=53.674335, pot=(-4.828314,0.000000)
event=1900, t=56.729749, pot=(-4.828314,0.000000)
event=2000, t=60.098863, pot=(-6.437752,0.000000)
event=2100, t=63.336487, pot=(-6.437752,0.000000)
event=2200, t=66.349227, pot=(-6.437752,0.000000)
event=2300, t=68.930944, pot=(-6.437752,0.000000)
event=2400, t=72.221093, pot=(-4.828314,0.000000)
event=2500, t=74.906476, pot=(-8.047190,0.000000)
event=2600, t=77.791846, pot=(-11.266065,0.000000)
event=2700, t=81.023734, pot=(-9.656627,0.000000)
event=2800, t=84.025826, pot=(-4.828314,0.000000)
event=2900, t=87.485331, pot=(-6.437752,0.000000)
event=3000, t=90.394832, pot=(-4.828314,0.000000)
event=3100, t=93.863379, pot=(-6.437752,0.000000)
event=3200, t=96.852045, pot=(-8.047190,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
event=0, t=0.000000, pot=(0.000000,0.000000)
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event=100, t=2.659679, pot=(-6.437752,0.000000)
event=200, t=5.359353, pot=(-4.828314,0.000000)
event=300, t=7.883819, pot=(-4.828314,0.000000)
event=400, t=10.674207, pot=(-4.828314,0.000000)
event=500, t=13.433824, pot=(-6.437752,0.000000)
event=600, t=16.480799, pot=(-6.437752,0.000000)
event=700, t=19.739928, pot=(-8.047190,0.000000)
event=800, t=22.920515, pot=(-6.437752,0.000000)
event=900, t=25.686102, pot=(-4.828314,0.000000)
event=1000, t=28.369066, pot=(-6.437752,0.000000)
event=1100, t=30.972230, pot=(-4.828314,0.000000)
event=1200, t=34.229836, pot=(-8.047190,0.000000)
event=1300, t=37.257030, pot=(-6.437752,0.000000)
event=1400, t=39.941636, pot=(-9.656627,0.000000)
event=1500, t=43.114292, pot=(-8.047190,0.000000)
event=1600, t=45.630538, pot=(-3.218876,0.000000)
event=1700, t=48.911483, pot=(-4.828314,0.000000)
event=1800, t=51.234426, pot=(-8.047190,0.000000)
event=1900, t=54.139225, pot=(-3.218876,0.000000)
event=2000, t=58.171074, pot=(-4.828314,0.000000)
event=2100, t=61.200948, pot=(-6.437752,0.000000)
event=2200, t=63.771039, pot=(-8.047190,0.000000)
event=2300, t=66.352472, pot=(-4.828314,0.000000)
event=2400, t=69.257853, pot=(-4.828314,0.000000)
event=2500, t=72.277688, pot=(-9.656627,0.000000)
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event=2700, t=78.084898, pot=(-6.437752,0.000000)
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event=2900, t=83.722176, pot=(-6.437752,0.000000)
event=3000, t=86.523607, pot=(-6.437752,0.000000)
event=3100, t=89.517535, pot=(-8.047190,0.000000)
event=3200, t=92.486215, pot=(-8.047190,0.000000)
event=3300, t=95.302813, pot=(-9.656627,0.000000)
event=3400, t=98.597167, pot=(-4.828314,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
event=0, t=0.000000, pot=(0.000000,0.000000)
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event=200, t=5.537095, pot=(-8.047190,0.000000)
event=300, t=8.515266, pot=(-6.437752,0.000000)
event=400, t=11.505128, pot=(-6.437752,0.000000)
event=500, t=14.809778, pot=(-6.437752,0.000000)
event=600, t=17.749851, pot=(-6.437752,0.000000)
event=700, t=20.471155, pot=(-3.218876,0.000000)
event=800, t=23.682140, pot=(-4.828314,0.000000)
event=900, t=26.684479, pot=(-6.437752,0.000000)
event=1000, t=30.056719, pot=(-8.047190,0.000000)
event=1100, t=33.059086, pot=(-4.828314,0.000000)
event=1200, t=36.043389, pot=(-8.047190,0.000000)
event=1300, t=39.144590, pot=(-4.828314,0.000000)
event=1400, t=42.382380, pot=(-9.656627,0.000000)
event=1500, t=45.880425, pot=(-6.437752,0.000000)
event=1600, t=49.075846, pot=(-6.437752,0.000000)
event=1700, t=52.745319, pot=(-4.828314,0.000000)
event=1800, t=55.586077, pot=(-8.047190,0.000000)
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event=1900, t=58.753667, pot=(-4.828314,0.000000)
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event=2100, t=65.121409, pot=(-4.828314,0.000000)
event=2200, t=67.856512, pot=(-4.828314,0.000000)
event=2300, t=71.219507, pot=(-6.437752,0.000000)
event=2400, t=73.758825, pot=(-6.437752,0.000000)
event=2500, t=76.620202, pot=(-6.437752,0.000000)
event=2600, t=79.400025, pot=(-6.437752,0.000000)
event=2700, t=82.378677, pot=(-4.828314,0.000000)
event=2800, t=84.875633, pot=(-11.266065,0.000000)
event=2900, t=88.087528, pot=(-8.047190,0.000000)
event=3000, t=90.939554, pot=(-8.047190,0.000000)
event=3100, t=93.911126, pot=(-6.437752,0.000000)
event=3200, t=97.269644, pot=(-8.047190,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=300, t=8.217697, pot=(-6.437752,0.000000)
event=400, t=11.171262, pot=(-3.218876,0.000000)
event=500, t=13.624463, pot=(-6.437752,0.000000)
event=600, t=16.359590, pot=(-4.828314,0.000000)
event=700, t=19.626253, pot=(-3.218876,0.000000)
event=800, t=22.092714, pot=(-4.828314,0.000000)
event=900, t=25.329240, pot=(-6.437752,0.000000)
event=1000, t=27.902796, pot=(-6.437752,0.000000)
event=1100, t=30.277595, pot=(-11.266065,0.000000)
event=1200, t=33.448188, pot=(-4.828314,0.000000)
event=1300, t=36.670290, pot=(-4.828314,0.000000)
event=1400, t=39.845699, pot=(-4.828314,0.000000)
event=1500, t=42.533177, pot=(-4.828314,0.000000)
event=1600, t=45.220468, pot=(-6.437752,0.000000)
event=1700, t=48.584105, pot=(-8.047190,0.000000)
event=1800, t=51.224413, pot=(-11.266065,0.000000)
event=1900, t=53.810639, pot=(-3.218876,0.000000)
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event=2100, t=60.657501, pot=(-3.218876,0.000000)
event=2200, t=63.771233, pot=(-9.656627,0.000000)
event=2300, t=66.645454, pot=(-4.828314,0.000000)
event=2400, t=69.980461, pot=(-4.828314,0.000000)
event=2500, t=73.405063, pot=(-4.828314,0.000000)
event=2600, t=76.305514, pot=(-6.437752,0.000000)
event=2700, t=79.530712, pot=(-4.828314,0.000000)
event=2800, t=82.101311, pot=(-3.218876,0.000000)
event=2900, t=84.615089, pot=(-8.047190,0.000000)
event=3000, t=87.793096, pot=(-6.437752,0.000000)
event=3100, t=90.396483, pot=(-9.656627,0.000000)
event=3200, t=93.009310, pot=(-9.656627,0.000000)
event=3300, t=95.901833, pot=(-8.047190,0.000000)
event=3400, t=98.891916, pot=(-8.047190,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=200, t=6.766119, pot=(-4.828314,0.000000)
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event=300, t=9.641415, pot=(-6.437752,0.000000)
event=400, t=12.606963, pot=(-4.828314,0.000000)
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event=600, t=18.565599, pot=(-8.047190,0.000000)
event=700, t=21.847835, pot=(-3.218876,0.000000)
event=800, t=25.061088, pot=(-6.437752,0.000000)
event=900, t=27.421392, pot=(-4.828314,0.000000)
event=1000, t=31.160631, pot=(-4.828314,0.000000)
event=1100, t=33.848606, pot=(-8.047190,0.000000)
event=1200, t=36.439907, pot=(-8.047190,0.000000)
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event=1400, t=42.321438, pot=(-6.437752,0.000000)
event=1500, t=45.204662, pot=(-9.656627,0.000000)
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event=1700, t=51.478092, pot=(-6.437752,0.000000)
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event=1900, t=58.388536, pot=(-3.218876,0.000000)
event=2000, t=61.297786, pot=(-4.828314,0.000000)
event=2100, t=64.284234, pot=(-8.047190,0.000000)
event=2200, t=67.792820, pot=(-8.047190,0.000000)
event=2300, t=71.167547, pot=(-4.828314,0.000000)
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event=2500, t=76.972975, pot=(-11.266065,0.000000)
event=2600, t=79.912230, pot=(-6.437752,0.000000)
event=2700, t=82.599765, pot=(-4.828314,0.000000)
event=2800, t=85.720222, pot=(-4.828314,0.000000)
event=2900, t=88.484702, pot=(-6.437752,0.000000)
event=3000, t=91.027797, pot=(-3.218876,0.000000)
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event=3300, t=99.369355, pot=(-12.875503,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=300, t=8.799298, pot=(-4.828314,0.000000)
event=400, t=12.098992, pot=(-3.218876,0.000000)
event=500, t=14.728944, pot=(-4.828314,0.000000)
event=600, t=17.872791, pot=(-8.047190,0.000000)
event=700, t=20.581462, pot=(-4.828314,0.000000)
event=800, t=23.704818, pot=(-3.218876,0.000000)
event=900, t=26.700153, pot=(-3.218876,0.000000)
event=1000, t=29.745984, pot=(-6.437752,0.000000)
event=1100, t=32.625715, pot=(-11.266065,0.000000)
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event=1400, t=42.160676, pot=(-6.437752,0.000000)
event=1500, t=45.678788, pot=(-12.875503,0.000000)
event=1600, t=48.696674, pot=(-6.437752,0.000000)
event=1700, t=52.033685, pot=(-8.047190,0.000000)
event=1800, t=55.355426, pot=(-4.828314,0.000000)
event=1900, t=58.575537, pot=(-4.828314,0.000000)
event=2000, t=61.764463, pot=(-4.828314,0.000000)
event=2100, t=64.039770, pot=(-6.437752,0.000000)
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event=2200, t=66.814717, pot=(-6.437752,0.000000)
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event=2500, t=74.878760, pot=(-1.609438,0.000000)
event=2600, t=78.304353, pot=(-4.828314,0.000000)
event=2700, t=81.119471, pot=(-6.437752,0.000000)
event=2800, t=84.226982, pot=(-4.828314,0.000000)
event=2900, t=87.151500, pot=(-4.828314,0.000000)
event=3000, t=90.944284, pot=(-6.437752,0.000000)
event=3100, t=93.099172, pot=(-6.437752,0.000000)
event=3200, t=96.110545, pot=(-12.875503,0.000000)
event=3300, t=98.779917, pot=(-4.828314,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=300, t=9.297584, pot=(-4.828314,0.000000)
event=400, t=12.275904, pot=(-6.437752,0.000000)
event=500, t=15.456588, pot=(-6.437752,0.000000)
event=600, t=17.594451, pot=(-9.656627,0.000000)
event=700, t=19.937256, pot=(-9.656627,0.000000)
event=800, t=22.779994, pot=(-9.656627,0.000000)
event=900, t=25.122807, pot=(-9.656627,0.000000)
event=1000, t=28.355994, pot=(-8.047190,0.000000)
event=1100, t=31.406367, pot=(-8.047190,0.000000)
event=1200, t=34.196020, pot=(-6.437752,0.000000)
event=1300, t=36.983927, pot=(-8.047190,0.000000)
event=1400, t=39.608631, pot=(-4.828314,0.000000)
event=1500, t=42.790795, pot=(-4.828314,0.000000)
event=1600, t=45.593594, pot=(-8.047190,0.000000)
event=1700, t=48.480753, pot=(-6.437752,0.000000)
event=1800, t=51.132177, pot=(-4.828314,0.000000)
event=1900, t=53.782855, pot=(-6.437752,0.000000)
event=2000, t=57.505305, pot=(-6.437752,0.000000)
event=2100, t=60.159960, pot=(-6.437752,0.000000)
event=2200, t=63.582883, pot=(-4.828314,0.000000)
event=2300, t=66.643310, pot=(-4.828314,0.000000)
event=2400, t=69.520366, pot=(-6.437752,0.000000)
event=2500, t=72.085516, pot=(-8.047190,0.000000)
event=2600, t=74.739549, pot=(-4.828314,0.000000)
event=2700, t=77.689963, pot=(-3.218876,0.000000)
event=2800, t=80.801396, pot=(-6.437752,0.000000)
event=2900, t=83.211596, pot=(-6.437752,0.000000)
event=3000, t=85.932991, pot=(-1.609438,0.000000)
event=3100, t=88.631897, pot=(-4.828314,0.000000)
event=3200, t=91.564126, pot=(-4.828314,0.000000)
event=3300, t=94.568589, pot=(-4.828314,0.000000)
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Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=400, t=12.930254, pot=(-8.047190,0.000000)
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event=500, t=15.518951, pot=(-6.437752,0.000000)
event=600, t=18.556708, pot=(-6.437752,0.000000)
event=700, t=21.286729, pot=(-8.047190,0.000000)
event=800, t=24.054181, pot=(-8.047190,0.000000)
event=900, t=27.288289, pot=(-4.828314,0.000000)
event=1000, t=30.351473, pot=(-6.437752,0.000000)
event=1100, t=32.836427, pot=(-6.437752,0.000000)
event=1200, t=35.947465, pot=(-4.828314,0.000000)
event=1300, t=39.058176, pot=(-4.828314,0.000000)
event=1400, t=42.516880, pot=(-6.437752,0.000000)
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event=1600, t=48.155588, pot=(-3.218876,0.000000)
event=1700, t=51.340682, pot=(-6.437752,0.000000)
event=1800, t=53.895298, pot=(-6.437752,0.000000)
event=1900, t=56.597875, pot=(-9.656627,0.000000)
event=2000, t=59.220281, pot=(-8.047190,0.000000)
event=2100, t=62.260004, pot=(-6.437752,0.000000)
event=2200, t=65.512463, pot=(-9.656627,0.000000)
event=2300, t=68.989215, pot=(-6.437752,0.000000)
event=2400, t=71.402916, pot=(-8.047190,0.000000)
event=2500, t=74.747108, pot=(-6.437752,0.000000)
event=2600, t=77.683848, pot=(-8.047190,0.000000)
event=2700, t=80.719329, pot=(-3.218876,0.000000)
event=2800, t=83.674119, pot=(-8.047190,0.000000)
event=2900, t=86.211067, pot=(-9.656627,0.000000)
event=3000, t=88.563210, pot=(-9.656627,0.000000)
event=3100, t=92.040749, pot=(-4.828314,0.000000)
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event=3300, t=97.897849, pot=(-8.047190,0.000000)
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event=300, t=8.323577, pot=(-4.828314,0.000000)
event=400, t=11.092787, pot=(-4.828314,0.000000)
event=500, t=14.240895, pot=(-6.437752,0.000000)
event=600, t=16.478714, pot=(-3.218876,0.000000)
event=700, t=19.890854, pot=(-8.047190,0.000000)
event=800, t=23.065356, pot=(-8.047190,0.000000)
event=900, t=25.947231, pot=(-8.047190,0.000000)
event=1000, t=29.037445, pot=(-9.656627,0.000000)
event=1100, t=31.880796, pot=(-4.828314,0.000000)
event=1200, t=34.055234, pot=(-8.047190,0.000000)
event=1300, t=36.607848, pot=(-6.437752,0.000000)
event=1400, t=40.313071, pot=(-1.609438,0.000000)
event=1500, t=43.269801, pot=(-1.609438,0.000000)
event=1600, t=46.188162, pot=(-6.437752,0.000000)
event=1700, t=49.508691, pot=(-6.437752,0.000000)
event=1800, t=52.996994, pot=(-6.437752,0.000000)
event=1900, t=56.209101, pot=(-4.828314,0.000000)
event=2000, t=58.835632, pot=(-9.656627,0.000000)
event=2100, t=61.242528, pot=(-8.047190,0.000000)
event=2200, t=63.665018, pot=(-8.047190,0.000000)
event=2300, t=66.899418, pot=(-4.828314,0.000000)
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event=2600, t=75.218033, pot=(-6.437752,0.000000)
event=2700, t=78.157896, pot=(-6.437752,0.000000)
event=2800, t=81.154834, pot=(-6.437752,0.000000)
event=2900, t=84.336879, pot=(-4.828314,0.000000)
event=3000, t=87.163452, pot=(-6.437752,0.000000)
event=3100, t=90.368970, pot=(-6.437752,0.000000)
event=3200, t=93.231526, pot=(-4.828314,0.000000)
event=3300, t=97.182267, pot=(-4.828314,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=300, t=8.706533, pot=(-3.218876,0.000000)
event=400, t=11.420163, pot=(-6.437752,0.000000)
event=500, t=14.986997, pot=(-6.437752,0.000000)
event=600, t=18.691799, pot=(-6.437752,0.000000)
event=700, t=21.206102, pot=(-4.828314,0.000000)
event=800, t=24.313169, pot=(-6.437752,0.000000)
event=900, t=27.800897, pot=(-3.218876,0.000000)
event=1000, t=30.707416, pot=(-6.437752,0.000000)
event=1100, t=33.862677, pot=(-4.828314,0.000000)
event=1200, t=37.110229, pot=(-9.656627,0.000000)
event=1300, t=40.712855, pot=(-4.828314,0.000000)
event=1400, t=43.520478, pot=(-6.437752,0.000000)
event=1500, t=46.496418, pot=(-3.218876,0.000000)
event=1600, t=50.164250, pot=(-4.828314,0.000000)
event=1700, t=53.500031, pot=(-3.218876,0.000000)
event=1800, t=56.813870, pot=(-8.047190,0.000000)
event=1900, t=59.905068, pot=(-6.437752,0.000000)
event=2000, t=62.566164, pot=(-4.828314,0.000000)
event=2100, t=65.552945, pot=(-4.828314,0.000000)
event=2200, t=68.318858, pot=(-3.218876,0.000000)
event=2300, t=71.443360, pot=(-8.047190,0.000000)
event=2400, t=74.161061, pot=(-6.437752,0.000000)
event=2500, t=76.825004, pot=(-4.828314,0.000000)
event=2600, t=79.677177, pot=(-6.437752,0.000000)
event=2700, t=82.766917, pot=(-6.437752,0.000000)
event=2800, t=85.158942, pot=(-3.218876,0.000000)
event=2900, t=88.228735, pot=(-6.437752,0.000000)
event=3000, t=91.291688, pot=(-6.437752,0.000000)
event=3100, t=94.373893, pot=(-6.437752,0.000000)
event=3200, t=97.003691, pot=(-3.218876,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=300, t=8.535906, pot=(-6.437752,0.000000)
event=400, t=11.479256, pot=(-9.656627,0.000000)
event=500, t=14.405277, pot=(-8.047190,0.000000)
event=600, t=16.866372, pot=(-4.828314,0.000000)
event=700, t=20.176393, pot=(-8.047190,0.000000)
event=800, t=23.854704, pot=(-6.437752,0.000000)
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event=900, t=26.701588, pot=(-8.047190,0.000000)
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event=1100, t=32.164753, pot=(-6.437752,0.000000)
event=1200, t=35.508876, pot=(-4.828314,0.000000)
event=1300, t=38.525730, pot=(-6.437752,0.000000)
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event=1600, t=47.480536, pot=(-4.828314,0.000000)
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event=1800, t=54.069685, pot=(-9.656627,0.000000)
event=1900, t=56.418717, pot=(-11.266065,0.000000)
event=2000, t=59.037539, pot=(-9.656627,0.000000)
event=2100, t=62.103618, pot=(-8.047190,0.000000)
event=2200, t=64.695333, pot=(-3.218876,0.000000)
event=2300, t=67.895059, pot=(-9.656627,0.000000)
event=2400, t=70.996745, pot=(-8.047190,0.000000)
event=2500, t=74.361231, pot=(-4.828314,0.000000)
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event=2700, t=79.936273, pot=(-8.047190,0.000000)
event=2800, t=83.113709, pot=(-8.047190,0.000000)
event=2900, t=86.104963, pot=(-6.437752,0.000000)
event=3000, t=88.556573, pot=(-9.656627,0.000000)
event=3100, t=91.465484, pot=(-3.218876,0.000000)
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event=3300, t=97.922590, pot=(-3.218876,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=200, t=6.511748, pot=(-8.047190,0.000000)
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event=400, t=11.997926, pot=(-6.437752,0.000000)
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event=600, t=17.886284, pot=(-6.437752,0.000000)
event=700, t=21.037471, pot=(-3.218876,0.000000)
event=800, t=23.937021, pot=(-8.047190,0.000000)
event=900, t=26.852862, pot=(-4.828314,0.000000)
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event=1100, t=33.373416, pot=(-8.047190,0.000000)
event=1200, t=36.673742, pot=(-3.218876,0.000000)
event=1300, t=40.300131, pot=(-9.656627,0.000000)
event=1400, t=43.203040, pot=(-6.437752,0.000000)
event=1500, t=46.602878, pot=(-4.828314,0.000000)
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event=1700, t=53.604402, pot=(-8.047190,0.000000)
event=1800, t=56.190188, pot=(-4.828314,0.000000)
event=1900, t=59.143853, pot=(-4.828314,0.000000)
event=2000, t=62.734465, pot=(-3.218876,0.000000)
event=2100, t=66.735019, pot=(-11.266065,0.000000)
event=2200, t=69.639006, pot=(-3.218876,0.000000)
event=2300, t=73.431995, pot=(-6.437752,0.000000)
event=2400, t=76.437594, pot=(-6.437752,0.000000)
event=2500, t=79.339511, pot=(-4.828314,0.000000)
event=2600, t=82.135550, pot=(-4.828314,0.000000)
event=2700, t=85.736635, pot=(-9.656627,0.000000)
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event=2900, t=90.593443, pot=(-6.437752,0.000000)
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event=3100, t=96.507733, pot=(-4.828314,0.000000)
event=3200, t=99.533497, pot=(-8.047190,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=300, t=9.220066, pot=(-6.437752,0.000000)
event=400, t=12.201593, pot=(-4.828314,0.000000)
event=500, t=14.904461, pot=(-8.047190,0.000000)
event=600, t=17.582404, pot=(-4.828314,0.000000)
event=700, t=20.752356, pot=(-8.047190,0.000000)
event=800, t=23.867071, pot=(-8.047190,0.000000)
event=900, t=26.460361, pot=(-8.047190,0.000000)
event=1000, t=29.043959, pot=(-6.437752,0.000000)
event=1100, t=33.049326, pot=(-4.828314,0.000000)
event=1200, t=36.132220, pot=(-8.047190,0.000000)
event=1300, t=39.724717, pot=(-1.609438,0.000000)
event=1400, t=42.889942, pot=(-4.828314,0.000000)
event=1500, t=46.135208, pot=(-3.218876,0.000000)
event=1600, t=48.741893, pot=(-6.437752,0.000000)
event=1700, t=51.605887, pot=(-6.437752,0.000000)
event=1800, t=54.420327, pot=(-4.828314,0.000000)
event=1900, t=57.549304, pot=(-6.437752,0.000000)
event=2000, t=60.531737, pot=(-8.047190,0.000000)
event=2100, t=63.982226, pot=(-9.656627,0.000000)
event=2200, t=66.690047, pot=(-4.828314,0.000000)
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event=2800, t=85.549927, pot=(-4.828314,0.000000)
event=2900, t=89.169733, pot=(-9.656627,0.000000)
event=3000, t=92.552145, pot=(-6.437752,0.000000)
event=3100, t=95.491818, pot=(-8.047190,0.000000)
event=3200, t=98.504908, pot=(-6.437752,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=200, t=6.237170, pot=(-6.437752,0.000000)
event=300, t=8.720962, pot=(-3.218876,0.000000)
event=400, t=11.861549, pot=(-8.047190,0.000000)
event=500, t=15.355270, pot=(-3.218876,0.000000)
event=600, t=18.729749, pot=(-6.437752,0.000000)
event=700, t=21.597165, pot=(-4.828314,0.000000)
event=800, t=24.385482, pot=(-8.047190,0.000000)
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event=1100, t=32.577228, pot=(-9.656627,0.000000)
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event=1700, t=49.277373, pot=(-4.828314,0.000000)
event=1800, t=51.753472, pot=(-6.437752,0.000000)
event=1900, t=54.898250, pot=(-6.437752,0.000000)
event=2000, t=58.495472, pot=(-6.437752,0.000000)
event=2100, t=61.462407, pot=(-8.047190,0.000000)
event=2200, t=64.243107, pot=(-11.266065,0.000000)
event=2300, t=67.028558, pot=(-6.437752,0.000000)
event=2400, t=69.885415, pot=(-4.828314,0.000000)
event=2500, t=72.483184, pot=(-9.656627,0.000000)
event=2600, t=76.601721, pot=(-3.218876,0.000000)
event=2700, t=79.165735, pot=(-4.828314,0.000000)
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event=3100, t=91.377794, pot=(-8.047190,0.000000)
event=3200, t=93.942560, pot=(-8.047190,0.000000)
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Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=100, t=3.242587, pot=(-4.828314,0.000000)
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event=300, t=8.588611, pot=(-8.047190,0.000000)
event=400, t=11.544735, pot=(-4.828314,0.000000)
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event=1400, t=42.513136, pot=(-6.437752,0.000000)
event=1500, t=45.401285, pot=(-6.437752,0.000000)
event=1600, t=48.247149, pot=(-1.609438,0.000000)
event=1700, t=51.299402, pot=(-6.437752,0.000000)
event=1800, t=53.764589, pot=(-6.437752,0.000000)
event=1900, t=57.272735, pot=(-12.875503,0.000000)
event=2000, t=60.047193, pot=(-8.047190,0.000000)
event=2100, t=63.499941, pot=(-4.828314,0.000000)
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event=2300, t=68.621884, pot=(-8.047190,0.000000)
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event=2600, t=78.775679, pot=(-6.437752,0.000000)
event=2700, t=81.617519, pot=(-8.047190,0.000000)
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event=2900, t=87.061777, pot=(-4.828314,0.000000)
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event=3200, t=95.726576, pot=(-6.437752,0.000000)
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event=200, t=6.286058, pot=(-8.047190,0.000000)
event=300, t=8.961507, pot=(-3.218876,0.000000)
event=400, t=12.698943, pot=(-9.656627,0.000000)
event=500, t=15.746126, pot=(-3.218876,0.000000)
event=600, t=18.647004, pot=(-9.656627,0.000000)
event=700, t=21.345566, pot=(-8.047190,0.000000)
event=800, t=24.188346, pot=(-4.828314,0.000000)
event=900, t=27.495240, pot=(-4.828314,0.000000)
event=1000, t=30.482792, pot=(-6.437752,0.000000)
event=1100, t=33.768544, pot=(-6.437752,0.000000)
event=1200, t=36.650418, pot=(-9.656627,0.000000)
event=1300, t=39.098590, pot=(-6.437752,0.000000)
event=1400, t=42.570412, pot=(-3.218876,0.000000)
event=1500, t=45.836784, pot=(-4.828314,0.000000)
event=1600, t=48.998874, pot=(-3.218876,0.000000)
event=1700, t=51.733133, pot=(-6.437752,0.000000)
event=1800, t=54.763625, pot=(-8.047190,0.000000)
event=1900, t=57.656684, pot=(-4.828314,0.000000)
event=2000, t=61.129480, pot=(-6.437752,0.000000)
event=2100, t=64.211885, pot=(-6.437752,0.000000)
event=2200, t=66.764021, pot=(-4.828314,0.000000)
event=2300, t=69.695361, pot=(-6.437752,0.000000)
event=2400, t=72.215263, pot=(-3.218876,0.000000)
event=2500, t=76.007533, pot=(-6.437752,0.000000)
event=2600, t=78.826373, pot=(-9.656627,0.000000)
event=2700, t=81.898722, pot=(-8.047190,0.000000)
event=2800, t=84.727050, pot=(-3.218876,0.000000)
event=2900, t=88.039164, pot=(-8.047190,0.000000)
event=3000, t=90.850829, pot=(-6.437752,0.000000)
event=3100, t=93.832042, pot=(-4.828314,0.000000)
event=3200, t=96.286428, pot=(-4.828314,0.000000)
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event=400, t=12.582432, pot=(-3.218876,0.000000)
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event=600, t=18.218558, pot=(-6.437752,0.000000)
event=700, t=21.814553, pot=(-8.047190,0.000000)
event=800, t=24.872448, pot=(-4.828314,0.000000)
event=900, t=27.926937, pot=(-8.047190,0.000000)
event=1000, t=30.660059, pot=(-6.437752,0.000000)
event=1100, t=33.678904, pot=(-6.437752,0.000000)
event=1200, t=37.202357, pot=(-11.266065,0.000000)
event=1300, t=40.451728, pot=(-6.437752,0.000000)
event=1400, t=43.002713, pot=(-6.437752,0.000000)
event=1500, t=45.715886, pot=(-4.828314,0.000000)
event=1600, t=48.567378, pot=(-4.828314,0.000000)
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event=1700, t=52.267036, pot=(-8.047190,0.000000)
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event=1900, t=58.327289, pot=(-8.047190,0.000000)
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event=2100, t=63.607375, pot=(-6.437752,0.000000)
event=2200, t=66.732476, pot=(-4.828314,0.000000)
event=2300, t=69.494353, pot=(-3.218876,0.000000)
event=2400, t=72.551775, pot=(-4.828314,0.000000)
event=2500, t=75.695695, pot=(-4.828314,0.000000)
event=2600, t=78.256816, pot=(-6.437752,0.000000)
event=2700, t=80.947127, pot=(-6.437752,0.000000)
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event=2900, t=87.243895, pot=(-4.828314,0.000000)
event=3000, t=90.250267, pot=(-9.656627,0.000000)
event=3100, t=93.562953, pot=(-6.437752,0.000000)
event=3200, t=96.705407, pot=(-6.437752,0.000000)
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event=700, t=21.585267, pot=(-4.828314,0.000000)
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event=1800, t=54.577998, pot=(-6.437752,0.000000)
event=1900, t=57.194357, pot=(-8.047190,0.000000)
event=2000, t=60.651348, pot=(-4.828314,0.000000)
event=2100, t=64.254986, pot=(-8.047190,0.000000)
event=2200, t=66.599459, pot=(-6.437752,0.000000)
event=2300, t=69.609329, pot=(-8.047190,0.000000)
event=2400, t=72.346417, pot=(-6.437752,0.000000)
event=2500, t=75.034549, pot=(-6.437752,0.000000)
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event=2700, t=81.141301, pot=(-3.218876,0.000000)
event=2800, t=84.063898, pot=(-8.047190,0.000000)
event=2900, t=87.131705, pot=(-4.828314,0.000000)
event=3000, t=90.040633, pot=(-8.047190,0.000000)
event=3100, t=93.618170, pot=(-6.437752,0.000000)
event=3200, t=96.659927, pot=(-4.828314,0.000000)
event=3300, t=99.698254, pot=(-8.047190,0.000000)
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event=100, t=3.276674, pot=(-4.828314,0.000000)
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event=500, t=14.966400, pot=(-6.437752,0.000000)
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event=700, t=20.532095, pot=(-9.656627,0.000000)
event=800, t=23.679818, pot=(-8.047190,0.000000)
event=900, t=27.106392, pot=(-4.828314,0.000000)
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event=1100, t=34.036868, pot=(-4.828314,0.000000)
event=1200, t=36.926917, pot=(-6.437752,0.000000)
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event=1400, t=43.565893, pot=(-4.828314,0.000000)
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event=1700, t=52.423461, pot=(-6.437752,0.000000)
event=1800, t=55.335966, pot=(-6.437752,0.000000)
event=1900, t=58.724494, pot=(-3.218876,0.000000)
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event=2100, t=63.365773, pot=(-4.828314,0.000000)
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event=300, t=8.599759, pot=(-6.437752,0.000000)
event=400, t=11.363855, pot=(-1.609438,0.000000)
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event=800, t=23.548124, pot=(-6.437752,0.000000)
event=900, t=26.352564, pot=(-8.047190,0.000000)
event=1000, t=30.272100, pot=(-8.047190,0.000000)
event=1100, t=33.331033, pot=(-3.218876,0.000000)
event=1200, t=36.250123, pot=(-3.218876,0.000000)
event=1300, t=39.779150, pot=(-4.828314,0.000000)
event=1400, t=42.753467, pot=(-4.828314,0.000000)
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event=1600, t=48.180572, pot=(-8.047190,0.000000)
event=1700, t=50.968551, pot=(-6.437752,0.000000)
event=1800, t=53.874265, pot=(-9.656627,0.000000)
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event=2000, t=59.474897, pot=(-6.437752,0.000000)
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event=2400, t=70.685942, pot=(-11.266065,0.000000)
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event=2700, t=79.046299, pot=(-4.828314,0.000000)
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event=2900, t=85.153348, pot=(-6.437752,0.000000)
event=3000, t=88.297207, pot=(-4.828314,0.000000)
event=3100, t=91.246998, pot=(-4.828314,0.000000)
event=3200, t=94.124040, pot=(-9.656627,0.000000)
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event=300, t=9.107506, pot=(-8.047190,0.000000)
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event=900, t=27.037828, pot=(-3.218876,0.000000)
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event=1400, t=41.923062, pot=(-6.437752,0.000000)
event=1500, t=44.888960, pot=(-6.437752,0.000000)
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event=2300, t=68.177316, pot=(-4.828314,0.000000)
event=2400, t=71.084150, pot=(-8.047190,0.000000)
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event=3100, t=92.639199, pot=(-6.437752,0.000000)
event=3200, t=95.565827, pot=(-4.828314,0.000000)
event=3300, t=99.277626, pot=(-4.828314,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=1100, t=34.053358, pot=(-4.828314,0.000000)
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event=1400, t=42.953654, pot=(-4.828314,0.000000)
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event=2900, t=88.964452, pot=(-4.828314,0.000000)
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event=300, t=8.266442, pot=(-4.828314,0.000000)
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event=700, t=20.378381, pot=(-6.437752,0.000000)
event=800, t=23.995368, pot=(-6.437752,0.000000)
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event=1000, t=30.246637, pot=(-6.437752,0.000000)
event=1100, t=33.759939, pot=(-4.828314,0.000000)
event=1200, t=36.535691, pot=(-4.828314,0.000000)
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event=1500, t=45.403676, pot=(-6.437752,0.000000)
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event=1900, t=57.610742, pot=(-4.828314,0.000000)
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event=3000, t=89.069937, pot=(-8.047190,0.000000)
event=3100, t=92.278650, pot=(-6.437752,0.000000)
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Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=700, t=22.591354, pot=(-4.828314,0.000000)
event=800, t=25.581561, pot=(-4.828314,0.000000)
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event=1200, t=37.784878, pot=(-6.437752,0.000000)
event=1300, t=40.857738, pot=(-9.656627,0.000000)
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event=2700, t=81.941195, pot=(-6.437752,0.000000)
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event=3000, t=90.646491, pot=(-3.218876,0.000000)
event=3100, t=94.023695, pot=(-4.828314,0.000000)
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event=3300, t=99.717543, pot=(-4.828314,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
event=0, t=0.000000, pot=(0.000000,0.000000)
event=100, t=3.221414, pot=(-6.437752,0.000000)
event=200, t=7.160347, pot=(-6.437752,0.000000)
event=300, t=9.675851, pot=(-4.828314,0.000000)
event=400, t=12.832540, pot=(-4.828314,0.000000)
event=500, t=16.032168, pot=(-4.828314,0.000000)
event=600, t=18.821600, pot=(-6.437752,0.000000)
event=700, t=22.044506, pot=(-6.437752,0.000000)
event=800, t=24.580582, pot=(-4.828314,0.000000)
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event=900, t=27.275091, pot=(-4.828314,0.000000)
event=1000, t=29.723182, pot=(-4.828314,0.000000)
event=1100, t=32.841540, pot=(-6.437752,0.000000)
event=1200, t=36.801055, pot=(-8.047190,0.000000)
event=1300, t=39.800360, pot=(-3.218876,0.000000)
event=1400, t=42.881092, pot=(-6.437752,0.000000)
event=1500, t=45.895946, pot=(-6.437752,0.000000)
event=1600, t=48.969692, pot=(-6.437752,0.000000)
event=1700, t=51.613751, pot=(-4.828314,0.000000)
event=1800, t=54.751837, pot=(-6.437752,0.000000)
event=1900, t=57.355534, pot=(-4.828314,0.000000)
event=2000, t=60.221417, pot=(-6.437752,0.000000)
event=2100, t=63.348814, pot=(-11.266065,0.000000)
event=2200, t=66.181262, pot=(-6.437752,0.000000)
event=2300, t=68.669679, pot=(-4.828314,0.000000)
event=2400, t=72.336418, pot=(-4.828314,0.000000)
event=2500, t=75.345044, pot=(-6.437752,0.000000)
event=2600, t=77.571386, pot=(-4.828314,0.000000)
event=2700, t=80.902265, pot=(-6.437752,0.000000)
event=2800, t=83.222771, pot=(-8.047190,0.000000)
event=2900, t=85.824160, pot=(-6.437752,0.000000)
event=3000, t=88.874748, pot=(-3.218876,0.000000)
event=3100, t=91.919423, pot=(-4.828314,0.000000)
event=3200, t=95.117165, pot=(-4.828314,0.000000)
event=3300, t=97.917037, pot=(-4.828314,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=200, t=6.150685, pot=(-4.828314,0.000000)
event=300, t=8.775784, pot=(-6.437752,0.000000)
event=400, t=11.859937, pot=(-6.437752,0.000000)
event=500, t=14.710124, pot=(-8.047190,0.000000)
event=600, t=17.435434, pot=(-8.047190,0.000000)
event=700, t=20.334869, pot=(-6.437752,0.000000)
event=800, t=23.520764, pot=(-4.828314,0.000000)
event=900, t=27.276300, pot=(-3.218876,0.000000)
event=1000, t=30.520634, pot=(-9.656627,0.000000)
event=1100, t=33.219518, pot=(-6.437752,0.000000)
event=1200, t=35.756048, pot=(-6.437752,0.000000)
event=1300, t=38.496975, pot=(-9.656627,0.000000)
event=1400, t=41.927651, pot=(-3.218876,0.000000)
event=1500, t=45.146196, pot=(-8.047190,0.000000)
event=1600, t=48.074538, pot=(-6.437752,0.000000)
event=1700, t=50.793965, pot=(-11.266065,0.000000)
event=1800, t=53.206140, pot=(-6.437752,0.000000)
event=1900, t=56.595940, pot=(-4.828314,0.000000)
event=2000, t=59.950036, pot=(-4.828314,0.000000)
event=2100, t=63.229988, pot=(-6.437752,0.000000)
event=2200, t=65.859669, pot=(-4.828314,0.000000)
event=2300, t=69.226563, pot=(-8.047190,0.000000)
event=2400, t=71.654911, pot=(-8.047190,0.000000)
event=2500, t=74.896259, pot=(-6.437752,0.000000)
event=2600, t=77.884034, pot=(-8.047190,0.000000)
event=2700, t=80.804547, pot=(-4.828314,0.000000)
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event=2800, t=83.653309, pot=(-4.828314,0.000000)
event=2900, t=86.225003, pot=(-4.828314,0.000000)
event=3000, t=89.101560, pot=(-4.828314,0.000000)
event=3100, t=92.033358, pot=(-8.047190,0.000000)
event=3200, t=95.230983, pot=(-6.437752,0.000000)
event=3300, t=98.110547, pot=(-4.828314,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=100, t=3.691660, pot=(-6.437752,0.000000)
event=200, t=6.174972, pot=(-6.437752,0.000000)
event=300, t=9.057123, pot=(-6.437752,0.000000)
event=400, t=12.341896, pot=(-3.218876,0.000000)
event=500, t=15.315423, pot=(-8.047190,0.000000)
event=600, t=18.600226, pot=(-3.218876,0.000000)
event=700, t=21.166449, pot=(-4.828314,0.000000)
event=800, t=23.776083, pot=(-8.047190,0.000000)
event=900, t=26.555464, pot=(-4.828314,0.000000)
event=1000, t=29.644500, pot=(-4.828314,0.000000)
event=1100, t=32.981908, pot=(-6.437752,0.000000)
event=1200, t=35.391197, pot=(-8.047190,0.000000)
event=1300, t=38.252263, pot=(-4.828314,0.000000)
event=1400, t=41.164369, pot=(-8.047190,0.000000)
event=1500, t=44.714022, pot=(-6.437752,0.000000)
event=1600, t=48.234602, pot=(-3.218876,0.000000)
event=1700, t=51.354009, pot=(-6.437752,0.000000)
event=1800, t=54.327727, pot=(-6.437752,0.000000)
event=1900, t=56.906714, pot=(-6.437752,0.000000)
event=2000, t=60.570158, pot=(-6.437752,0.000000)
event=2100, t=63.545567, pot=(-6.437752,0.000000)
event=2200, t=66.405897, pot=(-4.828314,0.000000)
event=2300, t=69.764756, pot=(-8.047190,0.000000)
event=2400, t=73.321752, pot=(-6.437752,0.000000)
event=2500, t=76.520771, pot=(-3.218876,0.000000)
event=2600, t=79.879428, pot=(-6.437752,0.000000)
event=2700, t=83.498772, pot=(-8.047190,0.000000)
event=2800, t=86.034291, pot=(-8.047190,0.000000)
event=2900, t=89.164859, pot=(-9.656627,0.000000)
event=3000, t=92.282509, pot=(-6.437752,0.000000)
event=3100, t=94.651764, pot=(-6.437752,0.000000)
event=3200, t=97.721050, pot=(-4.828314,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=200, t=5.351231, pot=(-3.218876,0.000000)
event=300, t=8.437125, pot=(-6.437752,0.000000)
event=400, t=11.318051, pot=(-6.437752,0.000000)
event=500, t=13.701905, pot=(-9.656627,0.000000)
event=600, t=16.645549, pot=(-3.218876,0.000000)
event=700, t=19.819554, pot=(-8.047190,0.000000)
event=800, t=22.439278, pot=(-8.047190,0.000000)
event=900, t=25.397632, pot=(-9.656627,0.000000)
event=1000, t=28.928022, pot=(-8.047190,0.000000)
event=1100, t=31.515531, pot=(-4.828314,0.000000)
event=1200, t=35.166769, pot=(-6.437752,0.000000)
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event=1300, t=37.782512, pot=(-8.047190,0.000000)
event=1400, t=41.446539, pot=(-4.828314,0.000000)
event=1500, t=44.978672, pot=(-6.437752,0.000000)
event=1600, t=48.137393, pot=(-4.828314,0.000000)
event=1700, t=51.842148, pot=(-4.828314,0.000000)
event=1800, t=55.349871, pot=(-8.047190,0.000000)
event=1900, t=58.224966, pot=(-8.047190,0.000000)
event=2000, t=60.762501, pot=(-9.656627,0.000000)
event=2100, t=63.982794, pot=(-3.218876,0.000000)
event=2200, t=67.104590, pot=(-6.437752,0.000000)
event=2300, t=70.050708, pot=(-3.218876,0.000000)
event=2400, t=73.091241, pot=(-3.218876,0.000000)
event=2500, t=76.037574, pot=(-3.218876,0.000000)
event=2600, t=79.356645, pot=(-8.047190,0.000000)
event=2700, t=82.244254, pot=(-3.218876,0.000000)
event=2800, t=85.362539, pot=(-9.656627,0.000000)
event=2900, t=87.931086, pot=(-8.047190,0.000000)
event=3000, t=90.799047, pot=(-4.828314,0.000000)
event=3100, t=93.794746, pot=(-6.437752,0.000000)
event=3200, t=96.815449, pot=(-6.437752,0.000000)
event=3300, t=99.637614, pot=(-4.828314,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=200, t=5.101461, pot=(-6.437752,0.000000)
event=300, t=8.277960, pot=(-1.609438,0.000000)
event=400, t=11.376397, pot=(-3.218876,0.000000)
event=500, t=14.369932, pot=(-1.609438,0.000000)
event=600, t=17.316006, pot=(-6.437752,0.000000)
event=700, t=19.863838, pot=(-9.656627,0.000000)
event=800, t=22.873955, pot=(-6.437752,0.000000)
event=900, t=25.577664, pot=(-8.047190,0.000000)
event=1000, t=28.830094, pot=(-6.437752,0.000000)
event=1100, t=32.208272, pot=(-8.047190,0.000000)
event=1200, t=35.072695, pot=(-6.437752,0.000000)
event=1300, t=38.502768, pot=(-6.437752,0.000000)
event=1400, t=42.148700, pot=(-4.828314,0.000000)
event=1500, t=45.057684, pot=(-11.266065,0.000000)
event=1600, t=47.281725, pot=(-9.656627,0.000000)
event=1700, t=50.087557, pot=(-4.828314,0.000000)
event=1800, t=52.939888, pot=(-4.828314,0.000000)
event=1900, t=55.854793, pot=(-8.047190,0.000000)
event=2000, t=58.231326, pot=(-8.047190,0.000000)
event=2100, t=60.910376, pot=(-8.047190,0.000000)
event=2200, t=64.251447, pot=(-4.828314,0.000000)
event=2300, t=67.250979, pot=(-6.437752,0.000000)
event=2400, t=70.120505, pot=(-9.656627,0.000000)
event=2500, t=72.714359, pot=(-4.828314,0.000000)
event=2600, t=76.427263, pot=(-3.218876,0.000000)
event=2700, t=79.686592, pot=(-8.047190,0.000000)
event=2800, t=82.404941, pot=(-11.266065,0.000000)
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event=3100, t=91.424350, pot=(-8.047190,0.000000)
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event=3200, t=93.872981, pot=(-8.047190,0.000000)
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event=3400, t=99.402906, pot=(-8.047190,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
event=0, t=0.000000, pot=(0.000000,0.000000)
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event=200, t=5.595528, pot=(-4.828314,0.000000)
event=300, t=9.188890, pot=(-6.437752,0.000000)
event=400, t=13.007629, pot=(-4.828314,0.000000)
event=500, t=15.927908, pot=(-4.828314,0.000000)
event=600, t=18.695038, pot=(-6.437752,0.000000)
event=700, t=22.319953, pot=(-4.828314,0.000000)
event=800, t=25.628160, pot=(-8.047190,0.000000)
event=900, t=28.711319, pot=(-4.828314,0.000000)
event=1000, t=31.342226, pot=(-3.218876,0.000000)
event=1100, t=34.031150, pot=(-3.218876,0.000000)
event=1200, t=37.063176, pot=(-8.047190,0.000000)
event=1300, t=39.584131, pot=(-8.047190,0.000000)
event=1400, t=42.676521, pot=(-9.656627,0.000000)
event=1500, t=45.525288, pot=(-8.047190,0.000000)
event=1600, t=48.998647, pot=(-6.437752,0.000000)
event=1700, t=52.450890, pot=(-6.437752,0.000000)
event=1800, t=55.321915, pot=(-4.828314,0.000000)
event=1900, t=58.639819, pot=(-3.218876,0.000000)
event=2000, t=61.602083, pot=(-6.437752,0.000000)
event=2100, t=64.720814, pot=(-3.218876,0.000000)
event=2200, t=67.448205, pot=(-6.437752,0.000000)
event=2300, t=71.056730, pot=(-4.828314,0.000000)
event=2400, t=74.352615, pot=(-3.218876,0.000000)
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event=2800, t=85.800521, pot=(-8.047190,0.000000)
event=2900, t=89.267032, pot=(-4.828314,0.000000)
event=3000, t=91.800917, pot=(-8.047190,0.000000)
event=3100, t=94.683992, pot=(-6.437752,0.000000)
event=3200, t=97.781591, pot=(-6.437752,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
event=0, t=0.000000, pot=(0.000000,0.000000)
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event=300, t=8.281459, pot=(-3.218876,0.000000)
event=400, t=11.572735, pot=(-4.828314,0.000000)
event=500, t=14.475757, pot=(-6.437752,0.000000)
event=600, t=17.104036, pot=(-3.218876,0.000000)
event=700, t=19.944331, pot=(-6.437752,0.000000)
event=800, t=22.766442, pot=(-6.437752,0.000000)
event=900, t=25.371151, pot=(-8.047190,0.000000)
event=1000, t=28.268124, pot=(-4.828314,0.000000)
event=1100, t=31.374838, pot=(-3.218876,0.000000)
event=1200, t=34.447376, pot=(-8.047190,0.000000)
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event=1500, t=45.025174, pot=(-4.828314,0.000000)
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event=1600, t=48.176171, pot=(-9.656627,0.000000)
event=1700, t=51.033275, pot=(-4.828314,0.000000)
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event=1900, t=58.203456, pot=(-3.218876,0.000000)
event=2000, t=61.193138, pot=(-4.828314,0.000000)
event=2100, t=64.745456, pot=(-6.437752,0.000000)
event=2200, t=67.511550, pot=(-9.656627,0.000000)
event=2300, t=70.670692, pot=(-8.047190,0.000000)
event=2400, t=73.603962, pot=(-6.437752,0.000000)
event=2500, t=76.764337, pot=(-8.047190,0.000000)
event=2600, t=80.181848, pot=(-6.437752,0.000000)
event=2700, t=83.192102, pot=(-6.437752,0.000000)
event=2800, t=85.733240, pot=(-11.266065,0.000000)
event=2900, t=88.685280, pot=(-6.437752,0.000000)
event=3000, t=91.346133, pot=(-9.656627,0.000000)
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Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=400, t=11.810792, pot=(-3.218876,0.000000)
event=500, t=14.134249, pot=(-9.656627,0.000000)
event=600, t=16.785400, pot=(-8.047190,0.000000)
event=700, t=20.385008, pot=(-6.437752,0.000000)
event=800, t=23.334715, pot=(-4.828314,0.000000)
event=900, t=26.169023, pot=(-6.437752,0.000000)
event=1000, t=29.473826, pot=(-6.437752,0.000000)
event=1100, t=32.746426, pot=(-6.437752,0.000000)
event=1200, t=35.760565, pot=(-3.218876,0.000000)
event=1300, t=38.885235, pot=(-3.218876,0.000000)
event=1400, t=42.051681, pot=(-8.047190,0.000000)
event=1500, t=45.290581, pot=(-3.218876,0.000000)
event=1600, t=48.454068, pot=(-6.437752,0.000000)
event=1700, t=51.187449, pot=(-6.437752,0.000000)
event=1800, t=53.400829, pot=(-6.437752,0.000000)
event=1900, t=56.368548, pot=(-3.218876,0.000000)
event=2000, t=59.441506, pot=(-9.656627,0.000000)
event=2100, t=61.811925, pot=(-8.047190,0.000000)
event=2200, t=64.570225, pot=(-4.828314,0.000000)
event=2300, t=67.769478, pot=(-8.047190,0.000000)
event=2400, t=70.411145, pot=(-12.875503,0.000000)
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event=2600, t=76.275929, pot=(-4.828314,0.000000)
event=2700, t=79.514129, pot=(-3.218876,0.000000)
event=2800, t=83.120356, pot=(-8.047190,0.000000)
event=2900, t=85.882238, pot=(-4.828314,0.000000)
event=3000, t=88.743449, pot=(-4.828314,0.000000)
event=3100, t=91.680172, pot=(-4.828314,0.000000)
event=3200, t=93.937798, pot=(-9.656627,0.000000)
event=3300, t=96.589215, pot=(-6.437752,0.000000)
event=3400, t=99.518363, pot=(-3.218876,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
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event=300, t=9.031571, pot=(-8.047190,0.000000)
event=400, t=12.178050, pot=(-1.609438,0.000000)
event=500, t=15.311107, pot=(-8.047190,0.000000)
event=600, t=17.828907, pot=(-8.047190,0.000000)
event=700, t=20.496672, pot=(-4.828314,0.000000)
event=800, t=23.601762, pot=(-4.828314,0.000000)
event=900, t=26.325122, pot=(-8.047190,0.000000)
event=1000, t=29.091617, pot=(-8.047190,0.000000)
event=1100, t=32.440306, pot=(-6.437752,0.000000)
event=1200, t=35.894168, pot=(-6.437752,0.000000)
event=1300, t=38.653855, pot=(-8.047190,0.000000)
event=1400, t=41.342232, pot=(-6.437752,0.000000)
event=1500, t=44.922326, pot=(-6.437752,0.000000)
event=1600, t=47.700342, pot=(-4.828314,0.000000)
event=1700, t=50.339393, pot=(-6.437752,0.000000)
event=1800, t=53.505521, pot=(-8.047190,0.000000)
event=1900, t=56.710122, pot=(-6.437752,0.000000)
event=2000, t=59.329796, pot=(-3.218876,0.000000)
event=2100, t=62.296882, pot=(-6.437752,0.000000)
event=2200, t=65.521961, pot=(-1.609438,0.000000)
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event=2500, t=74.158687, pot=(-8.047190,0.000000)
event=2600, t=77.454219, pot=(-6.437752,0.000000)
event=2700, t=80.994791, pot=(-3.218876,0.000000)
event=2800, t=84.436535, pot=(-6.437752,0.000000)
event=2900, t=87.183497, pot=(-4.828314,0.000000)
event=3000, t=90.536837, pot=(-3.218876,0.000000)
event=3100, t=93.563041, pot=(-4.828314,0.000000)
event=3200, t=96.561445, pot=(-8.047190,0.000000)
event=3300, t=99.679343, pot=(-4.828314,0.000000)
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
event=0, t=0.000000, pot=(0.000000,0.000000)
event=100, t=3.600779, pot=(-1.609438,0.000000)
event=200, t=6.912841, pot=(-9.656627,0.000000)
event=300, t=9.886196, pot=(-6.437752,0.000000)
event=400, t=12.632661, pot=(-6.437752,0.000000)
event=500, t=15.793823, pot=(-4.828314,0.000000)
event=600, t=18.976218, pot=(-3.218876,0.000000)
event=700, t=22.374907, pot=(-6.437752,0.000000)
event=800, t=25.088166, pot=(-9.656627,0.000000)
event=900, t=28.272561, pot=(-1.609438,0.000000)
event=1000, t=31.255491, pot=(-3.218876,0.000000)
event=1100, t=33.612702, pot=(-4.828314,0.000000)
event=1200, t=36.834250, pot=(-6.437752,0.000000)
event=1300, t=40.029455, pot=(-3.218876,0.000000)
event=1400, t=43.579808, pot=(-6.437752,0.000000)
event=1500, t=46.430883, pot=(-6.437752,0.000000)
event=1600, t=49.740736, pot=(-6.437752,0.000000)
event=1700, t=52.652674, pot=(-9.656627,0.000000)
event=1800, t=55.759171, pot=(-4.828314,0.000000)
```

```
event=1900, t=59.294834, pot=(-4.828314,0.000000)
event=2000, t=62.592077, pot=(-4.828314,0.000000)
event=2100, t=65.465961, pot=(-6.437752,0.000000)
event=2200, t=68.153944, pot=(-6.437752,0.000000)
event=2300, t=71.000634, pot=(-8.047190,0.000000)
event=2400, t=74.528230, pot=(-6.437752,0.000000)
event=2500, t=76.981954, pot=(-8.047190,0.000000)
event=2600, t=79.927007, pot=(-4.828314,0.000000)
event=2700, t=83.441278, pot=(-6.437752,0.000000)
event=2800, t=86.171684, pot=(-8.047190,0.000000)
event=2900, t=89.007107, pot=(-3.218876,0.000000)
event=3000, t=92.873966, pot=(-4.828314,0.000000)
event=3100, t=95.707798, pot=(-4.828314,0.000000)
event=3200, t=99.377588, pot=(-3.218876,0.000000)
```

Let's take a look at the output:

```
class(simbg)          # What kind of animal is it?
```

```
[1] "list"
```

```
length(simbg)         # How long is it?
```

```
[1] 100
```

```
simbg[[1]]            # Examine the first element
```

```
  Time Events Potential edges
0    0      0  0.000000     0
1  100   3342 -3.218876     4
```

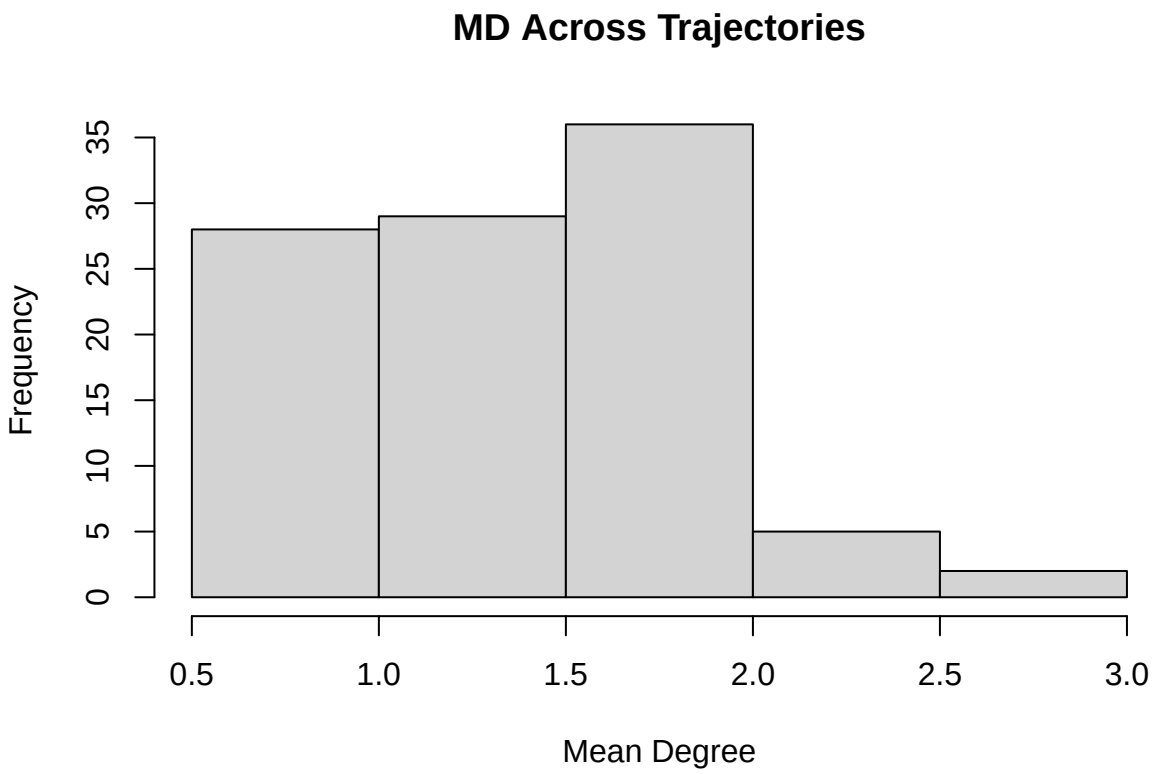
As the above implies, the return value here is a list with one element per trajectory. Since we asked for statistics, the content of each element is a checkpoint by statistic matrix, giving the state at each point. This matrix also contains the time and event count at which the checkpoint was made, and the graph potential at that point. As noted above, the initial state is always included; it is here rather dull, since we started with the empty graph.

Let's see what the distribution of mean degrees was across our replicates:

```
md <- sapply(simbg,function(z){z[,"edges"][2]/choose(10,2)*9})  # Mean degrees
mean(md)                                                        # Get the mean of means
```

```
[1] 1.428
```

```
hist(md, xlab = "Mean Degree", main = "MD Across Trajectories") # Plot the distribution
```



What would we expect this plot to look like? We know that our equilibrium should look like an ERGM with only an edge term - a homogeneous Bernoulli graph - with parameter $\log(1.5/(9-1.5))$. Those with ERGM experience will recognize this as a homogeneous Bernoulli graph with expected mean degree 1.5 (equivalently, expected density 0.167). Our mean is close to this equilibrium value, despite our having started with an empty graph; obviously, if we ran much shorter trajectories, we would be farther from convergence.

In this spirit, let us consider another example, motivated by Grazioli et al. (2019). Here we will use a LERGM, which has a single potential. Our terms will include the edge count, a negative 2-star parameter (reflecting limits on potential tie formation), and NSPs 1 (a factor that governs elongation) and 2 (a factor that governs formation of chordless 4-cycles). We will simulate the system for a duration of length 1000, taking 11 logarithmically spaced checkpoints (in addition to the initial condition, for which we use the empty graph).

```
set.seed(1331)
n <- 150
net <- network.initialize(n, directed=FALSE)
sim2r <- simEGPTraj(net~edges+kstar(2)+nsp(1:2), coef=c(109-log(n),-25,-1.25,3.25), time=1000, checkpoi
```

```
Initializing simulation: max events=inf, max time=0.873988, initial pot=(0.000000,0.000000)
event=0, t=0.000000, pot=(0.000000,0.000000)
event=100, t=0.010179, pot=(7248.936471,0.000000)
event=200, t=0.032158, pot=(10686.872941,0.000000)
event=300, t=0.379540, pot=(11421.431506,0.000000)
Initializing simulation: max events=inf, max time=1.637842, initial pot=(11708.942141,0.000000)
event=0, t=0.000000, pot=(11708.942141,0.000000)
event=100, t=0.675665, pot=(11809.505953,0.000000)
event=200, t=1.523845, pot=(11874.213412,0.000000)
```

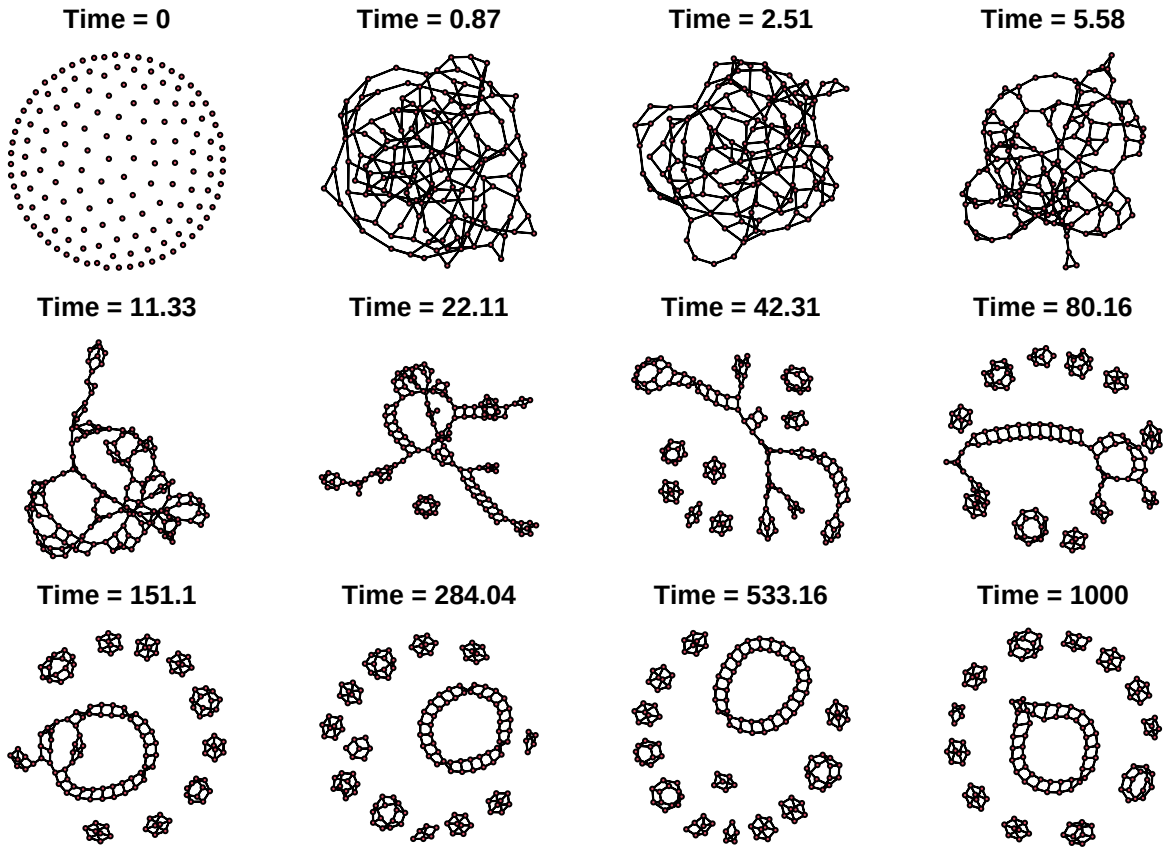
```
Initializing simulation: max events=inf, max time=3.069296, initial pot=(11872.192141,0.000000)
event=0, t=0.000000, pot=(11872.192141,0.000000)
event=100, t=0.919522, pot=(11914.463412,0.000000)
event=200, t=1.676340, pot=(11924.255953,0.000000)
event=300, t=2.275165, pot=(11942.963412,0.000000)
Initializing simulation: max events=inf, max time=5.751823, initial pot=(11954.442141,0.000000)
event=0, t=0.000000, pot=(11954.442141,0.000000)
event=100, t=0.951552, pot=(12002.213412,0.000000)
event=200, t=2.154232, pot=(12044.170871,0.000000)
event=300, t=3.362889, pot=(12075.005953,0.000000)
event=400, t=4.486737, pot=(12109.442141,0.000000)
event=500, t=5.730795, pot=(12138.170871,0.000000)
Initializing simulation: max events=inf, max time=10.778846, initial pot=(12138.170871,0.000000)
event=0, t=0.000000, pot=(12138.170871,0.000000)
event=100, t=1.479455, pot=(12190.192141,0.000000)
event=200, t=4.014835, pot=(12234.170871,0.000000)
event=300, t=6.419559, pot=(12257.734682,0.000000)
event=400, t=8.702821, pot=(12284.170871,0.000000)
Initializing simulation: max events=inf, max time=20.199424, initial pot=(12318.670871,0.000000)
event=0, t=0.000000, pot=(12318.670871,0.000000)
event=100, t=4.000243, pot=(12341.963412,0.000000)
event=200, t=7.606993, pot=(12353.170871,0.000000)
event=300, t=12.364600, pot=(12408.399600,0.000000)
event=400, t=17.597997, pot=(12435.670871,0.000000)
Initializing simulation: max events=inf, max time=37.853472, initial pot=(12439.670871,0.000000)
event=0, t=0.000000, pot=(12439.670871,0.000000)
event=100, t=5.685140, pot=(12470.128329,0.000000)
event=200, t=14.002362, pot=(12485.128329,0.000000)
event=300, t=25.988775, pot=(12513.628329,0.000000)
event=400, t=37.685208, pot=(12511.878329,0.000000)
Initializing simulation: max events=inf, max time=70.936941, initial pot=(12510.128329,0.000000)
event=0, t=0.000000, pot=(12510.128329,0.000000)
event=100, t=9.788441, pot=(12508.128329,0.000000)
event=200, t=22.181630, pot=(12523.378329,0.000000)
event=300, t=36.178759, pot=(12517.899600,0.000000)
event=400, t=47.780351, pot=(12512.649600,0.000000)
event=500, t=61.076959, pot=(12525.628329,0.000000)
Initializing simulation: max events=inf, max time=132.934955, initial pot=(12548.857059,0.000000)
event=0, t=0.000000, pot=(12548.857059,0.000000)
event=100, t=23.458849, pot=(12562.378329,0.000000)
event=200, t=50.960269, pot=(12575.628329,0.000000)
event=300, t=97.302259, pot=(12573.878329,0.000000)
Initializing simulation: max events=inf, max time=249.118469, initial pot=(12572.888965,0.000000)
event=0, t=0.000000, pot=(12572.888965,0.000000)
event=100, t=60.858454, pot=(12574.617694,0.000000)
event=200, t=108.792251, pot=(12574.888965,0.000000)
event=300, t=158.489280, pot=(12574.888965,0.000000)
event=400, t=227.047260, pot=(12584.367694,0.000000)
Initializing simulation: max events=inf, max time=466.844944, initial pot=(12586.117694,0.000000)
event=0, t=0.000000, pot=(12586.117694,0.000000)
event=100, t=101.003983, pot=(12574.888965,0.000000)
event=200, t=155.642636, pot=(12584.367694,0.000000)
event=300, t=245.742975, pot=(12586.117694,0.000000)
event=400, t=335.873862, pot=(12586.117694,0.000000)
```

```
event=500, t=426.716675, pot=(12582.638965,0.000000)
```

We have turned on `verbose` to show how the simulation works: the total time interval is broken into chunks (with the time points defined by `exp(seq(from=0, to=log1p(time), length=checkpoints+1))-1`), and the simulator uses `simEGP` to simulate each segment given the one before it. Note, that, since we only took one trajectory here, our output is not a list of trajectories, but simply the results for the first and only trajectory (namely a `network.list`) containing the snapshots.

What have we done? Let's plot the results and find out.

```
par(mfrow=c(3,4), mar=c(0.1,0.1,2,0.1))
for(i in 1:12)
  plot(sim2r[[i]], main = paste("Time =",round(sim2r[[i]]%n%"Time", 2)), mode="kamadakawai")
```



Well, that *is* exciting! What's going on here? This model was developed by Grazioli et al. (2019) to capture the structure and evolution of a type of *amyloid fibril,* a typically pathological protein aggregation state implicated in diseases such as Alzheimer's and Lewy Body Dementia. Each node in the model represents a protein monomer, with edges indicating proteins that are bound together. While the phenomenon captured here can be lethal, the network process is both beautiful and unexpected: we see that the system of free monomers first condenses into an unstructured gel-like state, and this state gradually self-organizes, eventually annealing into a stretches of fibril along with smaller oligomers (resembling the annular oligomers thought to be toxic species in some diseases). A close look at the timing information confirms the wisdom of using logarithmic sampling: many of the interesting intermediate states occur very early in the trajectory, with its evolution slowing markedly as the system matures. Although this system may seem very unlike a social network, the underlying EGP (though motivated by Grazioli et al. on physical grounds) was originally introduced by Koskinen and Snijders (2007) to study social networks. (It also offers an example of a system for which a degenerate ERGM is physically realistic.)

2.3 Options for Retaining History

Other than checkpointing, is there any way to recover the simulation history? No: we didn't save it, so it is lost. However, we can instruct `simEGP` or `simEGPTraj` to retain and return the history, using the `return.history` argument. If we just want to know the last time that an edge variable was updated, we can obtain this using the `return.changetime` argument. Let's try both:

```
set.seed(1331)
net <- network.initialize(10, directed = FALSE)
simbg <- simEGP(form = net ~ edges, coef = log(1.5/(9-1.5))/2, time = 100,
    process = "CTERGM", return.changetime = TRUE, return.history = TRUE)
```

```
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
event=0, t=0.000000, pot=(0.000000,0.000000)
event=100, t=3.202727, pot=(-6.437752,0.000000)
event=200, t=5.982151, pot=(-6.437752,0.000000)
event=300, t=9.174867, pot=(-8.047190,0.000000)
event=400, t=11.862279, pot=(-4.828314,0.000000)
event=500, t=14.903347, pot=(-8.047190,0.000000)
event=600, t=18.045407, pot=(-6.437752,0.000000)
event=700, t=21.203084, pot=(-4.828314,0.000000)
event=800, t=24.372466, pot=(-6.437752,0.000000)
event=900, t=27.452887, pot=(-6.437752,0.000000)
event=1000, t=30.385364, pot=(-4.828314,0.000000)
event=1100, t=32.575519, pot=(-8.047190,0.000000)
event=1200, t=36.417853, pot=(-6.437752,0.000000)
event=1300, t=39.209466, pot=(-3.218876,0.000000)
event=1400, t=41.987816, pot=(-6.437752,0.000000)
event=1500, t=44.920710, pot=(-4.828314,0.000000)
event=1600, t=48.135149, pot=(-3.218876,0.000000)
event=1700, t=51.803374, pot=(-9.656627,0.000000)
event=1800, t=55.135096, pot=(-6.437752,0.000000)
event=1900, t=57.678964, pot=(-8.047190,0.000000)
event=2000, t=60.515663, pot=(-4.828314,0.000000)
event=2100, t=63.625352, pot=(-9.656627,0.000000)
event=2200, t=66.243982, pot=(-6.437752,0.000000)
event=2300, t=68.960453, pot=(-4.828314,0.000000)
event=2400, t=71.816712, pot=(-6.437752,0.000000)
event=2500, t=75.477733, pot=(-4.828314,0.000000)
event=2600, t=78.447544, pot=(-8.047190,0.000000)
event=2700, t=81.608730, pot=(-6.437752,0.000000)
event=2800, t=84.551909, pot=(-6.437752,0.000000)
event=2900, t=88.150696, pot=(-4.828314,0.000000)
event=3000, t=91.070717, pot=(-4.828314,0.000000)
event=3100, t=93.382564, pot=(-3.218876,0.000000)
event=3200, t=96.037396, pot=(-4.828314,0.000000)
event=3300, t=98.678473, pot=(-9.656627,0.000000)
```

```
list.network.attributes(simbg)
```

```
 [1] "bipartite"      "directed"       "EventHistory"   "Events"
 [5] "hyper"          "LastChangeTime" "loops"          "mnext"
 [9] "multiple"       "n"              "Potential"      "Time"
```

Observe that we now have two new network attributes, `LastChangeTime` and `EventHistory`. Let's examine them:

```
simbg %n% "LastChangeTime"      # Get matrix of last change times
```

```
      [,1]     [,2]     [,3]     [,4]     [,5]     [,6]     [,7]     [,8]
 [1,]    0 93.12326 97.61180 98.81031 98.13734 99.52999 98.33131 99.98253
 [2,]    0  0.00000 99.04504 99.74061 96.61890 95.43326 98.91561 99.28491
 [3,]    0  0.00000  0.00000 99.83133 99.72148 98.74756 98.70257 99.26805
 [4,]    0  0.00000  0.00000  0.00000 92.88545 97.65569 99.72897 99.13205
 [5,]    0  0.00000  0.00000  0.00000  0.00000 99.76603 98.54063 99.33313
 [6,]    0  0.00000  0.00000  0.00000  0.00000  0.00000 90.52400 95.33560
 [7,]    0  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000 99.43762
 [8,]    0  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
 [9,]    0  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
[10,]    0  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000  0.00000
          [,9]     [,10]
 [1,] 99.10006 93.97647
 [2,] 97.56380 99.60120
 [3,] 97.65320 98.22028
 [4,] 98.25723 99.17176
 [5,] 98.15907 94.84751
 [6,] 97.89367 96.83191
 [7,] 91.45101 99.25254
 [8,] 95.25789 99.85659
 [9,]  0.00000 98.88427
[10,]  0.00000  0.00000
```

```
head(simbg %n% "EventHistory")  # Examine event history
```

```
           Time Snd Rec Onset
[1,] 0.05611166   6   8     1
[2,] 0.08279236   2   8     1
[3,] 0.13364125   1   7     1
[4,] 0.17060202   2   8     0
[5,] 0.27985952   6   8     0
[6,] 0.35826905   4   7     1
```

As can be seen, `LastChangeTime` is an n by n matrix whose i, j entry is the last change time for the i, j edge; here, the matrix is upper triangular, because the graph is undirected. `EventHistory` is a four-column matrix, whose respective columns indicate the time, sender, and receiver for each change event. The final column indicates whether the event was an "onset" event (in which an edge began) versus a "terminal" event (in which an edge ended). From this, the entire history of the simulation can be reconstructed. Use caution, however: the event history can be come extremely large, especially for large networks (as the number of events will typically scale quadratically in n). Pilot simulations are recommended before using this feature with longer trajectories.

A third option for storing history information is to encode it within a `networkDynamic` object, and to return that in lieu of the usual `network` object. (This can only be done using `simEGP`.) This may be convenient for use with functions in packages like `tsna` and `ndtv` that work with `networkDynamic` objects. For instance:

```
set.seed(1331)
simnd <- simEGP(form = net ~ edges, coef = log(1.5/(9-1.5))/2, time = 100,
    process = "CTERGM", return.networkDynamic = TRUE)
```

```
Initializing simulation: max events=inf, max time=100.000000, initial pot=(0.000000,0.000000)
event=0, t=0.000000, pot=(0.000000,0.000000)
event=100, t=3.202727, pot=(-6.437752,0.000000)
event=200, t=5.982151, pot=(-6.437752,0.000000)
```

```
event=300, t=9.174867, pot=(-8.047190,0.000000)
event=400, t=11.862279, pot=(-4.828314,0.000000)
event=500, t=14.903347, pot=(-8.047190,0.000000)
event=600, t=18.045407, pot=(-6.437752,0.000000)
event=700, t=21.203084, pot=(-4.828314,0.000000)
event=800, t=24.372466, pot=(-6.437752,0.000000)
event=900, t=27.452887, pot=(-6.437752,0.000000)
event=1000, t=30.385364, pot=(-4.828314,0.000000)
event=1100, t=32.575519, pot=(-8.047190,0.000000)
event=1200, t=36.417853, pot=(-6.437752,0.000000)
event=1300, t=39.209466, pot=(-3.218876,0.000000)
event=1400, t=41.987816, pot=(-6.437752,0.000000)
event=1500, t=44.920710, pot=(-4.828314,0.000000)
event=1600, t=48.135149, pot=(-3.218876,0.000000)
event=1700, t=51.803374, pot=(-9.656627,0.000000)
event=1800, t=55.135096, pot=(-6.437752,0.000000)
event=1900, t=57.678964, pot=(-8.047190,0.000000)
event=2000, t=60.515663, pot=(-4.828314,0.000000)
event=2100, t=63.625352, pot=(-9.656627,0.000000)
event=2200, t=66.243982, pot=(-6.437752,0.000000)
event=2300, t=68.960453, pot=(-4.828314,0.000000)
event=2400, t=71.816712, pot=(-6.437752,0.000000)
event=2500, t=75.477733, pot=(-4.828314,0.000000)
event=2600, t=78.447544, pot=(-8.047190,0.000000)
event=2700, t=81.608730, pot=(-6.437752,0.000000)
event=2800, t=84.551909, pot=(-6.437752,0.000000)
event=2900, t=88.150696, pot=(-4.828314,0.000000)
event=3000, t=91.070717, pot=(-4.828314,0.000000)
event=3100, t=93.382564, pot=(-3.218876,0.000000)
event=3200, t=96.037396, pot=(-4.828314,0.000000)
event=3300, t=98.678473, pot=(-9.656627,0.000000)
Created net.obs.period to describe network
 Network observation period info:
  Number of observation spells: 1
  Maximal time range observed: 0 until 100
  Temporal mode: continuous
  Time unit: unknown
  Suggested time increment: NA
```

```
simnd
```

```
NetworkDynamic properties:
  distinct change times: 3343
  maximal time range: 0.05611166 until  Inf

Includes optional net.obs.period attribute:
 Network observation period info:
  Number of observation spells: 1
  Maximal time range observed: 0 until 100
  Temporal mode: continuous
  Time unit: unknown
  Suggested time increment: NA

 Network attributes:
  vertices = 10
```

```
  directed = FALSE
  hyper = FALSE
  loops = FALSE
  multiple = FALSE
  bipartite = FALSE
  net.obs.period: (not shown)
  Potential = -3.218876
  Time = 100
  Events = 3342
  total edges= 45
    missing edges= 0
    non-missing edges= 45

 Vertex attribute names:
    vertex.names

 Edge attribute names:
    active
```

The `networkDynamic` class extends `network` by supplying direct support for changes in edges, attributes, or vertices. In the case of edge dynamics, this information is stored as a spell list on each observed edge, giving the intervals in which the edge is active. A cross-sectional slice through the history can then be obtained using the `network.extract` function (or, equivalently, the `%t%` operator). For instance, to see what the simulation looked like 2π time steps in, we can find the cross-section:

```
slice <- network.extract(simnd, at = 2*pi)  # Pull the state at a given moment
slice2 <- simnd %t% (2*pi)                  # Can also use the %t% operator for this
all(slice[,]==slice2[,])                    # The results should be the same
```

```
[1] TRUE
```

We revisit this below.

Section 3: Inspecting Simulated Trajectories

Having seen how to produce trajectories, we now consider various approaches to extracting information from them (some of which reprise examples shown above). To this end, we start by producing sample trajectories from our CSTERGM to use as a reference. For one, we use the standard, single endpoint method by request the simulation history. For another, we return the history as a `networkDynamic` object. And for the third, we use the checkpoint approach.

```
set.seed(1331)
net <- network(rgraph(50, tp=1.5/49, mode="graph"), directed = FALSE)
net %v% "x" <- sample(0:1, 50, replace = TRUE)

set.seed(1331)
simtgh <- simEGP(form = tgform, coef = tgcoef, time = 100,
    process = "CSTERGM", return.history = TRUE)
```

```
Initializing simulation: max events=inf, max time=100.000000, initial pot=(-92.804934,-221.471896)
event=0, t=0.000000, pot=(-92.804934,-221.471896)
event=100, t=0.065663, pot=(-8.856592,-18.656627)
event=200, t=0.214689, pot=(-12.808790,-21.875503)
event=300, t=0.327061, pot=(-13.760987,-31.094379)
event=400, t=0.473658, pot=(-12.808790,-21.875503)
event=500, t=0.611501, pot=(-13.760987,-31.094379)
event=600, t=0.735162, pot=(-14.713184,-31.313255)
```

```
event=700, t=0.896287, pot=(-17.713184,-31.313255)
event=800, t=1.025057, pot=(-11.713184,-28.313255)
event=900, t=1.152006, pot=(-13.617579,-34.751007)
event=1000, t=1.276422, pot=(-12.665382,-28.532131)
event=1100, t=1.426772, pot=(-13.617579,-34.751007)
event=1200, t=1.550706, pot=(-15.521974,-53.188758)
event=1300, t=1.693314, pot=(-15.521974,-53.188758)
event=1400, t=1.835471, pot=(-13.617579,-37.751007)
event=1500, t=1.972594, pot=(-12.665382,-28.532131)
event=1600, t=2.156943, pot=(-13.617579,-37.751007)
event=1700, t=2.293386, pot=(-13.617579,-37.751007)
event=1800, t=2.444075, pot=(-11.713184,-19.313255)
event=1900, t=2.605378, pot=(-16.617579,-37.751007)
event=2000, t=2.718488, pot=(-14.569776,-40.969882)
event=2100, t=2.860735, pot=(-14.569776,-37.969882)
event=2200, t=3.009601, pot=(-15.521974,-50.188758)
event=2300, t=3.114045, pot=(-13.617579,-37.751007)
event=2400, t=3.226533, pot=(-15.521974,-50.188758)
event=2500, t=3.367090, pot=(-13.617579,-31.751007)
event=2600, t=3.500491, pot=(-15.521974,-47.188758)
event=2700, t=3.638781, pot=(-15.521974,-47.188758)
event=2800, t=3.781288, pot=(-13.617579,-31.751007)
event=2900, t=3.912737, pot=(-17.569776,-43.969882)
event=3000, t=4.054446, pot=(-12.665382,-25.532131)
event=3100, t=4.199184, pot=(-16.617579,-37.751007)
event=3200, t=4.338050, pot=(-17.569776,-46.969882)
event=3300, t=4.474808, pot=(-13.617579,-34.751007)
event=3400, t=4.630684, pot=(-13.617579,-34.751007)
event=3500, t=4.745693, pot=(-18.521974,-56.188758)
event=3600, t=4.872102, pot=(-18.521974,-56.188758)
event=3700, t=4.988385, pot=(-14.569776,-46.969882)
event=3800, t=5.115327, pot=(-13.617579,-37.751007)
event=3900, t=5.242670, pot=(-12.665382,-28.532131)
event=4000, t=5.371837, pot=(-14.569776,-40.969882)
event=4100, t=5.534983, pot=(-19.474171,-59.407634)
event=4200, t=5.626519, pot=(-19.474171,-50.407634)
event=4300, t=5.767042, pot=(-17.426369,-59.626510)
event=4400, t=5.911725, pot=(-21.378566,-65.845386)
event=4500, t=6.031979, pot=(-16.474171,-44.407634)
event=4600, t=6.181785, pot=(-25.330763,-75.064262)
event=4700, t=6.318984, pot=(-16.474171,-47.407634)
event=4800, t=6.445370, pot=(-14.569776,-28.969882)
event=4900, t=6.579690, pot=(-16.474171,-44.407634)
event=5000, t=6.741953, pot=(-21.378566,-59.845386)
event=5100, t=6.842940, pot=(-16.474171,-41.407634)
event=5200, t=6.945043, pot=(-17.426369,-53.626510)
event=5300, t=7.067149, pot=(-21.378566,-44.845386)
event=5400, t=7.204160, pot=(-19.330763,-60.064262)
event=5500, t=7.318034, pot=(-20.282961,-66.283137)
event=5600, t=7.468698, pot=(-21.235158,-75.502013)
event=5700, t=7.579347, pot=(-19.330763,-48.064262)
event=5800, t=7.696822, pot=(-20.282961,-60.283137)
event=5900, t=7.819414, pot=(-18.378566,-50.845386)
event=6000, t=7.949265, pot=(-19.330763,-54.064262)
```

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event=6100, t=8.067174, pot=(-17.426369,-38.626510)
event=6200, t=8.179840, pot=(-18.378566,-50.845386)
event=6300, t=8.334930, pot=(-19.330763,-51.064262)
event=6400, t=8.474304, pot=(-21.235158,-66.502013)
event=6500, t=8.612226, pot=(-25.187355,-69.720889)
event=6600, t=8.753692, pot=(-23.139553,-75.939765)
event=6700, t=8.896647, pot=(-21.235158,-63.502013)
event=6800, t=9.020811, pot=(-16.187355,-69.720889)
event=6900, t=9.170549, pot=(-14.282961,-57.283137)
event=7000, t=9.324626, pot=(-14.282961,-54.283137)
event=7100, t=9.450548, pot=(-15.235158,-63.502013)
event=7200, t=9.581648, pot=(-16.187355,-72.720889)
event=7300, t=9.711021, pot=(-17.139553,-72.939765)
event=7400, t=9.844880, pot=(-16.187355,-66.720889)
event=7500, t=9.963564, pot=(-16.187355,-75.720889)
event=7600, t=10.102471, pot=(-15.235158,-60.502013)
event=7700, t=10.241103, pot=(-17.139553,-63.939765)
event=7800, t=10.383366, pot=(-19.996145,-85.596392)
event=7900, t=10.517166, pot=(-19.043948,-73.377516)
event=8000, t=10.667332, pot=(-20.948342,-79.815268)
event=8100, t=10.804427, pot=(-19.996145,-91.596392)
event=8200, t=10.943571, pot=(-19.996145,-82.596392)
event=8300, t=11.044441, pot=(-18.091750,-67.158641)
event=8400, t=11.202746, pot=(-17.139553,-66.939765)
event=8500, t=11.366134, pot=(-19.043948,-73.377516)
event=8600, t=11.497406, pot=(-22.852737,-95.253020)
event=8700, t=11.640092, pot=(-20.948342,-85.815268)
event=8800, t=11.769659, pot=(-20.948342,-73.815268)
event=8900, t=11.869258, pot=(-22.852737,-86.253020)
event=9000, t=11.992749, pot=(-25.709329,-92.909647)
event=9100, t=12.118510, pot=(-24.757132,-95.690771)
event=9200, t=12.259403, pot=(-23.804934,-89.471896)
event=9300, t=12.393802, pot=(-26.661527,-105.128523)
event=9400, t=12.537529, pot=(-32.661527,-108.128523)
event=9500, t=12.654658, pot=(-25.709329,-98.909647)
event=9600, t=12.774304, pot=(-23.804934,-92.471896)
event=9700, t=12.890264, pot=(-22.852737,-86.253020)
event=9800, t=13.048908, pot=(-23.804934,-98.471896)
event=9900, t=13.206620, pot=(-25.709329,-98.909647)
event=10000, t=13.338954, pot=(-27.757132,-101.690771)
event=10100, t=13.471707, pot=(-21.900540,-80.034144)
event=10200, t=13.611511, pot=(-23.804934,-92.471896)
event=10300, t=13.767882, pot=(-23.804934,-89.471896)
event=10400, t=13.927420, pot=(-24.757132,-95.690771)
event=10500, t=14.069183, pot=(-23.804934,-83.471896)
event=10600, t=14.209962, pot=(-26.661527,-102.128523)
event=10700, t=14.353845, pot=(-26.661527,-102.128523)
event=10800, t=14.464558, pot=(-29.518119,-120.785151)
event=10900, t=14.573765, pot=(-24.757132,-83.690771)
event=11000, t=14.685716, pot=(-22.852737,-89.253020)
event=11100, t=14.838476, pot=(-22.852737,-86.253020)
event=11200, t=14.989394, pot=(-20.948342,-79.815268)
event=11300, t=15.149900, pot=(-25.852737,-98.253020)
event=11400, t=15.296579, pot=(-20.948342,-73.815268)
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event=11500, t=15.437203, pot=(-21.900540,-80.034144)
event=11600, t=15.597504, pot=(-25.852737,-83.253020)
event=11700, t=15.750236, pot=(-23.804934,-86.471896)
event=11800, t=15.908117, pot=(-28.709329,-98.909647)
event=11900, t=16.031493, pot=(-34.422514,-118.222902)
event=12000, t=16.162863, pot=(-30.470316,-118.004026)
event=12100, t=16.296495, pot=(-27.613724,-111.347399)
event=12200, t=16.420628, pot=(-26.661527,-99.128523)
event=12300, t=16.584751, pot=(-25.709329,-95.909647)
event=12400, t=16.739688, pot=(-27.757132,-92.690771)
event=12500, t=16.887480, pot=(-22.852737,-80.253020)
event=12600, t=17.013021, pot=(-22.852737,-83.253020)
event=12700, t=17.106247, pot=(-25.709329,-104.909647)
event=12800, t=17.275377, pot=(-23.804934,-92.471896)
event=12900, t=17.413509, pot=(-24.757132,-86.690771)
event=13000, t=17.565913, pot=(-25.709329,-92.909647)
event=13100, t=17.704056, pot=(-25.709329,-95.909647)
event=13200, t=17.837589, pot=(-25.852737,-95.253020)
event=13300, t=18.009889, pot=(-19.996145,-67.596392)
event=13400, t=18.122831, pot=(-22.852737,-89.253020)
event=13500, t=18.262482, pot=(-23.948342,-79.815268)
event=13600, t=18.401074, pot=(-28.709329,-104.909647)
event=13700, t=18.498578, pot=(-25.709329,-92.909647)
event=13800, t=18.652413, pot=(-21.900540,-80.034144)
event=13900, t=18.799670, pot=(-27.757132,-95.690771)
event=14000, t=18.923860, pot=(-24.900540,-83.034144)
event=14100, t=19.063736, pot=(-22.852737,-86.253020)
event=14200, t=19.216418, pot=(-21.900540,-80.034144)
event=14300, t=19.315384, pot=(-24.900540,-89.034144)
event=14400, t=19.480436, pot=(-20.948342,-79.815268)
event=14500, t=19.591076, pot=(-20.948342,-85.815268)
event=14600, t=19.736556, pot=(-21.900540,-89.034144)
event=14700, t=19.854608, pot=(-19.996145,-73.596392)
event=14800, t=19.987396, pot=(-21.900540,-89.034144)
event=14900, t=20.128369, pot=(-26.804934,-95.471896)
event=15000, t=20.268255, pot=(-20.948342,-79.815268)
event=15100, t=20.378604, pot=(-23.948342,-76.815268)
event=15200, t=20.500745, pot=(-21.900540,-80.034144)
event=15300, t=20.650322, pot=(-26.804934,-89.471896)
event=15400, t=20.802451, pot=(-19.043948,-64.377516)
event=15500, t=20.940047, pot=(-18.091750,-67.158641)
event=15600, t=21.077982, pot=(-18.091750,-70.158641)
event=15700, t=21.207201, pot=(-20.139553,-66.939765)
event=15800, t=21.331144, pot=(-19.043948,-67.377516)
event=15900, t=21.473664, pot=(-16.187355,-66.720889)
event=16000, t=21.580195, pot=(-15.235158,-57.502013)
event=16100, t=21.719759, pot=(-11.426369,-38.626510)
event=16200, t=21.867361, pot=(-14.282961,-69.283137)
event=16300, t=21.998901, pot=(-13.330763,-54.064262)
event=16400, t=22.127646, pot=(-13.330763,-57.064262)
event=16500, t=22.243334, pot=(-13.330763,-48.064262)
event=16600, t=22.399806, pot=(-18.091750,-73.158641)
event=16700, t=22.520218, pot=(-18.235158,-60.502013)
event=16800, t=22.649003, pot=(-15.235158,-66.502013)
```

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event=16900, t=22.799444, pot=(-18.235158,-69.502013)
event=17000, t=22.957384, pot=(-25.187355,-63.720889)
event=17100, t=23.091640, pot=(-13.330763,-54.064262)
event=17200, t=23.202781, pot=(-16.187355,-75.720889)
event=17300, t=23.321294, pot=(-15.235158,-66.502013)
event=17400, t=23.433349, pot=(-15.235158,-69.502013)
event=17500, t=23.583860, pot=(-17.139553,-72.939765)
event=17600, t=23.724527, pot=(-15.235158,-66.502013)
event=17700, t=23.838134, pot=(-17.139553,-84.939765)
event=17800, t=23.947227, pot=(-17.139553,-69.939765)
event=17900, t=24.068503, pot=(-19.043948,-76.377516)
event=18000, t=24.173422, pot=(-19.043948,-76.377516)
event=18100, t=24.288003, pot=(-19.043948,-79.377516)
event=18200, t=24.398568, pot=(-20.139553,-69.939765)
event=18300, t=24.528122, pot=(-16.187355,-60.720889)
event=18400, t=24.685455, pot=(-24.091750,-82.158641)
event=18500, t=24.796134, pot=(-14.282961,-51.283137)
event=18600, t=24.934467, pot=(-15.235158,-57.502013)
event=18700, t=25.053948, pot=(-18.235158,-60.502013)
event=18800, t=25.201636, pot=(-19.187355,-69.720889)
event=18900, t=25.358829, pot=(-15.235158,-63.502013)
event=19000, t=25.511055, pot=(-16.187355,-63.720889)
event=19100, t=25.652768, pot=(-17.139553,-66.939765)
event=19200, t=25.787193, pot=(-20.139553,-66.939765)
event=19300, t=25.915994, pot=(-17.139553,-69.939765)
event=19400, t=26.047222, pot=(-17.139553,-63.939765)
event=19500, t=26.177870, pot=(-19.043948,-73.377516)
event=19600, t=26.331668, pot=(-19.043948,-76.377516)
event=19700, t=26.490952, pot=(-19.043948,-79.377516)
event=19800, t=26.614477, pot=(-18.091750,-64.158641)
event=19900, t=26.746668, pot=(-19.043948,-79.377516)
event=20000, t=26.876316, pot=(-18.091750,-79.158641)
event=20100, t=27.053748, pot=(-16.187355,-60.720889)
event=20200, t=27.222863, pot=(-16.187355,-60.720889)
event=20300, t=27.373532, pot=(-18.091750,-73.158641)
event=20400, t=27.510618, pot=(-18.091750,-73.158641)
event=20500, t=27.635818, pot=(-19.043948,-76.377516)
event=20600, t=27.779628, pot=(-18.091750,-73.158641)
event=20700, t=27.917434, pot=(-24.900540,-92.034144)
event=20800, t=28.045628, pot=(-20.948342,-79.815268)
event=20900, t=28.205864, pot=(-20.948342,-76.815268)
event=21000, t=28.340555, pot=(-28.852737,-92.253020)
event=21100, t=28.476303, pot=(-20.948342,-70.815268)
event=21200, t=28.632723, pot=(-25.852737,-86.253020)
event=21300, t=28.773973, pot=(-23.804934,-89.471896)
event=21400, t=28.908783, pot=(-26.661527,-96.128523)
event=21500, t=29.026528, pot=(-33.470316,-118.004026)
event=21600, t=29.135470, pot=(-31.565921,-105.566275)
event=21700, t=29.233678, pot=(-30.613724,-102.347399)
event=21800, t=29.391712, pot=(-30.613724,-105.347399)
event=21900, t=29.526542, pot=(-26.661527,-102.128523)
event=22000, t=29.663317, pot=(-29.518119,-108.785151)
event=22100, t=29.829178, pot=(-27.613724,-99.347399)
event=22200, t=29.978069, pot=(-25.709329,-95.909647)
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event=22300, t=30.122299, pot=(-24.757132,-89.690771)
event=22400, t=30.273860, pot=(-23.804934,-92.471896)
event=22500, t=30.413402, pot=(-22.852737,-89.253020)
event=22600, t=30.533711, pot=(-24.757132,-98.690771)
event=22700, t=30.674581, pot=(-23.804934,-89.471896)
event=22800, t=30.840737, pot=(-22.852737,-89.253020)
event=22900, t=30.971580, pot=(-20.948342,-79.815268)
event=23000, t=31.096665, pot=(-21.900540,-89.034144)
event=23100, t=31.241127, pot=(-19.043948,-67.377516)
event=23200, t=31.399728, pot=(-20.948342,-82.815268)
event=23300, t=31.538677, pot=(-20.948342,-73.815268)
event=23400, t=31.681179, pot=(-22.852737,-92.253020)
event=23500, t=31.832673, pot=(-20.948342,-79.815268)
event=23600, t=31.959044, pot=(-21.900540,-86.034144)
event=23700, t=32.080616, pot=(-21.900540,-83.034144)
event=23800, t=32.218560, pot=(-25.709329,-98.909647)
event=23900, t=32.383772, pot=(-28.709329,-98.909647)
event=24000, t=32.535480, pot=(-25.709329,-101.909647)
event=24100, t=32.661588, pot=(-28.565921,-105.566275)
event=24200, t=32.791468, pot=(-25.709329,-98.909647)
event=24300, t=32.915731, pot=(-23.804934,-89.471896)
event=24400, t=33.078775, pot=(-21.900540,-92.034144)
event=24500, t=33.214542, pot=(-24.757132,-101.690771)
event=24600, t=33.321542, pot=(-23.804934,-95.471896)
event=24700, t=33.443541, pot=(-22.852737,-86.253020)
event=24800, t=33.575872, pot=(-26.661527,-99.128523)
event=24900, t=33.701000, pot=(-28.565921,-105.566275)
event=25000, t=33.819139, pot=(-27.613724,-102.347399)
event=25100, t=33.936088, pot=(-26.661527,-93.128523)
event=25200, t=34.081007, pot=(-30.470316,-109.004026)
event=25300, t=34.242178, pot=(-33.326908,-115.660654)
event=25400, t=34.414717, pot=(-32.374711,-124.441778)
event=25500, t=34.545112, pot=(-33.326908,-121.660654)
event=25600, t=34.675036, pot=(-27.613724,-93.347399)
event=25700, t=34.839166, pot=(-26.661527,-93.128523)
event=25800, t=34.975188, pot=(-29.518119,-111.785151)
event=25900, t=35.134727, pot=(-31.422514,-115.222902)
event=26000, t=35.285670, pot=(-27.613724,-96.347399)
event=26100, t=35.446293, pot=(-29.518119,-105.785151)
event=26200, t=35.601982, pot=(-29.518119,-102.785151)
event=26300, t=35.738060, pot=(-27.613724,-99.347399)
event=26400, t=35.881530, pot=(-30.470316,-118.004026)
event=26500, t=36.012454, pot=(-28.565921,-102.566275)
event=26600, t=36.171520, pot=(-29.518119,-114.785151)
event=26700, t=36.314059, pot=(-31.565921,-117.566275)
event=26800, t=36.457097, pot=(-24.757132,-92.690771)
event=26900, t=36.613030, pot=(-25.709329,-89.909647)
event=27000, t=36.748465, pot=(-23.804934,-83.471896)
event=27100, t=36.879456, pot=(-28.709329,-101.909647)
event=27200, t=37.016895, pot=(-31.565921,-114.566275)
event=27300, t=37.146096, pot=(-26.661527,-90.128523)
event=27400, t=37.271408, pot=(-27.613724,-108.347399)
event=27500, t=37.409547, pot=(-25.709329,-89.909647)
event=27600, t=37.553086, pot=(-27.613724,-102.347399)
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event=55700, t=77.949499, pot=(-30.470316,-118.004026)
event=55800, t=78.062153, pot=(-31.422514,-115.222902)
event=55900, t=78.201195, pot=(-30.613724,-99.347399)
event=56000, t=78.338592, pot=(-30.470316,-115.004026)
event=56100, t=78.489801, pot=(-30.470316,-115.004026)
event=56200, t=78.611207, pot=(-30.470316,-112.004026)
event=56300, t=78.769809, pot=(-31.422514,-112.222902)
event=56400, t=78.907107, pot=(-36.326908,-121.660654)
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event=56600, t=79.174276, pot=(-42.992290,-144.192785)
event=56700, t=79.308867, pot=(-34.279106,-121.879530)
event=56800, t=79.424087, pot=(-36.183500,-143.317281)
event=56900, t=79.588365, pot=(-32.374711,-118.441778)
event=57000, t=79.743369, pot=(-28.565921,-99.566275)
event=57100, t=79.894484, pot=(-28.565921,-102.566275)
event=57200, t=80.075321, pot=(-30.470316,-115.004026)
event=57300, t=80.226465, pot=(-30.470316,-112.004026)
event=57400, t=80.383525, pot=(-30.470316,-112.004026)
event=57500, t=80.528358, pot=(-33.470316,-118.004026)
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event=57700, t=80.804491, pot=(-29.518119,-117.785151)
event=57800, t=80.967127, pot=(-31.422514,-118.222902)
event=57900, t=81.112098, pot=(-31.422514,-118.222902)
event=58000, t=81.222923, pot=(-32.374711,-118.441778)
event=58100, t=81.347181, pot=(-31.422514,-118.222902)
event=58200, t=81.458576, pot=(-30.470316,-118.004026)
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event=58400, t=81.772306, pot=(-23.804934,-80.471896)
event=58500, t=81.906637, pot=(-27.613724,-114.347399)
event=58600, t=82.035981, pot=(-26.804934,-89.471896)
event=58700, t=82.171762, pot=(-26.661527,-102.128523)
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event=59100, t=82.784294, pot=(-23.804934,-92.471896)
event=59200, t=82.936224, pot=(-26.804934,-95.471896)
event=59300, t=83.078817, pot=(-24.757132,-95.690771)
event=59400, t=83.201431, pot=(-23.804934,-86.471896)
event=59500, t=83.388303, pot=(-23.804934,-92.471896)
event=59600, t=83.523150, pot=(-26.661527,-102.128523)
event=59700, t=83.667897, pot=(-28.565921,-99.566275)
event=59800, t=83.820268, pot=(-29.518119,-99.785151)
event=59900, t=83.951086, pot=(-30.470316,-118.004026)
event=60000, t=84.042662, pot=(-24.757132,-92.690771)
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event=60500, t=84.761838, pot=(-25.709329,-101.909647)
event=60600, t=84.874331, pot=(-22.852737,-80.253020)
event=60700, t=85.027403, pot=(-26.661527,-99.128523)
event=60800, t=85.153363, pot=(-25.709329,-95.909647)
event=60900, t=85.318659, pot=(-26.661527,-99.128523)
event=61000, t=85.464454, pot=(-24.757132,-98.690771)
event=61100, t=85.598197, pot=(-22.852737,-86.253020)
event=61200, t=85.766811, pot=(-24.900540,-89.034144)
event=61300, t=85.890273, pot=(-22.852737,-86.253020)
event=61400, t=86.002177, pot=(-23.804934,-89.471896)
event=61500, t=86.137291, pot=(-23.804934,-89.471896)
event=61600, t=86.295982, pot=(-22.852737,-83.253020)
event=61700, t=86.387655, pot=(-24.757132,-89.690771)
event=61800, t=86.526615, pot=(-26.661527,-102.128523)
event=61900, t=86.660342, pot=(-31.565921,-105.566275)
event=62000, t=86.822998, pot=(-27.613724,-108.347399)
event=62100, t=86.936822, pot=(-24.757132,-95.690771)
event=62200, t=87.087027, pot=(-26.661527,-102.128523)
event=62300, t=87.228144, pot=(-26.804934,-86.471896)
event=62400, t=87.359536, pot=(-23.804934,-92.471896)
event=62500, t=87.483651, pot=(-23.804934,-92.471896)
event=62600, t=87.619778, pot=(-25.709329,-101.909647)
event=62700, t=87.759301, pot=(-24.757132,-101.690771)
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event=62900, t=87.989212, pot=(-28.565921,-117.566275)
event=63000, t=88.116781, pot=(-24.757132,-86.690771)
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event=63200, t=88.432152, pot=(-24.757132,-86.690771)
event=63300, t=88.577727, pot=(-25.709329,-95.909647)
event=63400, t=88.696916, pot=(-26.661527,-99.128523)
event=63500, t=88.849556, pot=(-34.565921,-102.566275)
event=63600, t=88.988976, pot=(-29.518119,-105.785151)
event=63700, t=89.130323, pot=(-32.518119,-108.785151)
event=63800, t=89.254998, pot=(-34.422514,-112.222902)
event=63900, t=89.392215, pot=(-30.613724,-96.347399)
event=64000, t=89.562144, pot=(-24.757132,-89.690771)
event=64100, t=89.726213, pot=(-30.470316,-109.004026)
event=64200, t=89.846249, pot=(-40.279106,-124.879530)
event=64300, t=90.010223, pot=(-33.326908,-118.660654)
event=64400, t=90.150520, pot=(-31.422514,-112.222902)
event=64500, t=90.327202, pot=(-34.422514,-121.222902)
event=64600, t=90.442400, pot=(-34.279106,-130.879530)
event=64700, t=90.576283, pot=(-31.422514,-109.222902)
event=64800, t=90.755415, pot=(-35.374711,-118.441778)
event=64900, t=90.930197, pot=(-38.231303,-128.098406)
event=65000, t=91.053420, pot=(-34.279106,-124.879530)
event=65100, t=91.184961, pot=(-35.374711,-124.441778)
event=65200, t=91.307012, pot=(-29.518119,-111.785151)
event=65300, t=91.508209, pot=(-32.518119,-108.785151)
event=65400, t=91.631531, pot=(-32.374711,-118.441778)
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event=65500, t=91.777161, pot=(-33.326908,-118.660654)
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event=65800, t=92.241432, pot=(-32.374711,-124.441778)
event=65900, t=92.355022, pot=(-32.374711,-118.441778)
event=66000, t=92.483563, pot=(-32.374711,-115.441778)
event=66100, t=92.618213, pot=(-33.326908,-124.660654)
event=66200, t=92.758947, pot=(-33.326908,-118.660654)
event=66300, t=92.912856, pot=(-34.422514,-118.222902)
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event=66500, t=93.152120, pot=(-32.374711,-127.441778)
event=66600, t=93.255750, pot=(-26.661527,-96.128523)
event=66700, t=93.397301, pot=(-30.470316,-124.004026)
event=66800, t=93.546115, pot=(-29.661527,-96.128523)
event=66900, t=93.680437, pot=(-30.470316,-121.004026)
event=67000, t=93.804882, pot=(-27.613724,-96.347399)
event=67100, t=93.943021, pot=(-33.470316,-118.004026)
event=67200, t=94.077341, pot=(-26.661527,-96.128523)
event=67300, t=94.206603, pot=(-26.661527,-99.128523)
event=67400, t=94.347010, pot=(-26.804934,-83.471896)
event=67500, t=94.472683, pot=(-23.804934,-92.471896)
event=67600, t=94.606816, pot=(-27.613724,-108.347399)
event=67700, t=94.710430, pot=(-24.757132,-92.690771)
event=67800, t=94.878058, pot=(-26.661527,-102.128523)
event=67900, t=94.991160, pot=(-26.661527,-102.128523)
event=68000, t=95.114773, pot=(-27.613724,-108.347399)
event=68100, t=95.276729, pot=(-26.661527,-105.128523)
event=68200, t=95.412567, pot=(-22.852737,-89.253020)
event=68300, t=95.547686, pot=(-20.948342,-79.815268)
event=68400, t=95.668310, pot=(-22.996145,-73.596392)
event=68500, t=95.803210, pot=(-21.900540,-89.034144)
event=68600, t=95.931125, pot=(-19.996145,-73.596392)
event=68700, t=96.063872, pot=(-20.948342,-91.815268)
event=68800, t=96.174733, pot=(-23.948342,-73.815268)
event=68900, t=96.293642, pot=(-21.900540,-80.034144)
event=69000, t=96.470375, pot=(-22.852737,-107.253020)
event=69100, t=96.607420, pot=(-19.996145,-76.596392)
event=69200, t=96.771896, pot=(-23.804934,-98.471896)
event=69300, t=96.907397, pot=(-21.900540,-83.034144)
event=69400, t=97.073663, pot=(-20.948342,-85.815268)
event=69500, t=97.208322, pot=(-19.043948,-67.377516)
event=69600, t=97.381131, pot=(-19.043948,-67.377516)
event=69700, t=97.508333, pot=(-21.900540,-89.034144)
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event=70000, t=97.899898, pot=(-24.757132,-95.690771)
event=70100, t=98.053000, pot=(-28.565921,-129.566275)
event=70200, t=98.197423, pot=(-30.613724,-114.347399)
event=70300, t=98.302067, pot=(-28.565921,-108.566275)
event=70400, t=98.450749, pot=(-26.661527,-102.128523)
event=70500, t=98.583241, pot=(-27.613724,-120.347399)
event=70600, t=98.747021, pot=(-21.900540,-83.034144)
event=70700, t=98.901402, pot=(-23.948342,-85.815268)
event=70800, t=99.040527, pot=(-24.757132,-104.690771)
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event=70900, t=99.167847, pot=(-21.900540,-80.034144)
event=71000, t=99.311231, pot=(-26.804934,-98.471896)
event=71100, t=99.450357, pot=(-22.852737,-77.253020)
event=71200, t=99.617780, pot=(-23.804934,-89.471896)
event=71300, t=99.767288, pot=(-23.804934,-89.471896)
event=71400, t=99.911731, pot=(-25.709329,-92.909647)
```

```
set.seed(1331)
simtgnd <- simEGP(form = tgform, coef = tgcoef, time = 100,
    process = "CSTERGM", return.networkDynamic = TRUE)
```

```
Initializing simulation: max events=inf, max time=100.000000, initial pot=(-92.804934,-221.471896)
event=0, t=0.000000, pot=(-92.804934,-221.471896)
event=100, t=0.065663, pot=(-8.856592,-18.656627)
event=200, t=0.214689, pot=(-12.808790,-21.875503)
event=300, t=0.327061, pot=(-13.760987,-31.094379)
event=400, t=0.473658, pot=(-12.808790,-21.875503)
event=500, t=0.611501, pot=(-13.760987,-31.094379)
event=600, t=0.735162, pot=(-14.713184,-31.313255)
event=700, t=0.896287, pot=(-17.713184,-31.313255)
event=800, t=1.025057, pot=(-11.713184,-28.313255)
event=900, t=1.152006, pot=(-13.617579,-34.751007)
event=1000, t=1.276422, pot=(-12.665382,-28.532131)
event=1100, t=1.426772, pot=(-13.617579,-34.751007)
event=1200, t=1.550706, pot=(-15.521974,-53.188758)
event=1300, t=1.693314, pot=(-15.521974,-53.188758)
event=1400, t=1.835471, pot=(-13.617579,-37.751007)
event=1500, t=1.972594, pot=(-12.665382,-28.532131)
event=1600, t=2.156943, pot=(-13.617579,-37.751007)
event=1700, t=2.293386, pot=(-13.617579,-37.751007)
event=1800, t=2.444075, pot=(-11.713184,-19.313255)
event=1900, t=2.605378, pot=(-16.617579,-37.751007)
event=2000, t=2.718488, pot=(-14.569776,-40.969882)
event=2100, t=2.860735, pot=(-14.569776,-37.969882)
event=2200, t=3.009601, pot=(-15.521974,-50.188758)
event=2300, t=3.114045, pot=(-13.617579,-37.751007)
event=2400, t=3.226533, pot=(-15.521974,-50.188758)
event=2500, t=3.367090, pot=(-13.617579,-31.751007)
event=2600, t=3.500491, pot=(-15.521974,-47.188758)
event=2700, t=3.638781, pot=(-15.521974,-47.188758)
event=2800, t=3.781288, pot=(-13.617579,-31.751007)
event=2900, t=3.912737, pot=(-17.569776,-43.969882)
event=3000, t=4.054446, pot=(-12.665382,-25.532131)
event=3100, t=4.199184, pot=(-16.617579,-37.751007)
event=3200, t=4.338050, pot=(-17.569776,-46.969882)
event=3300, t=4.474808, pot=(-13.617579,-34.751007)
event=3400, t=4.630684, pot=(-13.617579,-34.751007)
event=3500, t=4.745693, pot=(-18.521974,-56.188758)
event=3600, t=4.872102, pot=(-18.521974,-56.188758)
event=3700, t=4.988385, pot=(-14.569776,-46.969882)
event=3800, t=5.115327, pot=(-13.617579,-37.751007)
event=3900, t=5.242670, pot=(-12.665382,-28.532131)
event=4000, t=5.371837, pot=(-14.569776,-40.969882)
event=4100, t=5.534983, pot=(-19.474171,-59.407634)
event=4200, t=5.626519, pot=(-19.474171,-50.407634)
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event=4400, t=5.911725, pot=(-21.378566,-65.845386)
event=4500, t=6.031979, pot=(-16.474171,-44.407634)
event=4600, t=6.181785, pot=(-25.330763,-75.064262)
event=4700, t=6.318984, pot=(-16.474171,-47.407634)
event=4800, t=6.445370, pot=(-14.569776,-28.969882)
event=4900, t=6.579690, pot=(-16.474171,-44.407634)
event=5000, t=6.741953, pot=(-21.378566,-59.845386)
event=5100, t=6.842940, pot=(-16.474171,-41.407634)
event=5200, t=6.945043, pot=(-17.426369,-53.626510)
event=5300, t=7.067149, pot=(-21.378566,-44.845386)
event=5400, t=7.204160, pot=(-19.330763,-60.064262)
event=5500, t=7.318034, pot=(-20.282961,-66.283137)
event=5600, t=7.468698, pot=(-21.235158,-75.502013)
event=5700, t=7.579347, pot=(-19.330763,-48.064262)
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event=6200, t=8.179840, pot=(-18.378566,-50.845386)
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event=6900, t=9.170549, pot=(-14.282961,-57.283137)
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event=7200, t=9.581648, pot=(-16.187355,-72.720889)
event=7300, t=9.711021, pot=(-17.139553,-72.939765)
event=7400, t=9.844880, pot=(-16.187355,-66.720889)
event=7500, t=9.963564, pot=(-16.187355,-75.720889)
event=7600, t=10.102471, pot=(-15.235158,-60.502013)
event=7700, t=10.241103, pot=(-17.139553,-63.939765)
event=7800, t=10.383366, pot=(-19.996145,-85.596392)
event=7900, t=10.517166, pot=(-19.043948,-73.377516)
event=8000, t=10.667332, pot=(-20.948342,-79.815268)
event=8100, t=10.804427, pot=(-19.996145,-91.596392)
event=8200, t=10.943571, pot=(-19.996145,-82.596392)
event=8300, t=11.044441, pot=(-18.091750,-67.158641)
event=8400, t=11.202746, pot=(-17.139553,-66.939765)
event=8500, t=11.366134, pot=(-19.043948,-73.377516)
event=8600, t=11.497406, pot=(-22.852737,-95.253020)
event=8700, t=11.640092, pot=(-20.948342,-85.815268)
event=8800, t=11.769659, pot=(-20.948342,-73.815268)
event=8900, t=11.869258, pot=(-22.852737,-86.253020)
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event=9100, t=12.118510, pot=(-24.757132,-95.690771)
event=9200, t=12.259403, pot=(-23.804934,-89.471896)
event=9300, t=12.393802, pot=(-26.661527,-105.128523)
event=9400, t=12.537529, pot=(-32.661527,-108.128523)
event=9500, t=12.654658, pot=(-25.709329,-98.909647)
event=9600, t=12.774304, pot=(-23.804934,-92.471896)
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event=9700, t=12.890264, pot=(-22.852737,-86.253020)
event=9800, t=13.048908, pot=(-23.804934,-98.471896)
event=9900, t=13.206620, pot=(-25.709329,-98.909647)
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event=10100, t=13.471707, pot=(-21.900540,-80.034144)
event=10200, t=13.611511, pot=(-23.804934,-92.471896)
event=10300, t=13.767882, pot=(-23.804934,-89.471896)
event=10400, t=13.927420, pot=(-24.757132,-95.690771)
event=10500, t=14.069183, pot=(-23.804934,-83.471896)
event=10600, t=14.209962, pot=(-26.661527,-102.128523)
event=10700, t=14.353845, pot=(-26.661527,-102.128523)
event=10800, t=14.464558, pot=(-29.518119,-120.785151)
event=10900, t=14.573765, pot=(-24.757132,-83.690771)
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event=11100, t=14.838476, pot=(-22.852737,-86.253020)
event=11200, t=14.989394, pot=(-20.948342,-79.815268)
event=11300, t=15.149900, pot=(-25.852737,-98.253020)
event=11400, t=15.296579, pot=(-20.948342,-73.815268)
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event=11700, t=15.750236, pot=(-23.804934,-86.471896)
event=11800, t=15.908117, pot=(-28.709329,-98.909647)
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event=68000, t=95.114773, pot=(-27.613724,-108.347399)
event=68100, t=95.276729, pot=(-26.661527,-105.128523)
event=68200, t=95.412567, pot=(-22.852737,-89.253020)
event=68300, t=95.547686, pot=(-20.948342,-79.815268)
event=68400, t=95.668310, pot=(-22.996145,-73.596392)
event=68500, t=95.803210, pot=(-21.900540,-89.034144)
event=68600, t=95.931125, pot=(-19.996145,-73.596392)
event=68700, t=96.063872, pot=(-20.948342,-91.815268)
event=68800, t=96.174733, pot=(-23.948342,-73.815268)
event=68900, t=96.293642, pot=(-21.900540,-80.034144)
event=69000, t=96.470375, pot=(-22.852737,-107.253020)

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event=69100, t=96.607420, pot=(-19.996145,-76.596392)
event=69200, t=96.771896, pot=(-23.804934,-98.471896)
event=69300, t=96.907397, pot=(-21.900540,-83.034144)
event=69400, t=97.073663, pot=(-20.948342,-85.815268)
event=69500, t=97.208322, pot=(-19.043948,-67.377516)
event=69600, t=97.381131, pot=(-19.043948,-67.377516)
event=69700, t=97.508333, pot=(-21.900540,-89.034144)
event=69800, t=97.644238, pot=(-22.852737,-86.253020)
event=69900, t=97.779703, pot=(-24.757132,-95.690771)
event=70000, t=97.899898, pot=(-24.757132,-95.690771)
event=70100, t=98.053000, pot=(-28.565921,-129.566275)
event=70200, t=98.197423, pot=(-30.613724,-114.347399)
event=70300, t=98.302067, pot=(-28.565921,-108.566275)
event=70400, t=98.450749, pot=(-26.661527,-102.128523)
event=70500, t=98.583241, pot=(-27.613724,-120.347399)
event=70600, t=98.747021, pot=(-21.900540,-83.034144)
event=70700, t=98.901402, pot=(-23.948342,-85.815268)
event=70800, t=99.040527, pot=(-24.757132,-104.690771)
event=70900, t=99.167847, pot=(-21.900540,-80.034144)
event=71000, t=99.311231, pot=(-26.804934,-98.471896)
event=71100, t=99.450357, pot=(-22.852737,-77.253020)
event=71200, t=99.617780, pot=(-23.804934,-89.471896)
event=71300, t=99.767288, pot=(-23.804934,-89.471896)
event=71400, t=99.911731, pot=(-25.709329,-92.909647)
Edge activity in base.net was ignored
Created net.obs.period to describe network
 Network observation period info:
  Number of observation spells: 1
  Maximal time range observed: 0 until 100
  Temporal mode: continuous
  Time unit: unknown
  Suggested time increment: NA
```

```
set.seed(1331)
simtgcp <- simEGPTraj(form = tgform, coef = tgcoef, time = 100,
    process = "CSTERGM", checkpoints = 10)
```

```
Initializing simulation: max events=inf, max time=10.000000, initial pot=(-92.804934,-221.471896)
event=0, t=0.000000, pot=(-92.804934,-221.471896)
event=100, t=0.065663, pot=(-8.856592,-18.656627)
event=200, t=0.214689, pot=(-12.808790,-21.875503)
event=300, t=0.327061, pot=(-13.760987,-31.094379)
event=400, t=0.473658, pot=(-12.808790,-21.875503)
event=500, t=0.611501, pot=(-13.760987,-31.094379)
event=600, t=0.735162, pot=(-14.713184,-31.313255)
event=700, t=0.896287, pot=(-17.713184,-31.313255)
event=800, t=1.025057, pot=(-11.713184,-28.313255)
event=900, t=1.152006, pot=(-13.617579,-34.751007)
event=1000, t=1.276422, pot=(-12.665382,-28.532131)
event=1100, t=1.426772, pot=(-13.617579,-34.751007)
event=1200, t=1.550706, pot=(-15.521974,-53.188758)
event=1300, t=1.693314, pot=(-15.521974,-53.188758)
event=1400, t=1.835471, pot=(-13.617579,-37.751007)
event=1500, t=1.972594, pot=(-12.665382,-28.532131)
event=1600, t=2.156943, pot=(-13.617579,-37.751007)
```

```
event=1700, t=2.293386, pot=(-13.617579,-37.751007)
event=1800, t=2.444075, pot=(-11.713184,-19.313255)
event=1900, t=2.605378, pot=(-16.617579,-37.751007)
event=2000, t=2.718488, pot=(-14.569776,-40.969882)
event=2100, t=2.860735, pot=(-14.569776,-37.969882)
event=2200, t=3.009601, pot=(-15.521974,-50.188758)
event=2300, t=3.114045, pot=(-13.617579,-37.751007)
event=2400, t=3.226533, pot=(-15.521974,-50.188758)
event=2500, t=3.367090, pot=(-13.617579,-31.751007)
event=2600, t=3.500491, pot=(-15.521974,-47.188758)
event=2700, t=3.638781, pot=(-15.521974,-47.188758)
event=2800, t=3.781288, pot=(-13.617579,-31.751007)
event=2900, t=3.912737, pot=(-17.569776,-43.969882)
event=3000, t=4.054446, pot=(-12.665382,-25.532131)
event=3100, t=4.199184, pot=(-16.617579,-37.751007)
event=3200, t=4.338050, pot=(-17.569776,-46.969882)
event=3300, t=4.474808, pot=(-13.617579,-34.751007)
event=3400, t=4.630684, pot=(-13.617579,-34.751007)
event=3500, t=4.745693, pot=(-18.521974,-56.188758)
event=3600, t=4.872102, pot=(-18.521974,-56.188758)
event=3700, t=4.988385, pot=(-14.569776,-46.969882)
event=3800, t=5.115327, pot=(-13.617579,-37.751007)
event=3900, t=5.242670, pot=(-12.665382,-28.532131)
event=4000, t=5.371837, pot=(-14.569776,-40.969882)
event=4100, t=5.534983, pot=(-19.474171,-59.407634)
event=4200, t=5.626519, pot=(-19.474171,-50.407634)
event=4300, t=5.767042, pot=(-17.426369,-59.626510)
event=4400, t=5.911725, pot=(-21.378566,-65.845386)
event=4500, t=6.031979, pot=(-16.474171,-44.407634)
event=4600, t=6.181785, pot=(-25.330763,-75.064262)
event=4700, t=6.318984, pot=(-16.474171,-47.407634)
event=4800, t=6.445370, pot=(-14.569776,-28.969882)
event=4900, t=6.579690, pot=(-16.474171,-44.407634)
event=5000, t=6.741953, pot=(-21.378566,-59.845386)
event=5100, t=6.842940, pot=(-16.474171,-41.407634)
event=5200, t=6.945043, pot=(-17.426369,-53.626510)
event=5300, t=7.067149, pot=(-21.378566,-44.845386)
event=5400, t=7.204160, pot=(-19.330763,-60.064262)
event=5500, t=7.318034, pot=(-20.282961,-66.283137)
event=5600, t=7.468698, pot=(-21.235158,-75.502013)
event=5700, t=7.579347, pot=(-19.330763,-48.064262)
event=5800, t=7.696822, pot=(-20.282961,-60.283137)
event=5900, t=7.819414, pot=(-18.378566,-50.845386)
event=6000, t=7.949265, pot=(-19.330763,-54.064262)
event=6100, t=8.067174, pot=(-17.426369,-38.626510)
event=6200, t=8.179840, pot=(-18.378566,-50.845386)
event=6300, t=8.334930, pot=(-19.330763,-51.064262)
event=6400, t=8.474304, pot=(-21.235158,-66.502013)
event=6500, t=8.612226, pot=(-25.187355,-69.720889)
event=6600, t=8.753692, pot=(-23.139553,-75.939765)
event=6700, t=8.896647, pot=(-21.235158,-63.502013)
event=6800, t=9.020811, pot=(-16.187355,-69.720889)
event=6900, t=9.170549, pot=(-14.282961,-57.283137)
event=7000, t=9.324626, pot=(-14.282961,-54.283137)
```

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event=7100, t=9.450548, pot=(-15.235158,-63.502013)
event=7200, t=9.581648, pot=(-16.187355,-72.720889)
event=7300, t=9.711021, pot=(-17.139553,-72.939765)
event=7400, t=9.844880, pot=(-16.187355,-66.720889)
event=7500, t=9.963564, pot=(-16.187355,-75.720889)
Initializing simulation: max events=inf, max time=10.000000, initial pot=(-15.235158,-63.502013)
event=0, t=0.000000, pot=(-15.235158,-63.502013)
event=100, t=0.150451, pot=(-17.139553,-66.939765)
event=200, t=0.281464, pot=(-15.235158,-57.502013)
event=300, t=0.408085, pot=(-16.187355,-69.720889)
event=400, t=0.553095, pot=(-21.091750,-73.158641)
event=500, t=0.687506, pot=(-17.139553,-63.939765)
event=600, t=0.819851, pot=(-18.091750,-73.158641)
event=700, t=0.944456, pot=(-18.091750,-76.158641)
event=800, t=1.052095, pot=(-17.139553,-63.939765)
event=900, t=1.212875, pot=(-17.139553,-60.939765)
event=1000, t=1.348304, pot=(-21.091750,-73.158641)
event=1100, t=1.494505, pot=(-18.091750,-70.158641)
event=1200, t=1.639347, pot=(-19.996145,-79.596392)
event=1300, t=1.744589, pot=(-19.996145,-88.596392)
event=1400, t=1.836704, pot=(-18.091750,-67.158641)
event=1500, t=1.970433, pot=(-21.091750,-67.158641)
event=1600, t=2.076783, pot=(-19.996145,-85.596392)
event=1700, t=2.212612, pot=(-18.091750,-73.158641)
event=1800, t=2.358943, pot=(-17.139553,-60.939765)
event=1900, t=2.484437, pot=(-16.187355,-60.720889)
event=2000, t=2.596589, pot=(-17.139553,-72.939765)
event=2100, t=2.725532, pot=(-21.091750,-79.158641)
event=2200, t=2.871467, pot=(-13.330763,-45.064262)
event=2300, t=3.015181, pot=(-15.235158,-60.502013)
event=2400, t=3.177980, pot=(-13.330763,-48.064262)
event=2500, t=3.291327, pot=(-16.187355,-63.720889)
event=2600, t=3.406144, pot=(-12.378566,-50.845386)
event=2700, t=3.535809, pot=(-17.282961,-69.283137)
event=2800, t=3.684001, pot=(-12.378566,-53.845386)
event=2900, t=3.814815, pot=(-15.235158,-69.502013)
event=3000, t=3.961359, pot=(-12.378566,-44.845386)
event=3100, t=4.093858, pot=(-16.330763,-54.064262)
event=3200, t=4.236763, pot=(-14.282961,-63.283137)
event=3300, t=4.348706, pot=(-14.282961,-60.283137)
event=3400, t=4.465297, pot=(-15.235158,-57.502013)
event=3500, t=4.595667, pot=(-17.139553,-75.939765)
event=3600, t=4.736950, pot=(-15.235158,-63.502013)
event=3700, t=4.898802, pot=(-14.282961,-51.283137)
event=3800, t=5.061293, pot=(-16.187355,-60.720889)
event=3900, t=5.227830, pot=(-16.187355,-63.720889)
event=4000, t=5.352488, pot=(-18.091750,-79.158641)
event=4100, t=5.522059, pot=(-18.091750,-67.158641)
event=4200, t=5.669634, pot=(-19.996145,-79.596392)
event=4300, t=5.786389, pot=(-21.900540,-89.034144)
event=4400, t=5.897054, pot=(-18.091750,-67.158641)
event=4500, t=6.016065, pot=(-19.043948,-70.377516)
event=4600, t=6.164155, pot=(-23.948342,-85.815268)
event=4700, t=6.309494, pot=(-19.043948,-67.377516)
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event=4800, t=6.481654, pot=(-23.948342,-79.815268)
event=4900, t=6.636843, pot=(-27.900540,-80.034144)
event=5000, t=6.769103, pot=(-33.613724,-108.347399)
event=5100, t=6.877215, pot=(-32.661527,-96.128523)
event=5200, t=6.986416, pot=(-38.518119,-120.785151)
event=5300, t=7.137541, pot=(-30.757132,-92.690771)
event=5400, t=7.284592, pot=(-32.661527,-102.128523)
event=5500, t=7.444408, pot=(-36.613724,-105.347399)
event=5600, t=7.596454, pot=(-34.709329,-92.909647)
event=5700, t=7.716459, pot=(-33.613724,-105.347399)
event=5800, t=7.870747, pot=(-32.661527,-108.128523)
event=5900, t=7.971405, pot=(-29.804934,-89.471896)
event=6000, t=8.104239, pot=(-31.852737,-89.253020)
event=6100, t=8.242048, pot=(-31.709329,-101.909647)
event=6200, t=8.371102, pot=(-33.613724,-114.347399)
event=6300, t=8.508140, pot=(-31.709329,-98.909647)
event=6400, t=8.651776, pot=(-34.709329,-101.909647)
event=6500, t=8.789688, pot=(-29.804934,-89.471896)
event=6600, t=8.925577, pot=(-34.709329,-104.909647)
event=6700, t=9.051357, pot=(-29.804934,-92.471896)
event=6800, t=9.172900, pot=(-26.948342,-73.815268)
event=6900, t=9.327785, pot=(-32.804934,-95.471896)
event=7000, t=9.465917, pot=(-30.757132,-92.690771)
event=7100, t=9.599805, pot=(-29.804934,-98.471896)
event=7200, t=9.699867, pot=(-28.852737,-83.253020)
event=7300, t=9.857533, pot=(-29.804934,-89.471896)
Initializing simulation: max events=inf, max time=10.000000, initial pot=(-37.233231,-100.300209)
event=0, t=0.000000, pot=(-37.233231,-100.300209)
event=100, t=0.122735, pot=(-36.137625,-100.737961)
event=200, t=0.237952, pot=(-31.233231,-100.300209)
event=300, t=0.369091, pot=(-33.137625,-103.737961)
event=400, t=0.498718, pot=(-32.185428,-103.519085)
event=500, t=0.674226, pot=(-27.424441,-75.424706)
event=600, t=0.801086, pot=(-29.328836,-87.862458)
event=700, t=0.937504, pot=(-28.376638,-81.643582)
event=800, t=1.061235, pot=(-30.281033,-109.081334)
event=900, t=1.215975, pot=(-26.472244,-72.205830)
event=1000, t=1.335411, pot=(-35.328836,-87.862458)
event=1100, t=1.470585, pot=(-31.233231,-103.300209)
event=1200, t=1.616455, pot=(-34.233231,-91.300209)
event=1300, t=1.742324, pot=(-33.137625,-109.737961)
event=1400, t=1.884204, pot=(-29.328836,-87.862458)
event=1500, t=1.994315, pot=(-30.281033,-97.081334)
event=1600, t=2.132120, pot=(-35.328836,-84.862458)
event=1700, t=2.265091, pot=(-33.137625,-103.737961)
event=1800, t=2.397979, pot=(-31.233231,-88.300209)
event=1900, t=2.538084, pot=(-32.185428,-97.519085)
event=2000, t=2.696739, pot=(-34.089823,-109.956837)
event=2100, t=2.836696, pot=(-35.042020,-104.175713)
event=2200, t=2.980840, pot=(-33.137625,-100.737961)
event=2300, t=3.089252, pot=(-31.233231,-97.300209)
event=2400, t=3.229240, pot=(-34.089823,-112.956837)
event=2500, t=3.348821, pot=(-30.281033,-88.081334)
event=2600, t=3.502957, pot=(-32.185428,-100.519085)
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event=2700, t=3.650542, pot=(-34.089823,-112.956837)
event=2800, t=3.769032, pot=(-31.233231,-103.300209)
event=2900, t=3.888236, pot=(-30.281033,-97.081334)
event=3000, t=4.016045, pot=(-29.328836,-87.862458)
event=3100, t=4.125053, pot=(-29.328836,-93.862458)
event=3200, t=4.252968, pot=(-29.328836,-78.862458)
event=3300, t=4.373688, pot=(-35.185428,-103.519085)
event=3400, t=4.537073, pot=(-34.089823,-109.956837)
event=3500, t=4.689211, pot=(-41.994217,-119.394588)
event=3600, t=4.805255, pot=(-35.185428,-91.519085)
event=3700, t=4.930610, pot=(-29.328836,-87.862458)
event=3800, t=5.060731, pot=(-30.281033,-88.081334)
event=3900, t=5.213671, pot=(-32.328836,-90.862458)
event=4000, t=5.359739, pot=(-29.328836,-87.862458)
event=4100, t=5.491617, pot=(-32.328836,-87.862458)
event=4200, t=5.633000, pot=(-29.328836,-81.862458)
event=4300, t=5.787266, pot=(-31.233231,-85.300209)
event=4400, t=5.916766, pot=(-34.089823,-100.956837)
event=4500, t=6.045078, pot=(-38.185428,-100.519085)
event=4600, t=6.171991, pot=(-36.137625,-100.737961)
event=4700, t=6.346638, pot=(-36.946415,-119.613464)
event=4800, t=6.502692, pot=(-37.898612,-122.832340)
event=4900, t=6.654536, pot=(-43.755204,-138.488968)
event=5000, t=6.770507, pot=(-40.898612,-119.832340)
event=5100, t=6.923887, pot=(-38.850810,-126.051216)
event=5200, t=7.098950, pot=(-37.898612,-116.832340)
event=5300, t=7.265576, pot=(-35.994217,-107.394588)
event=5400, t=7.392364, pot=(-40.755204,-132.488968)
event=5500, t=7.528374, pot=(-36.946415,-119.613464)
event=5600, t=7.673074, pot=(-36.946415,-116.613464)
event=5700, t=7.829017, pot=(-35.994217,-107.394588)
event=5800, t=7.977989, pot=(-37.898612,-125.832340)
event=5900, t=8.109685, pot=(-40.898612,-122.832340)
event=6000, t=8.285388, pot=(-44.707402,-123.707843)
event=6100, t=8.409394, pot=(-47.707402,-138.707843)
event=6200, t=8.558577, pot=(-41.850810,-114.051216)
event=6300, t=8.705572, pot=(-43.755204,-126.488968)
event=6400, t=8.847880, pot=(-43.755204,-132.488968)
event=6500, t=8.982145, pot=(-47.707402,-132.707843)
event=6600, t=9.121533, pot=(-46.611796,-136.145595)
event=6700, t=9.226031, pot=(-44.563994,-145.364471)
event=6800, t=9.346970, pot=(-41.707402,-126.707843)
event=6900, t=9.487645, pot=(-44.563994,-148.364471)
event=7000, t=9.642112, pot=(-31.898612,-110.832340)
event=7100, t=9.771069, pot=(-36.803007,-120.270092)
event=7200, t=9.920275, pot=(-33.803007,-132.270092)
Initializing simulation: max events=inf, max time=10.000000, initial pot=(-31.898612,-113.832340)
event=0, t=0.000000, pot=(-31.898612,-113.832340)
event=100, t=0.135436, pot=(-29.994217,-110.394588)
event=200, t=0.286741, pot=(-32.042020,-110.175713)
event=300, t=0.442720, pot=(-27.137625,-97.737961)
event=400, t=0.572655, pot=(-29.994217,-116.394588)
event=500, t=0.733278, pot=(-29.042020,-116.175713)
event=600, t=0.862659, pot=(-27.137625,-97.737961)
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event=700, t=1.027807, pot=(-29.994217,-122.394588)
event=800, t=1.135454, pot=(-32.994217,-113.394588)
event=900, t=1.271387, pot=(-31.089823,-115.956837)
event=1000, t=1.417132, pot=(-27.137625,-106.737961)
event=1100, t=1.561957, pot=(-25.233231,-94.300209)
event=1200, t=1.696703, pot=(-27.137625,-97.737961)
event=1300, t=1.846927, pot=(-26.185428,-94.519085)
event=1400, t=1.969717, pot=(-25.233231,-91.300209)
event=1500, t=2.099840, pot=(-24.281033,-94.081334)
event=1600, t=2.228660, pot=(-26.185428,-91.519085)
event=1700, t=2.378314, pot=(-25.233231,-94.300209)
event=1800, t=2.530475, pot=(-29.042020,-113.175713)
event=1900, t=2.654599, pot=(-27.137625,-94.737961)
event=2000, t=2.815865, pot=(-28.233231,-97.300209)
event=2100, t=2.938527, pot=(-28.089823,-112.956837)
event=2200, t=3.077746, pot=(-27.137625,-97.737961)
event=2300, t=3.236095, pot=(-29.994217,-104.394588)
event=2400, t=3.352553, pot=(-31.898612,-119.832340)
event=2500, t=3.471801, pot=(-30.946415,-113.613464)
event=2600, t=3.606271, pot=(-29.994217,-113.394588)
event=2700, t=3.738257, pot=(-29.042020,-107.175713)
event=2800, t=3.862988, pot=(-29.042020,-101.175713)
event=2900, t=3.973491, pot=(-28.089823,-100.956837)
event=3000, t=4.123640, pot=(-24.281033,-85.081334)
event=3100, t=4.252864, pot=(-24.281033,-91.081334)
event=3200, t=4.455598, pot=(-24.281033,-85.081334)
event=3300, t=4.597991, pot=(-24.281033,-100.081334)
event=3400, t=4.716925, pot=(-23.328836,-84.862458)
event=3500, t=4.873302, pot=(-21.424441,-75.424706)
event=3600, t=5.028320, pot=(-24.281033,-91.081334)
event=3700, t=5.156604, pot=(-23.328836,-84.862458)
event=3800, t=5.293557, pot=(-22.376638,-90.643582)
event=3900, t=5.443669, pot=(-27.281033,-103.081334)
event=4000, t=5.580036, pot=(-22.376638,-84.643582)
event=4100, t=5.721783, pot=(-23.328836,-93.862458)
event=4200, t=5.850350, pot=(-21.424441,-81.424706)
event=4300, t=5.979564, pot=(-19.520046,-71.986954)
event=4400, t=6.133042, pot=(-21.424441,-87.424706)
event=4500, t=6.266124, pot=(-20.472244,-72.205830)
event=4600, t=6.403209, pot=(-25.233231,-106.300209)
event=4700, t=6.542997, pot=(-22.376638,-78.643582)
event=4800, t=6.686765, pot=(-32.185428,-100.519085)
event=4900, t=6.798470, pot=(-22.376638,-81.643582)
event=5000, t=6.938391, pot=(-25.233231,-91.300209)
event=5100, t=7.092291, pot=(-27.137625,-91.737961)
event=5200, t=7.243217, pot=(-26.185428,-100.519085)
event=5300, t=7.378312, pot=(-26.185428,-94.519085)
event=5400, t=7.513937, pot=(-26.185428,-97.519085)
event=5500, t=7.679857, pot=(-28.089823,-103.956837)
event=5600, t=7.817597, pot=(-29.185428,-100.519085)
event=5700, t=7.955963, pot=(-27.137625,-94.737961)
event=5800, t=8.072716, pot=(-29.042020,-107.175713)
event=5900, t=8.207699, pot=(-29.994217,-122.394588)
event=6000, t=8.322908, pot=(-31.898612,-113.832340)
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event=6100, t=8.459546, pot=(-29.042020,-116.175713)
event=6200, t=8.608701, pot=(-26.185428,-97.519085)
event=6300, t=8.764906, pot=(-22.376638,-78.643582)
event=6400, t=8.924655, pot=(-21.424441,-81.424706)
event=6500, t=9.048649, pot=(-23.328836,-87.862458)
event=6600, t=9.189054, pot=(-24.281033,-91.081334)
event=6700, t=9.311712, pot=(-30.281033,-88.081334)
event=6800, t=9.457007, pot=(-28.376638,-78.643582)
event=6900, t=9.593914, pot=(-31.233231,-97.300209)
event=7000, t=9.702882, pot=(-32.185428,-97.519085)
event=7100, t=9.846377, pot=(-34.089823,-100.956837)
event=7200, t=9.984329, pot=(-34.089823,-103.956837)
Initializing simulation: max events=inf, max time=10.000000, initial pot=(-33.613724,-102.347399)
event=0, t=0.000000, pot=(-33.613724,-102.347399)
event=100, t=0.153605, pot=(-32.661527,-93.128523)
event=200, t=0.284395, pot=(-36.470316,-121.004026)
event=300, t=0.424679, pot=(-36.613724,-99.347399)
event=400, t=0.580181, pot=(-34.565921,-102.566275)
event=500, t=0.734122, pot=(-36.470316,-112.004026)
event=600, t=0.870077, pot=(-34.565921,-108.566275)
event=700, t=1.021108, pot=(-39.470316,-115.004026)
event=800, t=1.174973, pot=(-36.470316,-112.004026)
event=900, t=1.297781, pot=(-36.470316,-112.004026)
event=1000, t=1.410639, pot=(-36.470316,-106.004026)
event=1100, t=1.548576, pot=(-37.422514,-109.222902)
event=1200, t=1.687791, pot=(-35.518119,-114.785151)
event=1300, t=1.818672, pot=(-35.518119,-114.785151)
event=1400, t=1.937127, pot=(-41.374711,-130.441778)
event=1500, t=2.083497, pot=(-42.470316,-109.004026)
event=1600, t=2.200743, pot=(-35.518119,-105.785151)
event=1700, t=2.337237, pot=(-41.518119,-114.785151)
event=1800, t=2.475801, pot=(-41.374711,-124.441778)
event=1900, t=2.611425, pot=(-36.470316,-112.004026)
event=2000, t=2.716752, pot=(-39.326908,-121.660654)
event=2100, t=2.843617, pot=(-42.326908,-124.660654)
event=2200, t=3.011385, pot=(-39.326908,-115.660654)
event=2300, t=3.174146, pot=(-43.135698,-131.536157)
event=2400, t=3.330734, pot=(-45.992290,-144.192785)
event=2500, t=3.478801, pot=(-44.087895,-143.755033)
event=2600, t=3.605885, pot=(-43.135698,-128.536157)
event=2700, t=3.732898, pot=(-45.183500,-131.317281)
event=2800, t=3.852525, pot=(-39.326908,-118.660654)
event=2900, t=3.990710, pot=(-39.326908,-118.660654)
event=3000, t=4.125361, pot=(-41.231303,-134.098406)
event=3100, t=4.257171, pot=(-42.326908,-118.660654)
event=3200, t=4.374025, pot=(-37.422514,-118.222902)
event=3300, t=4.489722, pot=(-44.231303,-131.098406)
event=3400, t=4.649287, pot=(-39.326908,-115.660654)
event=3500, t=4.782817, pot=(-40.279106,-121.879530)
event=3600, t=4.949008, pot=(-43.135698,-134.536157)
event=3700, t=5.110582, pot=(-47.087895,-137.755033)
event=3800, t=5.235920, pot=(-47.087895,-134.755033)
event=3900, t=5.378835, pot=(-47.087895,-134.755033)
event=4000, t=5.514757, pot=(-41.231303,-119.098406)
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event=4100, t=5.674107, pot=(-45.183500,-134.317281)
event=4200, t=5.836024, pot=(-41.231303,-125.098406)
event=4300, t=5.989813, pot=(-43.135698,-128.536157)
event=4400, t=6.135227, pot=(-44.087895,-134.755033)
event=4500, t=6.292672, pot=(-45.040093,-140.973909)
event=4600, t=6.424754, pot=(-45.992290,-144.192785)
event=4700, t=6.571962, pot=(-41.231303,-128.098406)
event=4800, t=6.748343, pot=(-40.422514,-109.222902)
event=4900, t=6.918540, pot=(-43.279106,-118.879530)
event=5000, t=7.081087, pot=(-44.231303,-125.098406)
event=5100, t=7.218270, pot=(-44.231303,-119.098406)
event=5200, t=7.367740, pot=(-44.231303,-122.098406)
event=5300, t=7.490814, pot=(-44.087895,-137.755033)
event=5400, t=7.651851, pot=(-45.040093,-140.973909)
event=5500, t=7.784712, pot=(-48.040093,-146.973909)
event=5600, t=7.933319, pot=(-42.183500,-125.317281)
event=5700, t=8.071401, pot=(-48.183500,-137.317281)
event=5800, t=8.222439, pot=(-41.231303,-125.098406)
event=5900, t=8.360920, pot=(-37.422514,-118.222902)
event=6000, t=8.499497, pot=(-34.565921,-99.566275)
event=6100, t=8.634616, pot=(-32.661527,-90.128523)
event=6200, t=8.764834, pot=(-34.565921,-108.566275)
event=6300, t=8.884943, pot=(-27.613724,-105.347399)
event=6400, t=9.029681, pot=(-27.613724,-99.347399)
event=6500, t=9.158583, pot=(-25.709329,-92.909647)
event=6600, t=9.298048, pot=(-28.565921,-111.566275)
event=6700, t=9.456958, pot=(-26.661527,-99.128523)
event=6800, t=9.648836, pot=(-25.709329,-95.909647)
event=6900, t=9.798217, pot=(-26.661527,-93.128523)
event=7000, t=9.916030, pot=(-25.709329,-92.909647)
Initializing simulation: max events=inf, max time=10.000000, initial pot=(-28.089823,-109.956837)
event=0, t=0.000000, pot=(-28.089823,-109.956837)
event=100, t=0.131189, pot=(-29.042020,-113.175713)
event=200, t=0.284272, pot=(-30.946415,-110.613464)
event=300, t=0.423788, pot=(-27.137625,-94.737961)
event=400, t=0.576766, pot=(-26.185428,-94.519085)
event=500, t=0.745511, pot=(-28.089823,-100.956837)
event=600, t=0.871144, pot=(-27.137625,-97.737961)
event=700, t=1.039168, pot=(-25.233231,-85.300209)
event=800, t=1.187292, pot=(-27.137625,-100.737961)
event=900, t=1.345264, pot=(-26.185428,-97.519085)
event=1000, t=1.523049, pot=(-29.185428,-103.519085)
event=1100, t=1.658481, pot=(-25.233231,-94.300209)
event=1200, t=1.816636, pot=(-27.281033,-85.081334)
event=1300, t=1.956063, pot=(-32.042020,-107.175713)
event=1400, t=2.081810, pot=(-29.042020,-119.175713)
event=1500, t=2.229941, pot=(-26.185428,-100.519085)
event=1600, t=2.349775, pot=(-30.137625,-103.737961)
event=1700, t=2.469202, pot=(-29.185428,-94.519085)
event=1800, t=2.609083, pot=(-24.281033,-97.081334)
event=1900, t=2.716486, pot=(-28.233231,-91.300209)
event=2000, t=2.904576, pot=(-26.185428,-100.519085)
event=2100, t=3.033668, pot=(-26.185428,-103.519085)
event=2200, t=3.176474, pot=(-25.233231,-91.300209)
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event=2300, t=3.323559, pot=(-28.233231,-88.300209)
event=2400, t=3.450433, pot=(-26.185428,-94.519085)
event=2500, t=3.603176, pot=(-25.233231,-91.300209)
event=2600, t=3.717704, pot=(-24.281033,-88.081334)
event=2700, t=3.847226, pot=(-24.281033,-88.081334)
event=2800, t=3.987048, pot=(-28.233231,-94.300209)
event=2900, t=4.141940, pot=(-25.233231,-88.300209)
event=3000, t=4.280917, pot=(-29.185428,-97.519085)
event=3100, t=4.406285, pot=(-31.089823,-103.956837)
event=3200, t=4.552150, pot=(-28.089823,-103.956837)
event=3300, t=4.691203, pot=(-27.137625,-97.737961)
event=3400, t=4.798357, pot=(-29.994217,-125.394588)
event=3500, t=4.891614, pot=(-40.898612,-125.832340)
event=3600, t=5.037056, pot=(-35.042020,-107.175713)
event=3700, t=5.197564, pot=(-34.089823,-109.956837)
event=3800, t=5.352778, pot=(-35.042020,-113.175713)
event=3900, t=5.478930, pot=(-31.233231,-94.300209)
event=4000, t=5.592749, pot=(-38.042020,-113.175713)
event=4100, t=5.740092, pot=(-33.137625,-106.737961)
event=4200, t=5.882630, pot=(-39.137625,-97.737961)
event=4300, t=6.031624, pot=(-33.137625,-115.737961)
event=4400, t=6.163156, pot=(-31.233231,-100.300209)
event=4500, t=6.267792, pot=(-30.281033,-91.081334)
event=4600, t=6.420700, pot=(-29.328836,-81.862458)
event=4700, t=6.573970, pot=(-32.328836,-87.862458)
event=4800, t=6.692531, pot=(-29.328836,-96.862458)
event=4900, t=6.838643, pot=(-31.376638,-90.643582)
event=5000, t=6.965353, pot=(-32.328836,-93.862458)
event=5100, t=7.111582, pot=(-26.472244,-72.205830)
event=5200, t=7.296875, pot=(-30.281033,-88.081334)
event=5300, t=7.446680, pot=(-30.281033,-94.081334)
event=5400, t=7.581848, pot=(-31.233231,-91.300209)
event=5500, t=7.707036, pot=(-35.328836,-87.862458)
event=5600, t=7.854000, pot=(-28.376638,-78.643582)
event=5700, t=8.006386, pot=(-27.424441,-81.424706)
event=5800, t=8.129986, pot=(-26.472244,-84.205830)
event=5900, t=8.254334, pot=(-26.472244,-72.205830)
event=6000, t=8.390847, pot=(-20.472244,-84.205830)
event=6100, t=8.497485, pot=(-23.472244,-87.205830)
event=6200, t=8.632326, pot=(-17.615652,-68.549203)
event=6300, t=8.780359, pot=(-25.520046,-77.986954)
event=6400, t=8.932740, pot=(-22.376638,-90.643582)
event=6500, t=9.055592, pot=(-21.424441,-90.424706)
event=6600, t=9.218923, pot=(-22.376638,-90.643582)
event=6700, t=9.340022, pot=(-20.472244,-75.205830)
event=6800, t=9.482336, pot=(-24.424441,-90.424706)
event=6900, t=9.614947, pot=(-21.424441,-84.424706)
event=7000, t=9.773878, pot=(-21.424441,-78.424706)
event=7100, t=9.925946, pot=(-22.520046,-77.986954)
Initializing simulation: max events=inf, max time=10.000000, initial pot=(-19.996145,-79.596392)
event=0, t=0.000000, pot=(-19.996145,-79.596392)
event=100, t=0.160167, pot=(-19.996145,-76.596392)
event=200, t=0.287317, pot=(-19.043948,-64.377516)
event=300, t=0.450100, pot=(-24.900540,-86.034144)
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event=400, t=0.592254, pot=(-20.948342,-82.815268)
event=500, t=0.714683, pot=(-23.948342,-82.815268)
event=600, t=0.832475, pot=(-20.948342,-76.815268)
event=700, t=0.956892, pot=(-20.948342,-76.815268)
event=800, t=1.123284, pot=(-21.900540,-80.034144)
event=900, t=1.283107, pot=(-22.852737,-92.253020)
event=1000, t=1.417088, pot=(-22.852737,-86.253020)
event=1100, t=1.554671, pot=(-24.757132,-98.690771)
event=1200, t=1.704723, pot=(-28.709329,-92.909647)
event=1300, t=1.829586, pot=(-26.661527,-105.128523)
event=1400, t=1.967276, pot=(-26.661527,-99.128523)
event=1500, t=2.120379, pot=(-27.757132,-92.690771)
event=1600, t=2.260892, pot=(-26.804934,-86.471896)
event=1700, t=2.402132, pot=(-22.852737,-80.253020)
event=1800, t=2.556302, pot=(-26.661527,-99.128523)
event=1900, t=2.711378, pot=(-26.661527,-105.128523)
event=2000, t=2.854125, pot=(-26.661527,-102.128523)
event=2100, t=3.010562, pot=(-23.804934,-89.471896)
event=2200, t=3.200550, pot=(-27.613724,-105.347399)
event=2300, t=3.349158, pot=(-25.709329,-98.909647)
event=2400, t=3.469888, pot=(-25.709329,-92.909647)
event=2500, t=3.634898, pot=(-24.757132,-86.690771)
event=2600, t=3.810698, pot=(-26.661527,-105.128523)
event=2700, t=3.924722, pot=(-23.804934,-92.471896)
event=2800, t=4.055456, pot=(-24.757132,-98.690771)
event=2900, t=4.179648, pot=(-22.852737,-86.253020)
event=3000, t=4.321274, pot=(-24.900540,-86.034144)
event=3100, t=4.457874, pot=(-25.852737,-98.253020)
event=3200, t=4.580657, pot=(-19.996145,-67.596392)
event=3300, t=4.701194, pot=(-21.900540,-86.034144)
event=3400, t=4.856509, pot=(-23.804934,-89.471896)
event=3500, t=4.973510, pot=(-23.804934,-89.471896)
event=3600, t=5.163849, pot=(-25.852737,-98.253020)
event=3700, t=5.304951, pot=(-21.900540,-95.034144)
event=3800, t=5.434820, pot=(-23.804934,-98.471896)
event=3900, t=5.555005, pot=(-31.565921,-117.566275)
event=4000, t=5.698754, pot=(-26.661527,-96.128523)
event=4100, t=5.840291, pot=(-27.613724,-102.347399)
event=4200, t=5.960573, pot=(-27.613724,-108.347399)
event=4300, t=6.118823, pot=(-28.709329,-98.909647)
event=4400, t=6.251649, pot=(-28.709329,-89.909647)
event=4500, t=6.392075, pot=(-28.565921,-105.566275)
event=4600, t=6.530597, pot=(-26.661527,-102.128523)
event=4700, t=6.679664, pot=(-26.661527,-96.128523)
event=4800, t=6.814575, pot=(-27.613724,-96.347399)
event=4900, t=6.952919, pot=(-29.518119,-108.785151)
event=5000, t=7.092363, pot=(-26.661527,-102.128523)
event=5100, t=7.214267, pot=(-26.661527,-111.128523)
event=5200, t=7.350430, pot=(-23.804934,-92.471896)
event=5300, t=7.473831, pot=(-25.709329,-101.909647)
event=5400, t=7.580981, pot=(-24.757132,-86.690771)
event=5500, t=7.740313, pot=(-31.709329,-98.909647)
event=5600, t=7.884759, pot=(-23.804934,-80.471896)
event=5700, t=8.035323, pot=(-29.661527,-102.128523)
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event=5800, t=8.146622, pot=(-26.661527,-99.128523)
event=5900, t=8.285561, pot=(-30.470316,-109.004026)
event=6000, t=8.436602, pot=(-27.613724,-96.347399)
event=6100, t=8.590592, pot=(-26.661527,-96.128523)
event=6200, t=8.729523, pot=(-26.661527,-99.128523)
event=6300, t=8.866686, pot=(-25.709329,-95.909647)
event=6400, t=9.019471, pot=(-26.661527,-93.128523)
event=6500, t=9.164009, pot=(-26.661527,-93.128523)
event=6600, t=9.311489, pot=(-23.804934,-86.471896)
event=6700, t=9.467296, pot=(-22.852737,-83.253020)
event=6800, t=9.582229, pot=(-24.757132,-89.690771)
event=6900, t=9.718208, pot=(-25.852737,-86.253020)
event=7000, t=9.865876, pot=(-22.852737,-83.253020)
Initializing simulation: max events=inf, max time=10.000000, initial pot=(-27.137625,-106.737961)
event=0, t=0.000000, pot=(-27.137625,-106.737961)
event=100, t=0.129249, pot=(-28.089823,-103.956837)
event=200, t=0.303092, pot=(-28.089823,-106.956837)
event=300, t=0.431047, pot=(-30.946415,-113.613464)
event=400, t=0.575712, pot=(-29.994217,-104.394588)
event=500, t=0.691941, pot=(-35.850810,-123.051216)
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event=700, t=0.976859, pot=(-28.089823,-103.956837)
event=800, t=1.126033, pot=(-29.042020,-110.175713)
event=900, t=1.243100, pot=(-31.089823,-106.956837)
event=1000, t=1.380856, pot=(-33.137625,-109.737961)
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event=1200, t=1.687201, pot=(-29.042020,-107.175713)
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event=1600, t=2.259739, pot=(-25.233231,-91.300209)
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event=1900, t=2.707404, pot=(-29.042020,-107.175713)
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event=2700, t=3.883011, pot=(-30.946415,-110.613464)
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event=2900, t=4.162280, pot=(-33.803007,-123.270092)
event=3000, t=4.256422, pot=(-36.659599,-132.926719)
event=3100, t=4.416585, pot=(-33.803007,-120.270092)
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event=3600, t=5.161535, pot=(-36.659599,-135.926719)
event=3700, t=5.277793, pot=(-33.803007,-120.270092)
event=3800, t=5.404032, pot=(-32.850810,-120.051216)
event=3900, t=5.505316, pot=(-35.850810,-123.051216)
```

```
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event=4600, t=6.540479, pot=(-32.850810,-117.051216)
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event=5400, t=7.729708, pot=(-42.659599,-141.926719)
event=5500, t=7.858682, pot=(-36.659599,-132.926719)
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event=6100, t=8.720129, pot=(-34.755204,-135.488968)
event=6200, t=8.897403, pot=(-35.707402,-129.707843)
event=6300, t=9.037522, pot=(-35.707402,-132.707843)
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event=6700, t=9.696832, pot=(-33.803007,-120.270092)
event=6800, t=9.858367, pot=(-30.946415,-113.613464)
Initializing simulation: max events=inf, max time=10.000000, initial pot=(-31.898612,-110.832340)
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event=900, t=1.252100, pot=(-34.898612,-116.832340)
event=1000, t=1.396512, pot=(-33.946415,-113.613464)
event=1100, t=1.516989, pot=(-29.994217,-116.394588)
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event=1300, t=1.833721, pot=(-35.850810,-117.051216)
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event=2000, t=2.890871, pot=(-29.994217,-110.394588)
event=2100, t=3.038437, pot=(-33.803007,-126.270092)
event=2200, t=3.174969, pot=(-35.707402,-126.707843)
event=2300, t=3.316379, pot=(-36.659599,-135.926719)
```

```
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event=4800, t=6.843296, pot=(-28.089823,-100.956837)
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event=6600, t=9.410491, pot=(-30.946415,-113.613464)
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event=6800, t=9.679687, pot=(-31.898612,-116.832340)
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event=7000, t=9.972330, pot=(-36.803007,-138.270092)
Initializing simulation: max events=inf, max time=10.000000, initial pot=(-32.850810,-123.051216)
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event=300, t=0.467391, pot=(-33.946415,-110.613464)
event=400, t=0.592155, pot=(-29.994217,-107.394588)
event=500, t=0.744991, pot=(-31.898612,-125.832340)
```

```
event=600, t=0.861923, pot=(-31.898612,-119.832340)
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event=800, t=1.167062, pot=(-32.994217,-104.394588)
event=900, t=1.345213, pot=(-33.803007,-132.270092)
event=1000, t=1.497246, pot=(-35.850810,-117.051216)
event=1100, t=1.637338, pot=(-33.803007,-126.270092)
event=1200, t=1.803248, pot=(-35.707402,-138.707843)
event=1300, t=1.933151, pot=(-33.803007,-132.270092)
event=1400, t=2.073943, pot=(-33.803007,-120.270092)
event=1500, t=2.234151, pot=(-29.042020,-104.175713)
event=1600, t=2.390374, pot=(-33.946415,-113.613464)
event=1700, t=2.553504, pot=(-34.898612,-125.832340)
event=1800, t=2.675975, pot=(-32.850810,-126.051216)
event=1900, t=2.791662, pot=(-33.803007,-120.270092)
event=2000, t=2.925770, pot=(-37.755204,-123.488968)
event=2100, t=3.041927, pot=(-35.707402,-129.707843)
event=2200, t=3.200538, pot=(-34.755204,-123.488968)
event=2300, t=3.326472, pot=(-35.707402,-123.707843)
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event=2500, t=3.601357, pot=(-43.468389,-148.802223)
event=2600, t=3.746401, pot=(-35.707402,-129.707843)
event=2700, t=3.873954, pot=(-35.707402,-123.707843)
event=2800, t=4.026895, pot=(-35.707402,-126.707843)
event=2900, t=4.144065, pot=(-33.803007,-129.270092)
event=3000, t=4.293234, pot=(-36.659599,-132.926719)
event=3100, t=4.405345, pot=(-40.468389,-148.802223)
event=3200, t=4.549728, pot=(-39.516191,-151.583347)
event=3300, t=4.673401, pot=(-40.611796,-142.145595)
event=3400, t=4.805079, pot=(-37.611796,-130.145595)
event=3500, t=4.964789, pot=(-37.611796,-136.145595)
event=3600, t=5.095344, pot=(-34.755204,-132.488968)
event=3700, t=5.238520, pot=(-31.898612,-113.832340)
event=3800, t=5.382659, pot=(-42.516191,-142.583347)
event=3900, t=5.523581, pot=(-31.898612,-113.832340)
event=4000, t=5.662764, pot=(-35.707402,-129.707843)
event=4100, t=5.771547, pot=(-34.755204,-129.488968)
event=4200, t=5.900196, pot=(-37.755204,-123.488968)
event=4300, t=6.042387, pot=(-34.755204,-129.488968)
event=4400, t=6.187461, pot=(-33.803007,-129.270092)
event=4500, t=6.333711, pot=(-32.850810,-126.051216)
event=4600, t=6.476537, pot=(-35.707402,-132.707843)
event=4700, t=6.612629, pot=(-35.707402,-123.707843)
event=4800, t=6.776632, pot=(-35.707402,-135.707843)
event=4900, t=6.938770, pot=(-32.850810,-111.051216)
event=5000, t=7.127120, pot=(-34.755204,-120.488968)
event=5100, t=7.257268, pot=(-33.803007,-120.270092)
event=5200, t=7.391783, pot=(-34.755204,-126.488968)
event=5300, t=7.540334, pot=(-37.611796,-130.145595)
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event=5600, t=7.973036, pot=(-32.850810,-111.051216)
event=5700, t=8.096616, pot=(-31.898612,-116.832340)
event=5800, t=8.247747, pot=(-33.803007,-126.270092)
event=5900, t=8.388062, pot=(-35.707402,-141.707843)
```

```
event=6000, t=8.551441, pot=(-36.803007,-123.270092)
event=6100, t=8.697764, pot=(-29.994217,-101.394588)
event=6200, t=8.840042, pot=(-34.898612,-113.832340)
event=6300, t=8.981447, pot=(-35.707402,-129.707843)
event=6400, t=9.125100, pot=(-44.563994,-145.364471)
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event=6700, t=9.586349, pot=(-38.563994,-142.364471)
event=6800, t=9.716433, pot=(-39.516191,-151.583347)
event=6900, t=9.834708, pot=(-35.707402,-120.707843)
event=7000, t=9.994666, pot=(-38.563994,-139.364471)
```

Because we keep the seeds the same, the first two of these should be identical; note that the trajectory from the checkpoint method with `simEGPTraj` will be slightly different (given the same random number seed), because seed allocation is handled slightly differently in that routine (due to the use of the `parallel` package). Identical runs with `mc.cores=1` using the same seed are currently reproducible, but at this time, multi-core runs will produce slightly different trajectories on each execution; thus, in applications for which exact reproducibility of trajectories is required, stick to single-core cases.

3.1 Examining Statistics and Snapshots

There are several ways to obtain statistics and snapshots from EGP trajectories, some of which we have already seen. For the latter, the following are the most direct methods:

- When `return.networkDynamic==FALSE`, the output of `simEGP` contains a snapshot of the final simulation state (as a `network` onbject), and can be used directly where this is the desired outcome.
- When `statsonly==FALSE`, the output of `simEGPTraj` likewise contains a list of networks (or a list of lists, if `trajectories>1`) representing snapshots of the initial state and each checkpoint. These provide a convenient way of tracking the simulation, provided that one can set a reasonable sampling schedule.
- For `simEGP` with `return.networkDynamic==TRUE`, the `network.extract` function or `%t%` operator can be used to obtain a network with the state of the simulation at any point in time. Note that the raw structure of the returned network should *not* be used in this way, because the network contains every edge that is *ever* observed in the event history; `network.extract` is needed to pull out only those edges that were active at the specified time. This is more costly than the above techniques (because the entire event history must be stored), but allows states to be retroactively queries at any time.

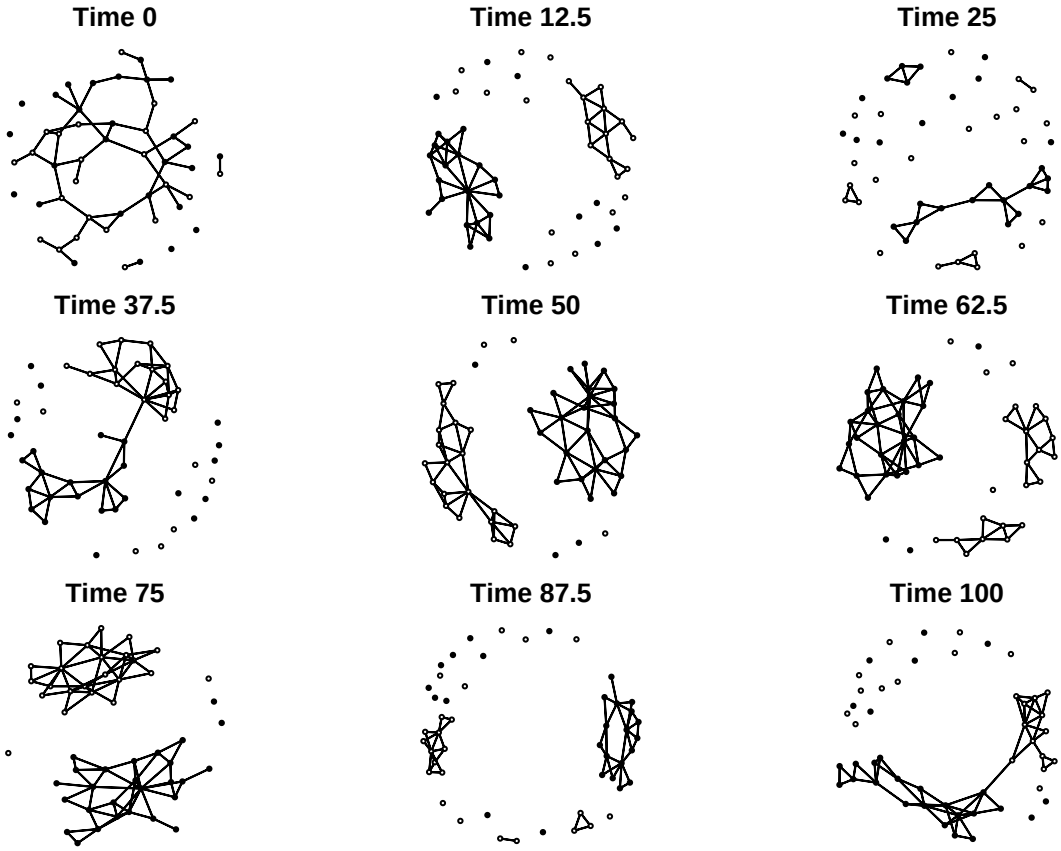
Where the `return.history` option to `simEGP` or `simEGPTraj` has been used, it is also possible to reconstruct snapshots from the history of toggle events. This requires more work, however: one must accumulate the desired toggles from the event history, and then apply them cumulatively to the initial network. Although `ergmgp` does not have a built-in function for this, the `ergm.godfather` function can be easily used for this purpose. `ergm.godfather` is something of a Swiss army knife for processing edge toggles, and can be used to calculate a wide range of things involving an initial graph and a series of changes. Let's see a basic example. Here we'll write a small convenience function that takes an initial graph and a set of toggles, that applies the toggles to the initial state and returns the resulting network. We'll then use this function to compute *ex post facto* checkpoints for the simulation

```
# Quick helper function to update a network using toggle information
histAccum <- function(basenet, toggles) {
  ergm.godfather(basenet ~ edges, changes = toggles, end.network=TRUE)
}

# Find the network state at several checkpoints
cpts <- vector(mode="list",length=9)
cpts[[1]] <-net
for(i in 2:9){              # Walk through the checkpoints
  # Select the toggles we want
```

```
  togs <- (simtgh %n% "EventHistory")[ (simtgh %n% "EventHistory")[,1]<= 100*(i-1)/8 ,2:3]
  # Apply and recover the graph
  cpts[[i]] <- histAccum(net, togs)
}

# Plot the results
par(mfrow=c(3,3), mar=c(0.1,0.1,2,0.1))
for(i in 1:9)
  plot(cpts[[i]], vertex.col = "x", main = paste("Time",(i-1)/8*100))
```



Obviously, any other subset of toggles may be used in like fashion.

As with snapshots, we may also be interested in obtaining network statistics. As we have already seen, `simEGPTraj` can be used to return (only) statistics by setting `statsonly=TRUE`. In cases where the graphs have been returned, however, statistics are also available via the `"stats"` attribute attached to the returned network list(s). For instance, in the above case we have

```
attr(simtgcp,"stats")   # Obtain the statistics for each checkpoint
```

```
   Time Events Potential.Form Potential.Diss edges nodematch.x edges esp0
0     0      0      -92.80493     -221.47190    50          27    50   47
1    10   7534      -15.23516      -63.50201    32          32    32    4
2    20  14933      -37.23323     -100.30021    53          49    53    5
3    30  22185      -31.89861     -113.83234    67          67    67    2
4    40  29394      -33.61372     -102.34740    58          56    58    3
5    50  36459      -28.08982     -109.95684    59          59    59    5
6    60  43618      -19.99614      -79.59639    42          42    42    4
```

```
7    70  50701      -27.13763     -106.73796    57          57    57    5
8    80  57579      -31.89861     -110.83234    67          67    67    1
9    90  64593      -32.85081     -123.05122    69          69    69    4
10  100  71594      -38.08790     -134.75503    80          80    80    2
```

Where multiple trajectories have been computed, this attribute will be added to the `network.list` for every simulated trajectory. The included statistics here are those in the model, as well as any passed via the `monitor` formula argument to `simEGPTraj`. It is, of course, also possible to obtain statistics using `ergm` summary formulas, like so:

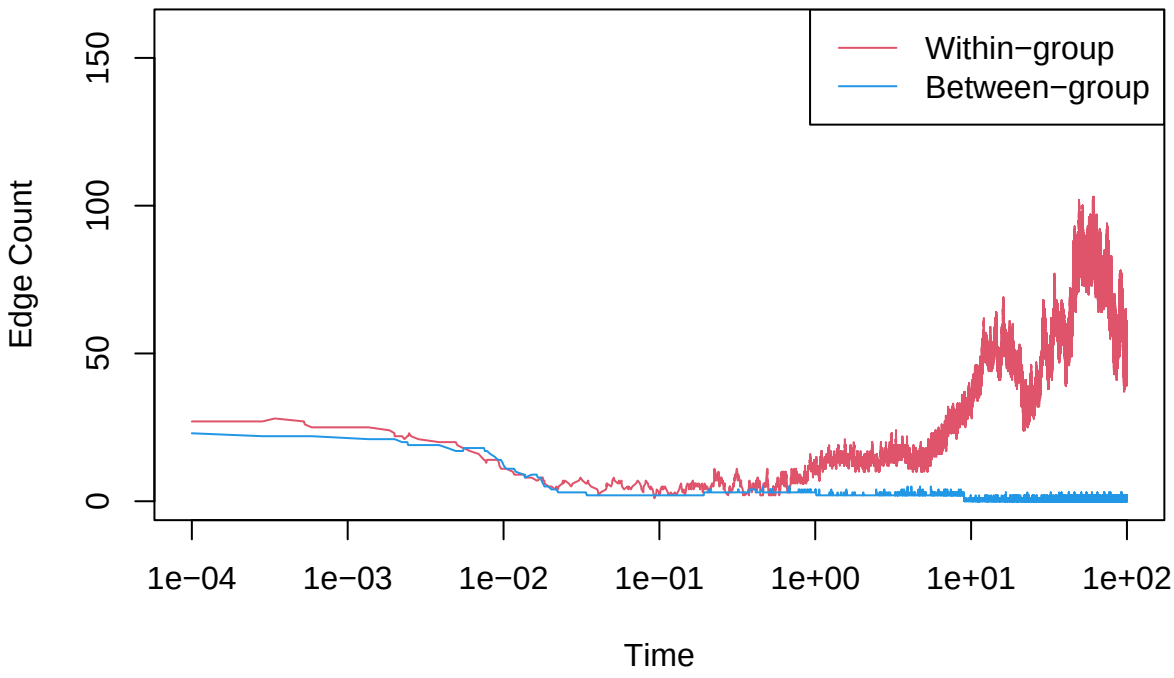
```
summary(simtgcp ~ edges + kstar(2) + esp(1:3) + gwdegree(0.5, fixed= TRUE)) # Arbitrary example
```

```
      edges kstar2 esp1 esp2 esp3 gwdeg.fixed.0.5
 [1,]    50     93    3    0    0        59.07651
 [2,]    32     74   27    0    1        35.84455
 [3,]    53    213   33   12    3        42.69172
 [4,]    67    254   43   17    4        51.85141
 [5,]    58    213   38   14    3        49.38544
 [6,]    59    199   37   13    4        52.54797
 [7,]    42    102   28   10    0        41.54318
 [8,]    57    177   36   15    1        51.94440
 [9,]    67    221   41   21    3        57.41500
[10,]    69    227   41   20    4        57.66816
[11,]    80    296   53   23    2        66.07171
```

As this demonstrates, any arbitrary set of statistics may be queried in this way. Computation is carried out by the `ergm` package. Similar schemes may be performed using `ergm.godfather`, which can return statistics as well as networks. For instance, we can see cumulative change in network statistics like so:

```
# Track evolution of edge and within-group edge counts
tog <- (simtgh%n%"EventHistory")[,2:3]     # Get the toggle set
stats <- ergm.godfather(net ~ edges + nodematch("x"),
    changes= lapply(apply(tog,1,as.matrix,simplify=F),"t"), stats.start = TRUE)

# Plot edge counts over time
plot(c(0.0001,(simtgh%n%"EventHistory")[,1]), stats[,2], type="l", col =2,
    xlab= "Time", ylab = "Edge Count", ylim=c(0.0001,160), log="x")
lines(c(0.0001,(simtgh%n%"EventHistory")[,1]), stats[,1]-stats[,2], col = 4)
legend("topright", lty=1, col=c(2,4), legend = c("Within-group","Between-group"))
```



The `stats.start` argument tells `ergm.godfather` to append the initial condition; turning the toggle set into a list of one-row matrices likewise `ergm.godfather` to apply the toggles one at a time (instead of all in one go). The output plot shows us that, in the early phase of the simulation, both edge count and the count of within-group edges fall from their initial conditions, and in parallel. However, within-group edges arise at a higher rate, and eventually begin forming triangles; at that point, the buttressed edges are more stable and accumulate, leading the within-group edge count to climb. Meanwhile, the between-group count remains low. Such plots can provide considerable insight into both the approach of the system to equilibrium, and into its long-run behavior.

3.2 Extracting further information from `networkDynamic` objects

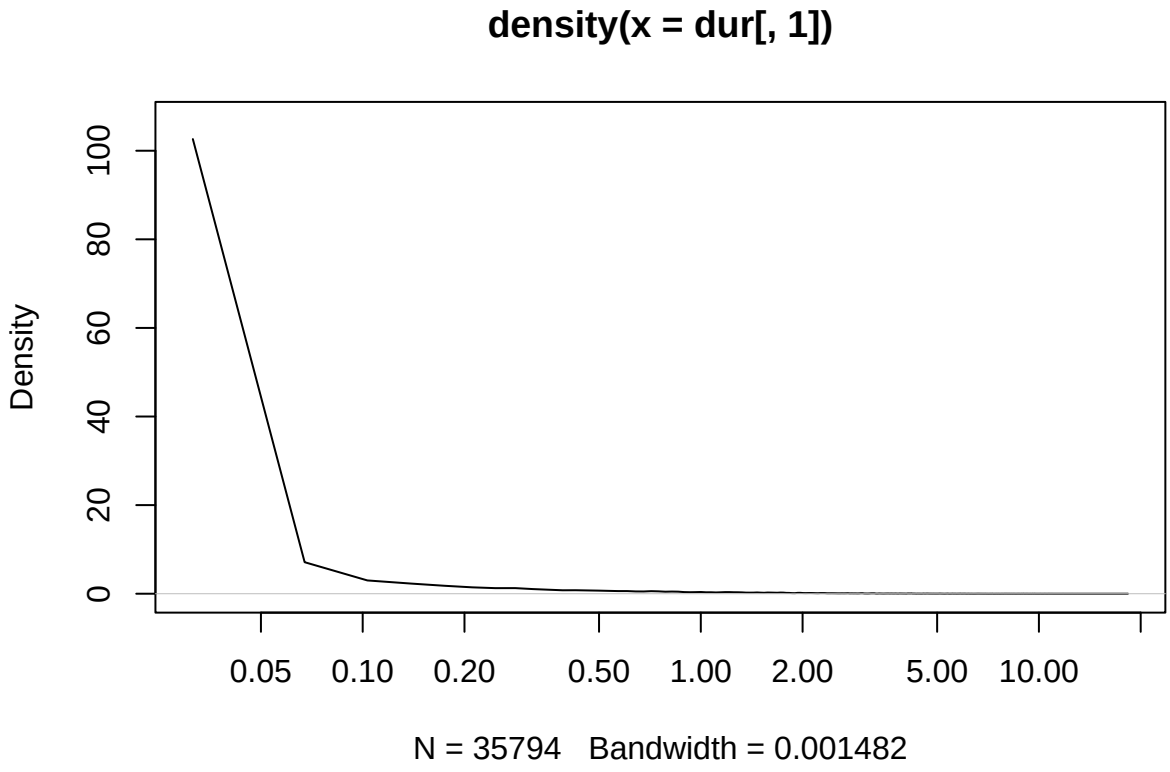
Beyond snapshots, many other dynamic properties can be conveniently obtained from `networkDynamic` objects. Of particular interest in some applications (including model calibration) is the distribution of edge spell durations (i.e., the lengths of time that specific relations are active). These may be conveniently computed via the `durations` command, which can also take `simEGP` network output with an `EventHistory` attribute. Typical usage is as follows:

```
dur <- durations(simtgnd)  # Compute the durations
head(dur)                  # Note the censoring column
```

```
        Duration Censoring
dur 0.0342010437         2
    0.0005308187         2
    0.0019659813         0
    0.0102452741         0
    0.0008508139         0
    0.0244737322         0
```

```
# Plot the duration distribution
plot(density(dur[,1]), log="x")
```

```
Warning in xy.coords(x, y, xlabel, ylabel, log): 1 x value <= 0 omitted from
logarithmic plot
```



Here, we can see that the spell durations are extremely skewed, with most being very short and a few being extremely long. This arises because our model has an extremely high rate of baseline edge turnover, coupled with a greatly reduced turnover for cohesively embedded edges. New edges without a shared partnership vanish almost immediately; however, if they become embedded in a cohesive unit, their persistence increases dramatically. This results in an extremely heterogeneous duration distribution.

In addition to the set of edge durations, the function by default returns the censoring indicators for each spell; these are 0 for uncensored, 1 for right-censored, 2 for left-censored, and 3 for interval censored. Censoring arises because the onset and termination times of all edges are not observed: we do not know, for instance, when the first edges in our network arose, and we do not know when the edges active in the final state of the network will end. While little censoring occurs in long trajectories with high turnover rates, corrections for censoring may be important when estimating duration statistics from shorter trajectories.

Many additional functions for extracting complex temporal information from `networkDynamic` objects (or visualizing them) can be found in the `tsna` and `ndtv` libraries. Extensive coverage of these packages is beyond this tutorial (indeed, it is the subject of other tutorials!), but a few examples bear mention. For instance, it is frequently of interest to know whether a diffusion or search process starting at one node can reach another (*forward reachability*). The `forward.reachable` command in `tsna` will identify the set of all vertices reachable by a focal vertex, considering network states between a given start and end point. For instance,

```
forward.reachable(simtgnd, v=1)                    # Whom can 1 reach over the whole period
```

```
 [1]  1 18 44 49 50 11 14 25  7 32 15 33 48 27 30  6 19 40 16 36  5 21  2  3 38
```

```
[26] 13 22 37 43 42 20 47 31  4  8 26 46  9 23 10 34 28 45 17 29 41 39 12 35 24
```

```
forward.reachable(simtgnd, v=1, end=median(dur))        # Whom can 1 reach in a typical edge duration
```

```
 [1]  1 18 44 49 50 11 14 25  7 32 15 33 48 27 30  6 19 40 16 36  5 21  2  3 38
[26] 13 22 37 43 42 20 47 31  4  8 26 46  9 23 10 34
```

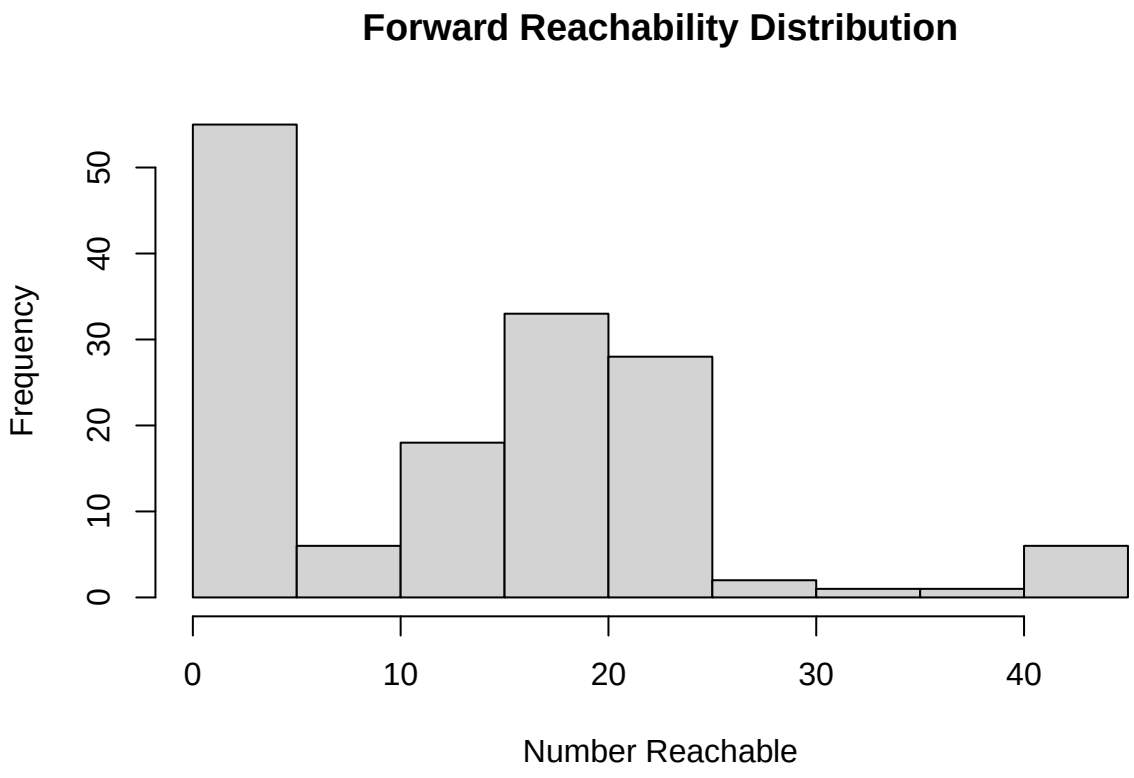
```
forward.reachable(simtgnd, v=1, start=100-median(dur))  # Same at the end
```

```
 [1]  1 26 43 45 46 13 17 23 19 28 35 24 40 48 12 41 44 11  3  9 20 27 30 31 49
[26]  5  6 38 25 16 39
```

```
forward.reachable(simtgnd, v=1, start=50, end=50+median(dur)) # Same in the middle
```

```
 [1]  1 12 23 40 44 45 17 19 35 26  8 41 43 24 33 42 11 14 32  3  7 13 46 48
```

```
# How many vertices can an average vertex reach, at a random time, in a typical duration?
cnt <- sapply(1:150, function(z){
  st <- runif(1,0,100)
  length(forward.reachable(simtgnd, v=sample(1:50,1), start=st, end=st+median(dur)))
})
hist(cnt, xlab = "Number Reachable", main = "Forward Reachability Distribution")
```

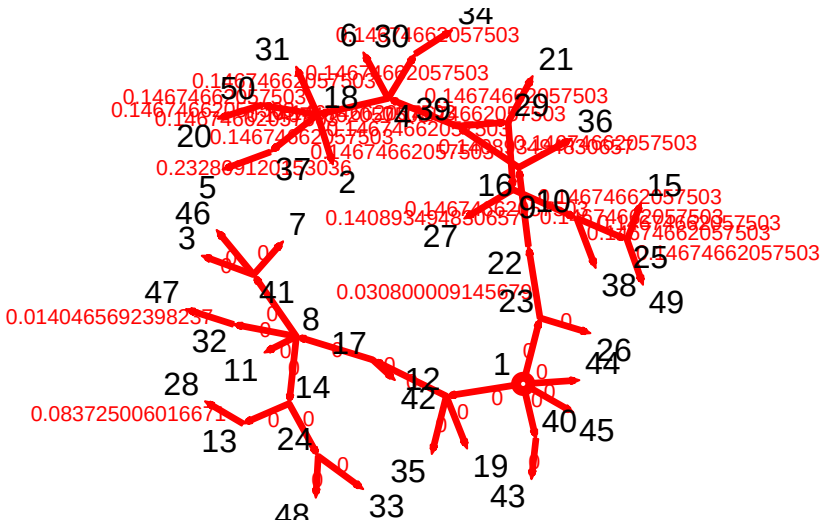


We can see here that vertex 1 shows impressive reach within a short period of time. Is that because this vertex is uniquely well-connected? Our distribution shows that it may be on the high side during these query periods, but a substantial range exists. Perhaps most notably, across vertices and across time we see substantial variation in short-duration forward reachability, showing that even a very simple process can have complex dynamics.

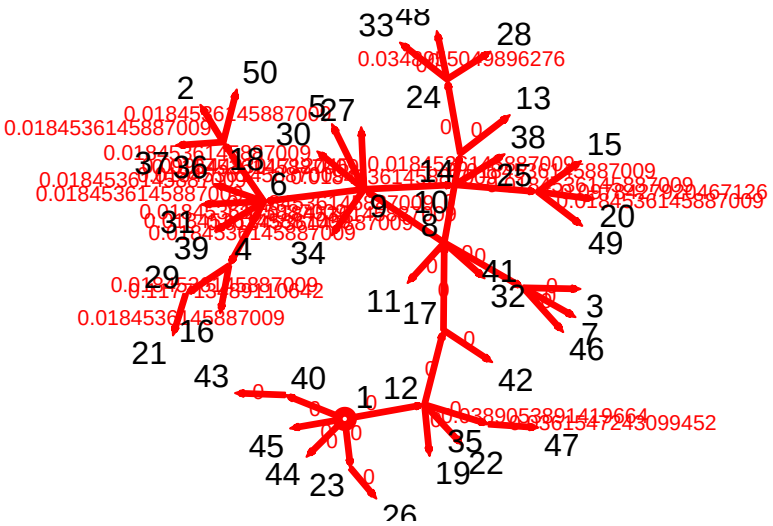
In some cases, one may want to examine not only whom can be reached by a focal vertex, but also what those

paths are through time. The `tsna` function `tPaths` (for "temporal paths") contains considerable functionality in this regard. For instance, we can compute and visualize paths from vertex 1 to other vertices (and vice versa) in the graph as follows

```
plot(tPath(simtgnd, v=1, start=50))                    # Plot paths from 1 to others
```

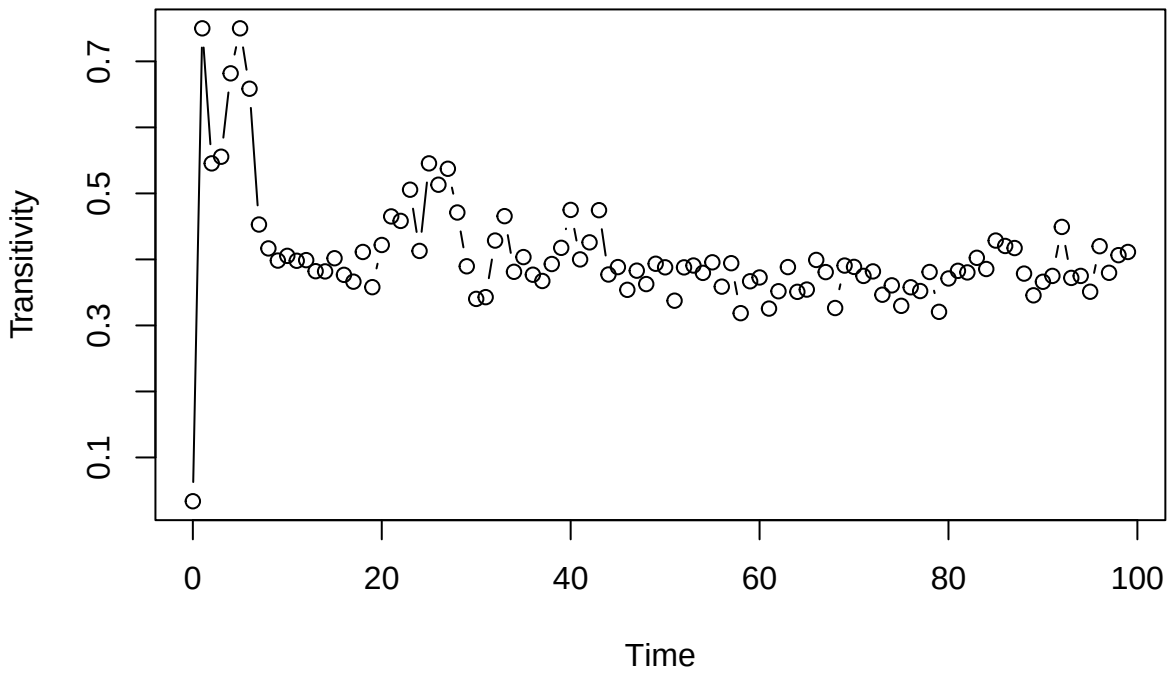



```
plot(tPath(simtgnd, v=1, end=50, direction="bkwd", type="latest"))  # Plot paths from others to 1
```



In addition to specialized metrics such as the above, `tsna` has functionality to automate computation of cross-sectional statistics from the `sna` library, using the `tSnaStats` function. This function can be passed a `networkDynamic` object, an interval to sample, and an `sna` function to evaluate it, and will perform the evaluation at each time slice. For instance, graph-level indices (e.g., transitivity) or node-level indices (e.g., degree) can easily be computed this way. Usage is relatively straightforward, e.g.:

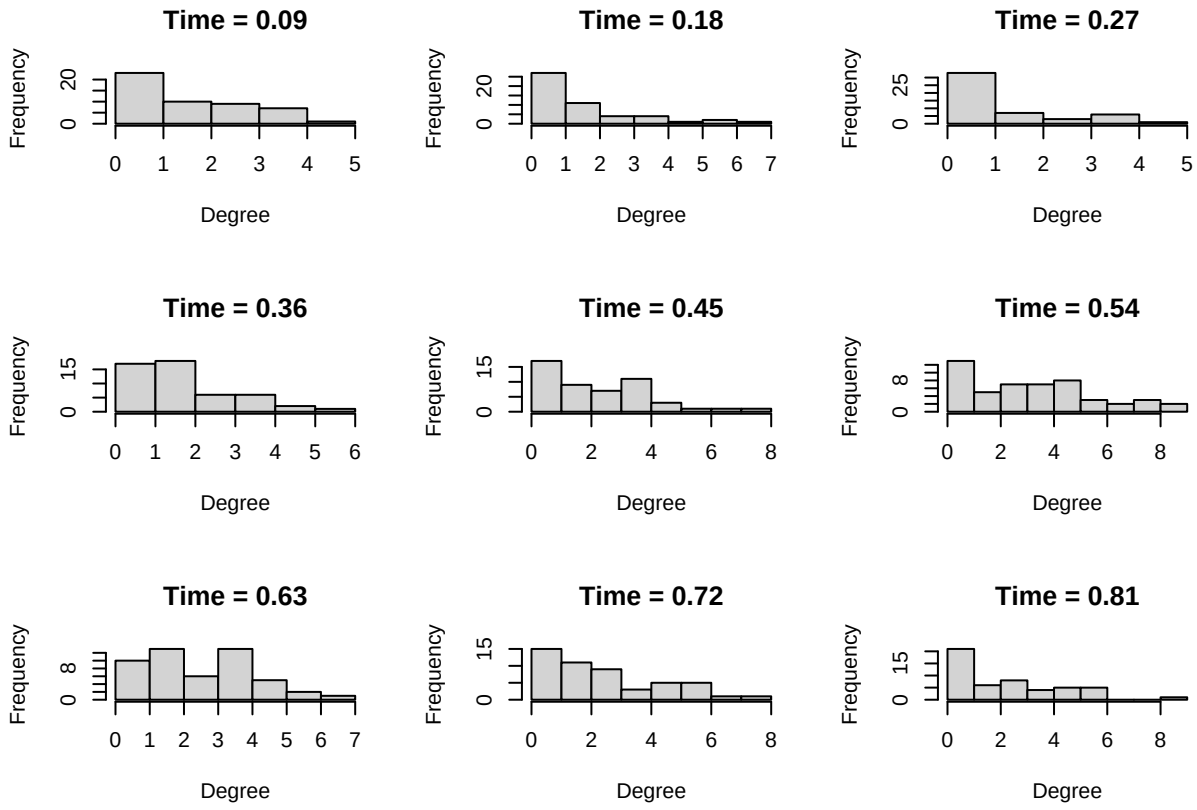
```
# Examine transitivity through time
plot(tSnaStats(simtgnd, snafun="gtrans", time.interval=1),type="b", ylab="Transitivity")
```




```
# Examine the degree distribution over time
dd <- tSnaStats(simtgnd, snafun="degree", time.interval=100/9, gmode="graph")
dim(dd)  # This is a time x vertex matrix
```

```
[1]  9 50
```

```
par(mfrow=c(3,3))
for(i in 1:9)
  hist(dd[i,], xlab="Degree", main = paste("Time =",attr(dd,"tsp")[3]*i))
```



Many other tools and options are available. See `library(help="tsna")` for more.

Another capability made straightforward via `networkDynamic` objects is dynamic visualization. The `ndtv` library offers very flexible tools for such visualization, including outputs in multiple formats. Here, we only mention one such case. `ndtv` supports creation of convenient, interactive visualizations using HTML5, which can be used with any modern web browser. This is done using the `render.d3movie` command. In order to tell it what it is to render, a network attribute called `slice.par` must be added to the simulation output containing the elements `start` (with the start time), `end` (with the end time), `aggregate.dur` (the interval over which it averages to create the network snapshots), `interval` (the gap between snapshots), and `rule` (generally, `latest` is desired). Passing the suitably endowed `networkDynamic` object to `render.d3movie` will result in the eponymous creation of interactive movie output. As an example, let us consider viewing the first 10 time units from our simulation, aggregating on the timescale of the median edge duration, with an interval of 0.1 time units. The code to do this looks like so:

```
simtgnd %n% "slice.par" <- list(start = 0, end = 10, aggregate.dur = 8e-04,
   interval = 0.1, rule = "latest")
render.d3movie(simtgnd, vertex.col = "x")
```

The HTML5 files created by this function can be saved and reused elsewhere. See the `ndtv` documentation for details.

3.3 Calculating Transition Hazards

When attempting to understand how dynamics occur, it can be useful to examine the hazards of edge formation/dissolution for a specified EGP occupying a particular state. These hazards can be calculated by the `EGPHazard` function, which will take a graph potential (expressed, as usual in terms of `ergm` formula(a) and coefficient vector(s)) and calculate the instantaneous transition hazard for each edge variable (or a subset thereof, if the `toggles` argument is used.

Let's see a simple example, using Padgett's Florentine family marriage network. Here, we will posit a simple LERGM EGP with an edge and an ESP(0) effect, expressing the notion that alliances between families are more stable when buttressed by shared partnerships. (Obviously, these are not shared partnerships at the individual level. Or so one presumes.) The hazards are obtained by a call to `EGPHazard`, as follows:

```
data(florentine)
haz <- EGPHazard(flomarriage ~ edges + esp(0), coef = c(-1, -1), process = "LERGM")
head(haz)
```

```
     Snd Rec IsForm     logHaz
[1,]   1   2      1 -0.3132617
[2,]   1   3      1 -0.3132617
[3,]   2   3      1 -0.3132617
[4,]   1   4      1 -2.1269280
[5,]   2   4      1 -0.3132617
[6,]   3   4      1 -2.1269280
```

As can be seen, the hazard matrix contains columns for the sender of the affected edge variable, the receiver of that edge variable, whether the toggle would be a formation (vs dissolution) event, and the log transition hazard. It may be observed that the probability that the ith transition will be the next realized event is $\lambda_i / \sum_j \lambda_j$, where λ_j is the hazard of the jth potential toggle, and the expected waiting time to the next toggle is $1/\sum_j \lambda_j$. From this we can e.g. identify the most likely next events:

```
fnam <- network.vertex.names(flomarriage)      # Get the family names
ord <- order(haz[,"logHaz"], decreasing=TRUE)  # Order by hazard
# Get the top ten
cbind(fnam[haz[ord,1]],fnam[haz[ord,2]], haz[ord,"IsForm"],round(haz[ord,"logHaz"],2))[1:10,]
```

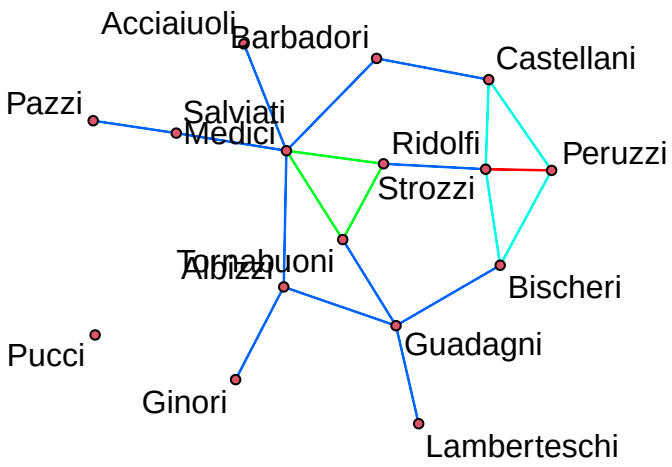
```
      [,1]          [,2]           [,3] [,4]
 [1,] "Barbadori"   "Castellani"   "0"  "-0.13"
 [2,] "Albizzi"     "Ginori"       "0"  "-0.13"
 [3,] "Albizzi"     "Guadagni"     "0"  "-0.13"
 [4,] "Bischeri"    "Guadagni"     "0"  "-0.13"
 [5,] "Guadagni"    "Lamberteschi" "0"  "-0.13"
 [6,] "Acciaiuoli"  "Medici"       "0"  "-0.13"
 [7,] "Albizzi"     "Medici"       "0"  "-0.13"
 [8,] "Barbadori"   "Medici"       "0"  "-0.13"
 [9,] "Guadagni"    "Medici"       "1"  "-0.13"
[10,] "Medici"      "Salviati"     "0"  "-0.13"
```

We can see that many of the most likely events are dissolution events. Visualizing them makes the pattern evident:

```
a <- function(z) (z-min(z))/diff(range(z))    # Convenience scaling function

# Create a matrix of color codes - blue = fast, red = slow
hm <- matrix(0,16,16)
hm[upper.tri(hm)] <- a(haz[,4])
hm[lower.tri(hm)] <- t(hm)[lower.tri(hm)]
cm <- matrix(hsv((hm)*0.6), 16, 16)

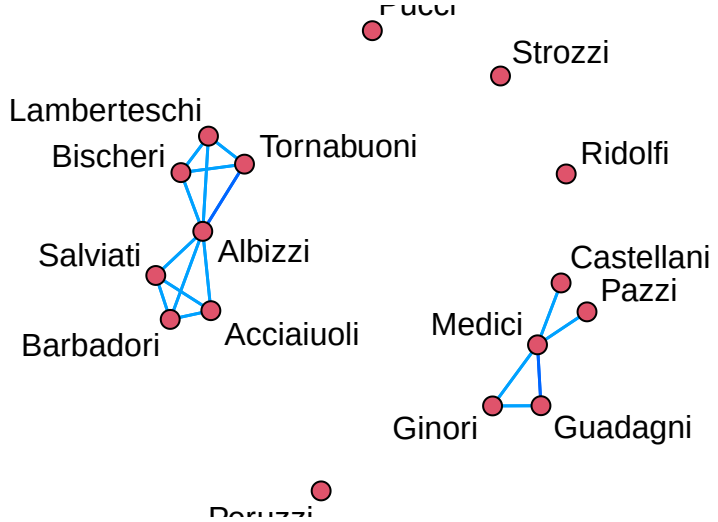
plot(flomarriage, edge.col=cm, displaylabels=TRUE)
```



The low-stability edges belong to a large collection of unbuttressed edges, incidentally revealing (in this model) a weakness of the Medici family versus their Strozzi rivals: more of the Strozzi alliances are predicted to be stable, while many of the Medici alliances are at risk of dissolution. (Or would be, if the family alliances followed this model.) Of course, dissolution is only part of the picture; what about ties that we would expect to be more likely to form? These are tough to visualize, because there are a lot of them, but we can grab the top candidates:

```
# Select out the nulls, and winnow them down
fhm <- hm
fhm <- fhm * (1 - flomarriage[, ])
fhm <- fhm > quantile(fhm, 0.75)  # Pick everything in the upper quartile

# Plot the most likely candidates
gplot(fhm, edge.col = cm, gmode = "graph", displaylabels = TRUE)  # Use gplot to plot adjacency matrice
```



This is revealing: note that the group with the most growth potential here is the Albizzi family! A glance at the former plot shows why. The Albizzis sit at the ends of numerous open two-paths, all of which are unstable under the model - thus, there are many families to which they are not yet aligned, but for which an alliance is favorable (and would be predicted to arise). We observe that the Medici also have room to grow (with four such high-probability formation events), though somewhat less. The Strozzi, by contrast, have none at all: their alliances are stable, but so are their "non-alliances." Of course, this is a simply a toy model, and is not based on events in Renaissance Florence - but it illustrates how EGPs can be used to gain insights into otherwise cross-sectional data.

Section 4: Elementary Rate Calibration

While this tutorial is not focused on inference, basic calibration of the rate of change for an EGP is a common problem; we may either want to find a rate that gives us a certain expected number of events in a fixed time period, or that gives us a certain expected time period for a fixed number of events. In the `ergmgp` package, the `EGPRateEst` function can be used to facilitate such tasks. `EGPRateEst` takes an EGP (specified, as usual, by a graph potential and coefficient set) and either a target number of events (set by `event.target`) or a target time (set by `time.target`). If `event.target` is set, the `EGPRateEst` will run multiple independent trajectories from the specified start point until the specified number of events occurs, returning the mean time required for the events to accrue. Likewise, if `time.target` is set, the function will estimate the average number of events occuring within the specified time period. An estimate of the standard error is given in each case, as well as the standard deviation of the random quantity.

Let's see a simple example, again using our Florentine model. We will ask, on the one hand, how much time is needed for 100 events to elapse, and, on the other, how many events are expected to occur within 10 time units. Both are computed as follows:

```
set.seed(1331)
```

```
# How much time, on average, to get 100 events?
EGPRateEst(flomarriage ~ edges + esp(0), coef = c(-1, -1), process = "LERGM",event.target=100)
```

```
   mean.time mean.time.se      sd.time replications
  2.53790209   0.05718931   0.28594654  25.00000000
```

```
# How many events, on average, in 10 time units?
EGPRateEst(flomarriage ~ edges + esp(0), coef = c(-1, -1), process = "LERGM",time.target=10)
```

```
  mean.events mean.event.se     sd.events  replications
   435.720000      7.734882     38.674410     25.000000
```

We can see that, for this model (and starting with the observed data), it takes about 2.5 time units to accrue 100 events (on average), and a 10-unit simulation is expected to accrue an average of 436 events. These two numbers are in *relative* agreement ($10/2.5100 = 400 \approx 436$) but they do not exactly align (and this does not go away with increased numbers of replicates). Why the discrepancy? First, since the mapping from events/time to time/events is nonlinear, we should not expect their respective means to agree perfectly. But secondly - and more subtly - our model here is *out of equilibrium*. We are using short trajectories starting with the observed Florentine marriage network, but (since our model was never calibrated to it) we have no reason to think that the observed network is typical of what would be seen from this model over time. As such, we would expect our network state to be moving away from the starting point, and its progress may be different when measured in units of time or events. Thus, if we wanted to estimate these respective means *in general*, it would behoove us to run the model from a starting point drawn from the equilibrium distribution of the EGP. How can we do that? Simple: since this is an EGP, we can just use the corresponding ERGM! The `ergm` package `simulate` method for ERGM formulas will (provided we run the MCMC long enough) give us an equilibrium draw, which we can use as a valid starting point. Of course, in some cases we may be genuinely interested in e.g. how long it takes to accumulate a certain amount of change from a specific target graph, or (by turns) how much change we'll see in a certain period given a specific starting point, perhaps quite precisely because the network *is* far from equilibrium! In that case, we should use our substantively chosen starting point for the calculation. The important thing, as always, is to have the procedure match the goals.

Section 5: Simple Demonstrations

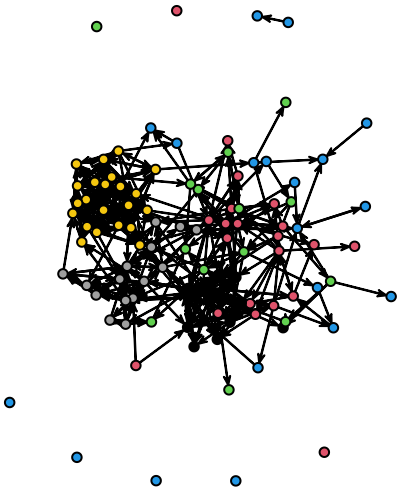
As a general tool for modeling continuous time network dynamics with guaranteed long-run behavior, `ergmgp` can be used in many ways. Here, we give a few simple demonstrations.

5.1 Creating Plausible Dynamics from Cross-sectional Observations

In some settings, we may have a cross-sectional observation of a social network, taken at what we believe to be a (suitably) random time, and may seek to create a corresponding plausible dynamic model that is compatible with the cross-sectional observation (in the sense that we would not be surprised to have observed it, were our observations taken from the hypothesized process). This may be sought as a substantively insightful model, or as a proxy model for use e.g. in method testing. For instance, Butts (2025) uses LERGMs fit to observations of friendship and advice-seeking networks in an organization to create temporally consistent discrete time dynamics with controllable velocity, for use in testing the effect of change rates on a network analytic procedure.

Here, we illustrate a simple example of such an application. For demonstration purposes, we use the Faux Desert High network from the `ergm` package, a synthetic network based on a school from the AddHealth data set. Although we do not know the actual parameters used to produce the network, we can approximate them by fitting the original model (or something very close to it) to the realized graph. Here, we use the Stochastic Approximation method in `ergm`, which tends to work a bit better on this case:

```
data(faux.desert.high)  # Load the data set
plot(faux.desert.high, vertex.col="grade")  # Take a quick look at the network, by grade
```



```
set.seed(1331)
dhfit <- ergm(faux.desert.high ~ edges + mutual + absdiff("grade") + nodefactor("race",base=5)
    + nodefactor("grade",base=3) + nodefactor("sex") + nodematch("race",diff=TRUE)
    + nodematch("grade", diff=TRUE) + nodematch("sex") +idegree(0:1) +odegree(0:1)
    + gwesp(0.1,fixed=TRUE), control=control.ergm(MCMC.interval=1e4, main.method="Stochastic",
    SA.nsubphases=5,init=c(log(0.038),rep(0,29))))
```

```
In term 'nodefactor' in package 'ergm': Argument 'base' has been superseded by 'levels', and it is reco
Observed statistic(s) nodefactor.race.A, nodematch.race.A, and nodematch.race.B are at their smallest a
```

```
Warning in ergm.checkextreme.model(model = model, nw = nw, init = control$init,
: Overriding user-specified initial init coefficient. To preserve, enclose in
an offset() function.
```

```
Stochastic approximation algorithm with theta_0 equal to:
```

```
             edges             mutual       absdiff.grade   nodefactor.race.A
          -3.270169           0.000000           0.000000               -Inf
  nodefactor.race.B   nodefactor.race.H   nodefactor.race.O  nodefactor.grade.7
           0.000000           0.000000           0.000000           0.000000
 nodefactor.grade.8 nodefactor.grade.10 nodefactor.grade.11 nodefactor.grade.12
           0.000000           0.000000           0.000000           0.000000
   nodefactor.sex.2    nodematch.race.A    nodematch.race.B    nodematch.race.H
           0.000000               -Inf               -Inf           0.000000
   nodematch.race.O    nodematch.race.W   nodematch.grade.7   nodematch.grade.8
           0.000000           0.000000           0.000000           0.000000
  nodematch.grade.9  nodematch.grade.10  nodematch.grade.11  nodematch.grade.12
           0.000000           0.000000           0.000000           0.000000
```

```
      nodematch.sex            idegree0            idegree1            odegree0
           0.000000            0.000000            0.000000            0.000000
           odegree1 gwesp.OTP.fixed.0.1
           0.000000            0.000000
Starting burnin of 160000 steps
Phase 1: 200 steps (interval = 10000)

Stochastic Approximation estimate:
              edges             mutual       absdiff.grade   nodefactor.race.A
      -3.493160e+00       1.571110e+00       -4.418183e-01       -4.503600e+15
  nodefactor.race.B   nodefactor.race.H   nodefactor.race.O  nodefactor.grade.7
      -5.616746e-01       -4.978187e-01       -6.576229e-01       -3.025185e-01
 nodefactor.grade.8 nodefactor.grade.10 nodefactor.grade.11 nodefactor.grade.12
       5.655792e-02        3.279961e-01        2.254890e-01       -1.959037e-01
   nodefactor.sex.2    nodematch.race.A    nodematch.race.B    nodematch.race.H
      -2.140090e-02       -4.503600e+15       -4.503600e+15        2.794626e+00
   nodematch.race.O    nodematch.race.W   nodematch.grade.7   nodematch.grade.8
       1.455602e+00       -5.514859e-01        1.839270e+00        1.096237e+00
  nodematch.grade.9  nodematch.grade.10  nodematch.grade.11  nodematch.grade.12
       1.114584e+00        7.793032e-02        4.570539e-01        8.737107e-01
      nodematch.sex            idegree0            idegree1            odegree0
       2.578471e-01       -6.557088e-01       -2.078819e-01        1.568672e+00
           odegree1 gwesp.OTP.fixed.0.1
       4.898456e-01        8.951161e-01
Phase 3:  1000 iterations (interval=10000)
Evaluating log-likelihood at the estimate. Fitting the dyad-independent submodel...
Bridging between the dyad-independent submodel and the full model...
Setting up bridge sampling...
Using 16 bridges: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 .
Bridging finished.

This model was fit using MCMC.  To examine model diagnostics and check
for degeneracy, use the mcmc.diagnostics() function.
```

```
summary(dhfit)
```

```
Call:
ergm(formula = faux.desert.high ~ edges + mutual + absdiff("grade") +
    nodefactor("race", base = 5) + nodefactor("grade", base = 3) +
    nodefactor("sex") + nodematch("race", diff = TRUE) + nodematch("grade",
    diff = TRUE) + nodematch("sex") + idegree(0:1) + odegree(0:1) +
    gwesp(0.1, fixed = TRUE), control = control.ergm(MCMC.interval = 10000,
    main.method = "Stochastic", SA.nsubphases = 5, init = c(log(0.038),
        rep(0, 29))))

Stochastic Approximation Maximum Likelihood Results:

                     Estimate Std. Error MCMC % z value Pr(>|z|)
edges               -2.351e+00  8.238e-01      0  -2.854 0.004319 **
mutual               1.584e+00  1.963e-01      0   8.069  < 1e-04 ***
absdiff.grade       -5.245e-01  1.109e-01      0  -4.729  < 1e-04 ***
nodefactor.race.A   -4.504e+15  0.000e+00      0    -Inf  < 1e-04 ***
nodefactor.race.B   -1.593e+00  7.834e-01      0  -2.033 0.042044 *
nodefactor.race.H   -1.483e+00  7.490e-01      0  -1.980 0.047647 *
nodefactor.race.O   -1.644e+00  7.510e-01      0  -2.189 0.028576 *
```

```
nodefactor.grade.7  -2.286e-01  2.400e-01      0  -0.953 0.340831
nodefactor.grade.8   7.444e-02  2.158e-01      0   0.345 0.730070
nodefactor.grade.10  3.523e-01  2.190e-01      0   1.609 0.107641
nodefactor.grade.11  2.556e-01  1.909e-01      0   1.339 0.180632
nodefactor.grade.12 -1.031e-01  3.075e-01      0  -0.335 0.737487
nodefactor.sex.2    -2.609e-02  5.273e-02      0  -0.495 0.620674
nodematch.race.A    -4.504e+15  0.000e+00      0    -Inf  < 1e-04 ***
nodematch.race.B    -4.504e+15  0.000e+00      0    -Inf  < 1e-04 ***
nodematch.race.H     3.754e+00  1.322e+00      0   2.839 0.004519 **
nodematch.race.O     2.423e+00  1.112e+00      0   2.180 0.029280 *
nodematch.race.W    -1.598e+00  7.791e-01      0  -2.052 0.040218 *
nodematch.grade.7    1.627e+00  4.889e-01      0   3.329 0.000873 ***
nodematch.grade.8    9.727e-01  3.558e-01      0   2.734 0.006253 **
nodematch.grade.9    1.040e+00  3.249e-01      0   3.201 0.001370 **
nodematch.grade.10  -3.590e-02  3.167e-01      0  -0.113 0.909760
nodematch.grade.11   3.093e-01  4.037e-01      0   0.766 0.443622
nodematch.grade.12   6.197e-01  6.085e-01      0   1.018 0.308483
nodematch.sex        2.643e-01  9.453e-02      0   2.797 0.005165 **
idegree0            -5.884e-01  6.001e-01      0  -0.981 0.326813
idegree1            -1.524e-01  4.004e-01      0  -0.381 0.703387
odegree0             1.687e+00  5.056e-01      0   3.337 0.000848 ***
odegree1             5.812e-01  4.300e-01      0   1.351 0.176573
gwesp.OTP.fixed.0.1  8.712e-01  1.213e-01      0   7.179  < 1e-04 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1


 Warning: The following terms have infinite coefficient estimates:
  nodefactor.race.A nodematch.race.A nodematch.race.B
```

Voila! This gives us our equilibrium distribution. Now for dynamics. Our presumption here is that we lack data on dynamics (which is true), but we want to produce something plausible. A reasonable way to proceed in such cases can be to look for information from related data, that will provide at least an approximate basis for calibration. Here, a natural thing to consider are other studies using the AddHealth data set, which have looked at tie turnover rates. For instance, in a study of two of the larger schools from the data set, Lakon et al. (2014) report approximately 15% of ties surviving in the 6 months between wave 1 (when this data would have been taken) and wave 2 (which we do not have). While the school on which Faux Desert High was based may or may not have had quite the same turnover rate, this seems a reasonable ballpark.

We must then decide how to use this information. The simplest way to proceed is to assume that ties fail at a constant rate, suggesting a constant dissolution rate continuum STERGM. At a constant dissolution rate, 15% survival in 6 months implies a failure rate of $r = -\log(0.15)/6 \approx 0.316$ per month. Taking our time units to reflect months (which we may freely choose), this implies that our dissolution parameter is equal to $\theta_d = \log(0.316) = -1.15$. Where does it leave our formation parameters? We know that, for the CDCSTERGM, the equilibrium potential is $q(y) = q_f(y) - \theta_d w_e(y)$. Here, we know $q(y)$ (from our fitted model), and thus can obtain the formation potential as $q_f(y) = q(y) + \theta_d w_e(y)$; i.e., we use the fitted ERGM potential, with an adjustment to the edge parameter. We may thus specify our EGP as follows:

```
# Define the coefficients
dhdco <- log(-log(0.15)/6)        # Dissolution coefficient (15% survival at 6 months)
dhfco <- coef(dhfit)              # Formation coefficients (from ERGM)
dhfco[1] <- dhfco[1] + dhdco      #   Need to adjust the edge term for dissolution
dhco <- list(formation = dhfco, dissolution = dhdco)

# Define the formula (which is just the ERGM formula)
```

```
dhform <- formula(dhfit)
```

We now have all of the ingredients needed for our model: a choice of process, a starting point, a set of terms, and a set of coefficients. Simulation is now straightforward, using `simEGP`. Since we've chosen to parameterize time units in terms of months, we will simulate a 12 month period, giving us a "year in the life" of our hypothetical high school.

```
set.seed(1331)
dhsim <- simEGP(dhform, coef=dhco, process = "CDCSTERGM", time=12, return.networkDynamic=TRUE)
```

```
Initializing simulation: max events=inf, max time=12.000000, initial pot=(-1453.652597,-505.474491)
event=0, t=0.000000, pot=(-1453.652597,-505.474491)
event=100, t=0.343787, pot=(-1434.598877,-620.616744)
event=200, t=0.619926, pot=(-1440.933523,-735.758997)
event=300, t=0.962465, pot=(-1484.009130,-850.901250)
event=400, t=1.339712, pot=(-1471.246256,-966.043503)
event=500, t=1.707617, pot=(-1446.904305,-1081.185756)
event=600, t=2.029858, pot=(-1469.116729,-1196.328009)
event=700, t=2.377658, pot=(-1453.233094,-1311.470262)
event=800, t=2.678660, pot=(-1400.465876,-1426.612515)
event=900, t=3.034229, pot=(-1461.670256,-1541.754768)
event=1000, t=3.340667, pot=(-1430.746013,-1656.897021)
event=1100, t=3.680238, pot=(-1421.542341,-1772.039274)
event=1200, t=4.013906, pot=(-1485.452448,-1887.181527)
event=1300, t=4.413096, pot=(-1465.650577,-2002.323780)
event=1400, t=4.736373, pot=(-1429.515921,-2117.466034)
event=1500, t=5.039823, pot=(-1439.023159,-2232.608287)
event=1600, t=5.399201, pot=(-1419.163325,-2347.750540)
event=1700, t=5.744339, pot=(-1423.459815,-2462.892793)
event=1800, t=6.131928, pot=(-1433.358743,-2578.035046)
event=1900, t=6.499923, pot=(-1468.642132,-2693.177299)
event=2000, t=6.853183, pot=(-1445.656609,-2808.319552)
event=2100, t=7.233363, pot=(-1413.003456,-2923.461805)
event=2200, t=7.550769, pot=(-1393.781782,-3038.604058)
event=2300, t=7.908876, pot=(-1426.295902,-3153.746311)
event=2400, t=8.302951, pot=(-1459.026030,-3268.888564)
event=2500, t=8.658421, pot=(-1499.808359,-3384.030817)
event=2600, t=8.981328, pot=(-1510.878139,-3499.173070)
event=2700, t=9.354742, pot=(-1512.793772,-3614.315323)
event=2800, t=9.738251, pot=(-1462.947574,-3729.457576)
event=2900, t=10.102338, pot=(-1455.307095,-3844.599829)
event=3000, t=10.493265, pot=(-1510.257505,-3959.742082)
event=3100, t=10.912648, pot=(-1444.172114,-4074.884335)
event=3200, t=11.250946, pot=(-1500.992010,-4190.026588)
event=3300, t=11.616319, pot=(-1480.570370,-4305.168841)
event=3400, t=11.935933, pot=(-1439.765988,-4420.311094)
Edge activity in base.net was ignored
Created net.obs.period to describe network
 Network observation period info:
  Number of observation spells: 1
  Maximal time range observed: 0 until 12
  Temporal mode: continuous
  Time unit: unknown
  Suggested time increment: NA
```

Note that we decided to return our result in `networkDynamic` form, in order to facilitate downstream examination. Since our network is not all that huge, dynamic visualization is potentially worthwhile. The following code will produce an interactive movie using `ndtv`, aggregating data and taking snapshots on a weekly basis. This is by default written as HTML5 code that can be saved and reused. Note that we tweak the default layout here a bit, since Kamada-Kawai makes it a little easier to see what is changing for this network.

```
# Render 'a year in the life,' at weekly resolution
dhsim %n% "slice.par" <- list(start = 0, end = 12, aggregate.dur = 0.25,
   interval = 0.25, rule = "latest")
render.d3movie(dhsim, vertex.col = "grade", edge.lwd = 2, mode = "kamadakawai")
```

Now that we have our simulated trajectory, we can use it as we please. Here's one example. While adolescents have many positive interactions through friendships, friendship ties are also conduits for power and influence: individuals bargain for favors, position for status, compete for access to scarce resources (whether it be who gets to sit in the front seat of the car or who decides which activities the group will pursue), and engage in other interactions that create relative winners and losers. These types of interactions have the character of *negative exchange* - *ceteris paribus,* ego's position is stronger when their alter's is weaker. One of many metrics created to proxy negative exchange outcomes is the *Bonacich power score* (Bonacich, 1987), a feedback centrality measure of the form

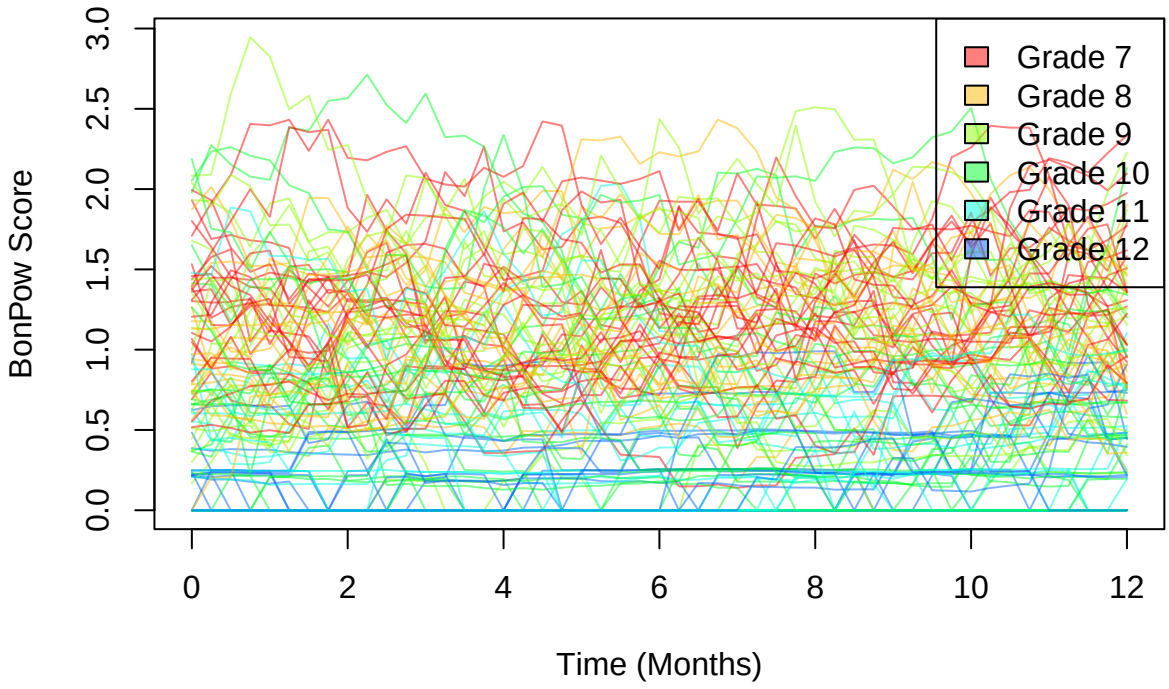
$$b(v, y) \propto [(I - \rho y)^{-1} y\mathbf{1}]_v$$

where v is the selected vertex, $\mathbf{1}$ is the 1-vector, I is the identity matrix, and ρ is an *attenuation* parameter that governs the diffusion of power through the network. b arises as the equilibrium of a forced linear diffusion process in discrete time, whereby each individual gets an input of $y\mathbf{1}$ (i.e., their degree) in each period, and then has their power incremented/decremented by ρ times the sum of their neighbors' current power scores. Choosing $\rho > 0$ leads to a situation in which ego gains power by having strong alters, as is characteristic of a positive exchange network; by turns when $\rho < 0$, ego loses power when their alters are strong. This negative regime is the one of interest here.

When exchange process equilibrates on the same timescale as network evolution, the above does not hold (see Butts 2025), but for the types of phenomena described above, it is reasonable to assume that the bargaining process is always in equilibrium relative to network dynamics (i.e., we have timescale separation). Given that assumption, how does "drama" (in the sense of power exercise) vary across the network, and through time? To begin, we can use `tSnaStats` to calculate power scores over the course of the simulation, plotting the trajectories of individuals' scores.

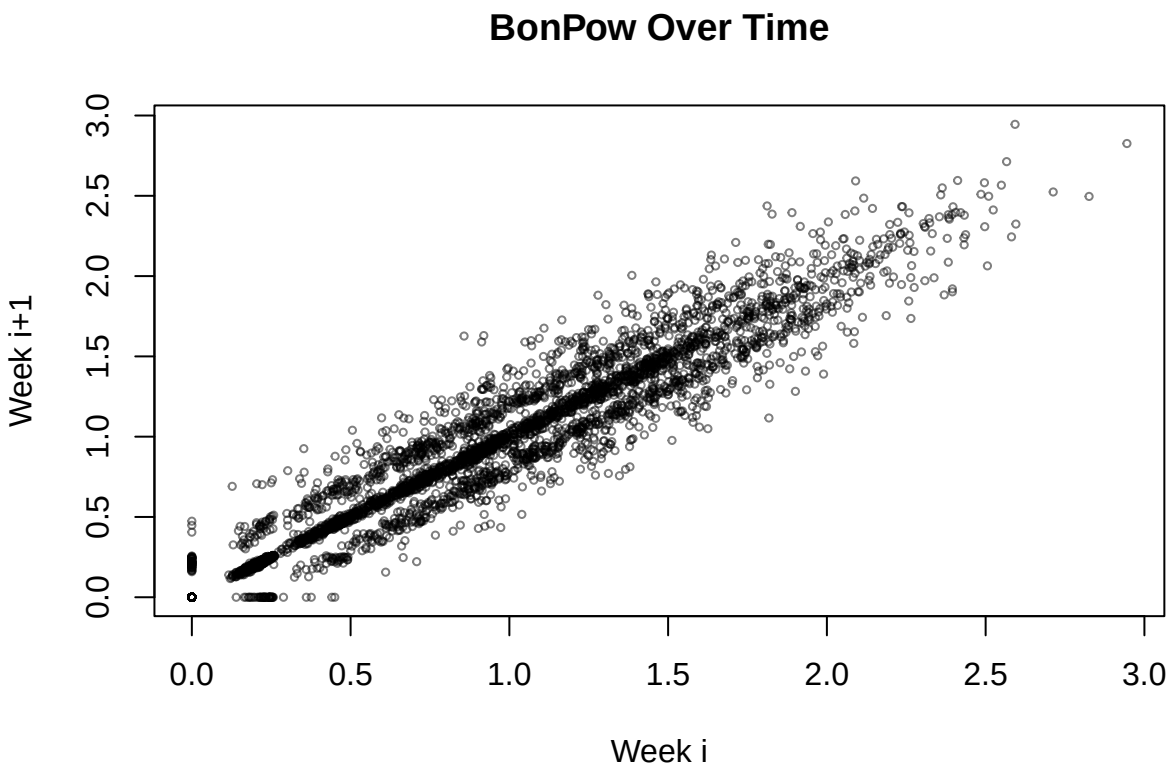
```
# Compute bonpow scores over time, with rho<0; we use a value close to the maximum
# convergent value
dhbp <- tSnaStats(dhsim, snafun="bonpow", exponent=-1/Mod(eigen(dhsim[,])$val[1]), start=0,
    end=12, time.interval=0.25)

# Visualize the scores
tsteps<-seq(from=0, to=12, by=0.25)
gr<-dhsim%v%"grade"
plot(0,0,type="n",xlim=c(0,12), ylim=range(dhbp),ylab="BonPow Score", xlab="Time (Months)")
for(i in 1:NCOL(dhbp))
  lines(tsteps, dhbp[,i], col=hsv((gr[i]-7)/(12-7)*0.6,alpha=0.5))
legend("topright", fill=hsv((0:5)/5*0.6,alpha=0.5), legend=paste("Grade",7:12))
```



This plot suggests several things. First, we do see variation over time in individual power scores, with fortunes rising and falling as the network evolves. But second, while fortunes evolve, there also seems to be a lot of autocorrelation. We can examine this directly, by simply plotting week-on-week change:

```
# Plot each week against the next
powlast<-as.vector(dhbp[-NROW(dhbp),])
pownext<-as.vector(dhbp[-1,])
plot(powlast,pownext, cex=0.5, col=rgb(0,0,0,0.5), xlab="Week i", ylab = "Week i+1",
    main = "BonPow Over Time")
```



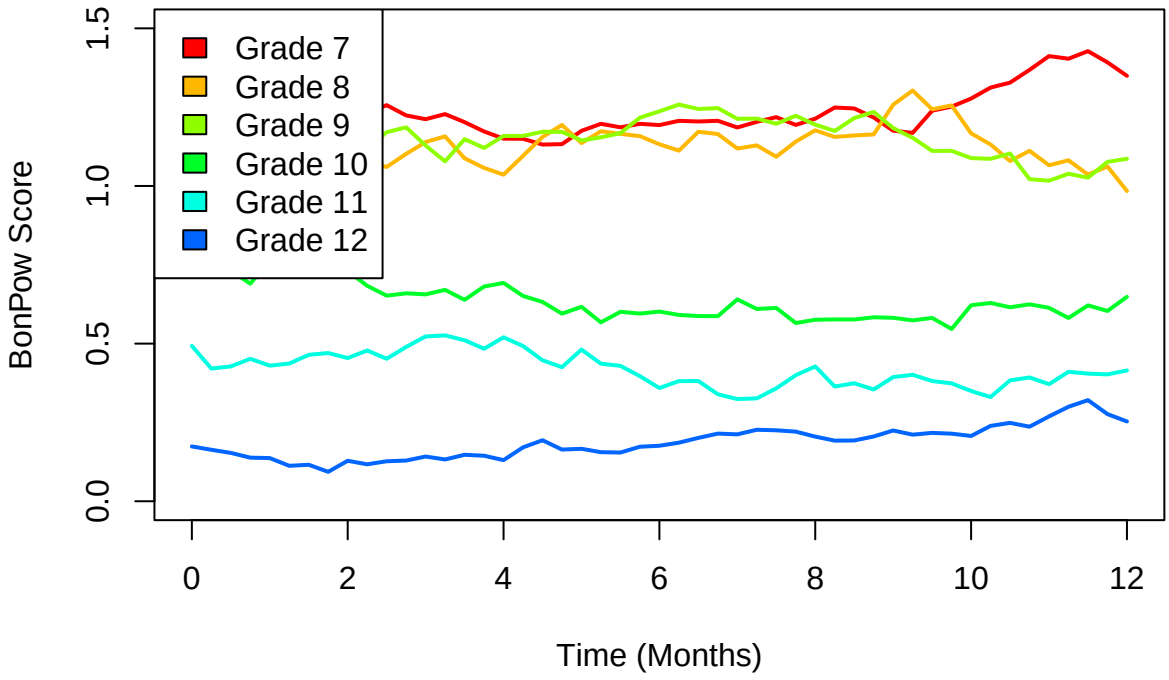

```
# What's the overall first-order autocorrelation"
cor(powlast,pownext)
```

```
[1] 0.9696046
```

We can see that most individuals stay more or less where they are on a given week, with some gaining and others losing. It is interesting to note that gains and losses are not entirely continuous, and change by semi-discrete "jump" away from the past state. This arises because we are primarily seeing the impact of single edge changes, which exert a unit shift in the local power scores; these are, however, slightly amplified or attenuated by local network structure, resulting in a "blurring" of the underlying perturbation. Such semi-discrete effects of time-evolution could potentially affect how individuals understand their own situations, and are an example of a non-obvious insight that can be gained by studying the behavior of dynamic models.

Another observation from our above figure is that "drama" doesn't seem to be uniformly distributed across grade. We can gain further insight by examining the evolution of the mean scores by grade over time:

```
# Plot mean BonPow scores
plot(0,0,type="n",xlim=c(0,12), ylim=c(0,1.5),ylab="BonPow Score", xlab="Time (Months)")
for(i in 7:12)
  lines(tsteps, dhbp%*%(gr==i)/sum(gr==i), col=hsv((i-7)/(12-7)*0.6), lwd=2)
legend("topleft", fill=hsv((0:5)/5*0.6), legend=paste("Grade",7:12), bg="white")
```



A very clear pattern is evident here: while the average leverage within each grade evolves with time, we see much more of it in lower grades than higher ones. At least to the extent that BonPow captures "drama," it seems to be maximized within the relatively dense networks of the junior high school (7-9) students, and reduced within the much looser and more fluid networks of the older students. This suggests very real differences in the social milieus of younger and older students, as well as a gradual change in social context as the students enter their transition to adulthood. Of course, this is a toy model, and should not be taken too seriously. It does, however, comport with frequently asserted folk wisdom about social relations during this time of life.

5.2 Continuous Time Dynamics from Sampled Data

The above section shows how we can use a network cross-section and some basic intuition (or perhaps some related data) to create a model of social dynamics. An important use case along similar lines is to create models with continuous time dynamics from sampled network data (combined with some duration information). The idea of building dynamic models from sampled data was the original motivation behind the discrete-time STERGMs (Krivitsky, 2012; Krivitsky and Handcock, 2014), as well as recent work on ERGM inference from egocentric data (Krivitsky and Morris, 2017). The central insight motivating this work is that ERGM inference for a given model requires only the sufficient statistics for the observed data, which may often be approximated via sampling. Likewise, tie duration information may in some cases be obtained by eliciting the onset times of observed ties. If one is willing to assume constant dissolution rates, then one can obtain STERGMs that approximate both the overall pace of change and the equilibrium graph distribution (Carnegie et al., 2015). As we have already see, the CDCSTERGMs provide a continuous-time parallel to this type of model class, and the same strategies are hence applicable to it. Unlike discrete models, however, the CDCSTERGM is not subject to artifacts from timescale selection, difficulties in aligning to data sets with different temporal resolution, or other problems arising from the discrete-time approximation.

Here, we consider a simplified example, that illustrates how this process can be used. Much more in-depth

treatment of the relevant issues can be found in the `statnet` "Egocentric Network Data Analysis with ERGMs" tutorial, which is highly recommended for those seeking to use this approach.

Our simplified case involves a heterosexual contact network in a population of 922 individuals, of whom 453 are male and 469 are female. Based on an egocentric survey, we estimate that 181 of the males were isolates at the time of measurement (i.e., no current partners), as were 281 of the females. The mean degrees for male and female respondents were respectively estimated to be 0.9 and 0.87. (Note that, setting aside error, these quantities must differ, since the network is bipartite and the number of individuals in each group differs.) From the above, we estimate that the network contains approximately 408 edges. Likewise, based on individuals' reports of relationship duration, we estimate that the mean duration of a sexual partnership in this community is approximately 8.3 months.

From this information, we can fit a simple ERGM. We begin by creating a bipartite graph, with respectively 453 and 469 row and column vertices (synonymous here with sex). As we also have estimates of the male/female isolate counts and total edge count, we can employ these as model statistics. Although we do not have the actual network, we do not need it: we can create a synthetic network, and fit to the estimated statistics using the `target.stats` argument of `ergm`. (Pro tip: it does help, however, to initialize the synthetic network with a structure of roughly correct density, particularly in a large network such as this one. We do this here by using `rgraph` to create a Bernoulli graph with a density in the neighborhood of the observed, which improves the performance of the ERGM initialization process.)

```
# Create our synthetic network (we don't fit to it, but it is computationally important)
set.seed(1331)
snet <- as.network(rgraph(922,tp=1.8/921,mode="graph")[1:453,454:922],
    bipartite=453, directed=FALSE)
snet%v%"sex" <- rep(c("M","F"),times=c(453,469))

# Fit an ERGM to the population, using the estimated sufficient statistics
set.seed(1331)
snfit <- ergm(snet ~ edges+degree(0,by="sex"), target.stats=c(408, 181, 281),
    control=control.ergm(MCMC.interval=1e5))
```

```
Starting maximum pseudolikelihood estimation (MPLE):

Obtaining the responsible dyads.

Evaluating the predictor and response matrix.

Maximizing the pseudolikelihood.

Finished MPLE.

Starting Monte Carlo maximum likelihood estimation (MCMLE):

Iteration 1 of at most 60:

1 Optimizing with step length 1.0000.
The log-likelihood improved by 0.3214.
Estimating equations are not within tolerance region.
Iteration 2 of at most 60:
1 Optimizing with step length 1.0000.
The log-likelihood improved by 0.0170.
Convergence test p-value: 0.0001. Converged with 99% confidence.
Finished MCMLE.
Evaluating log-likelihood at the estimate. Fitting the dyad-independent submodel...
Bridging between the dyad-independent submodel and the full model...
Setting up bridge sampling...
Using 16 bridges: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 .
Bridging finished.
```

```
This model was fit using MCMC.  To examine model diagnostics and check
for degeneracy, use the mcmc.diagnostics() function.
```

```
summary(snfit)
```

```
Call:
ergm(formula = snet ~ edges + degree(0, by = "sex"), target.stats = c(408,
    181, 281), control = control.ergm(MCMC.interval = 1e+05))

Monte Carlo Maximum Likelihood Results:

          Estimate Std. Error MCMC % z value Pr(>|z|)
edges     -5.57008    0.09278      0 -60.038   <1e-04 ***
deg0.sexF -0.36255    0.14854      0  -2.441   0.0147 *
deg0.sexM  2.43765    0.16261      0  14.990   <1e-04 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

     Null Deviance: 294528  on 212457  degrees of freedom
 Residual Deviance:   5684  on 212454  degrees of freedom

AIC: 5690  BIC: 5721  (Smaller is better. MC Std. Err. = 0.5097)
```

Voila! We have a model. (For a more rigorous treatment, including handling of uncertainty associated with the sampling process, see the above tutorial on egocentric inference.)

Given that all we know is the mean tie duration, it seems reasonable to use a CDCSTERGM here. As in our above example, we can easily obtain the coefficient corresponding to the reported mean duration of 8.3 months, by exploiting the fact that for this process, tie durations are exponentially distributed. Since we have the equilibrium graph potential from the ERGM, we can then correct for dissolution to get the formation potential:

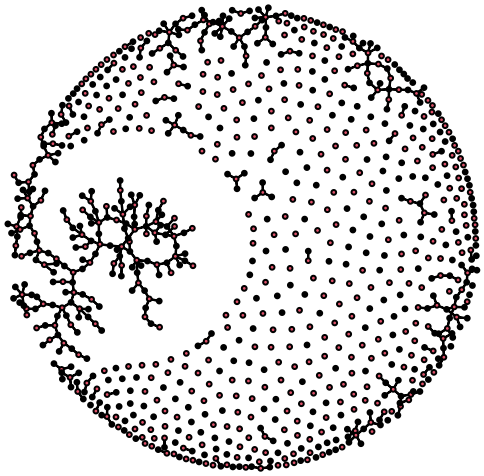
```
# Define the coefficients
sndco <- -log(8.3)                # Dissolution coefficient (mean survival time 8.3 months)
snfco <- coef(snfit)              # Formation coefficients (from ERGM)
snfco[1] <- snfco[1] + sndco      #   Need to adjust the edge term for dissolution
snco <- list(formation = snfco, dissolution = sndco)

# Define the formula (which is just the ERGM formula)
snform <- formula(snfit)
```

Note, incidentally, that we do not *have* to use a CDCSTERGM here: most of the EGPs supported in `ergmgp` can be identified from a combination of cross-sectional and rate information. Because the tie decay processes in these models are non-uniform, however, simulation-based calibration to the mean edge duration would be required. That said, the CDCSTERGM is a fairly natural first-approximation model for a system of this kind.

Given the model, we can now simulate from it! In doing so, we must be careful regarding our initial condition: the synthetic graph we started with was *not* an equilibrium draw from our dynamic process, and indeed was deliberately *ad hoc*. If we were to use it as our starting point, our dynamics would be dominated by transients from the unusual configuration. Fortunately, we have an easy way to get a better starting point: we can simply draw one directly from the equilibrium distribution (since it is, after all, an ERGM). We thus proceed by taking an initial draw, and then simulating using `simEGP` for a two-year period (which, since we have calibrated by months, corresponds to a total time of 24 units). We store the trajectory in a `networkDynamic` object.

```
snstart <- simulate(snfit, control=control.simulate.ergm(MCMC.interval=1e6))
plot(snstart, vertex.col="sex", vertex.cex=0.5, mode="kamadakawai")
```



```
snform<-as.formula(paste0("snstart ~",as.character(snform)[3]))
snsim <- simEGP(snform, coef=snco, process="CDCSTERGM", time = 24, return.networkDynamic=TRUE)
```

```
Initializing simulation: max events=inf, max time=24.000000, initial pot=(-2277.622454,-802.060840)
event=0, t=0.000000, pot=(-2277.622454,-802.060840)
event=100, t=0.599910, pot=(-2629.989387,-1013.686392)
event=200, t=1.197863, pot=(-2915.706330,-1225.311943)
event=300, t=1.759546, pot=(-3105.499814,-1436.937495)
event=400, t=2.348117, pot=(-3325.129658,-1648.563046)
event=500, t=2.845201, pot=(-3433.100836,-1860.188598)
event=600, t=3.489034, pot=(-3632.823594,-2071.814149)
event=700, t=4.016234, pot=(-3915.940686,-2283.439700)
event=800, t=4.497205, pot=(-4012.689410,-2495.065252)
event=900, t=5.046670, pot=(-4095.778029,-2706.690803)
event=1000, t=5.546908, pot=(-4291.372250,-2918.316355)
event=1100, t=6.115562, pot=(-4543.459975,-3129.941906)
event=1200, t=6.630059, pot=(-4598.524965,-3341.567458)
event=1300, t=7.127579, pot=(-4645.005496,-3553.193009)
event=1400, t=7.650292, pot=(-4845.837563,-3764.818561)
event=1500, t=8.097492, pot=(-4826.314693,-3976.444112)
event=1600, t=8.590430, pot=(-4914.278613,-4188.069664)
event=1700, t=9.031107, pot=(-5039.959929,-4399.695215)
event=1800, t=9.554243, pot=(-5127.561303,-4611.320767)
```

```
event=1900, t=10.008178, pot=(-5022.127948,-4822.946318)
event=2000, t=10.458803, pot=(-5013.464986,-5034.571870)
event=2100, t=10.925730, pot=(-5096.575276,-5246.197421)
event=2200, t=11.509090, pot=(-5190.523803,-5457.822973)
event=2300, t=11.979225, pot=(-5179.401522,-5669.448524)
event=2400, t=12.490504, pot=(-5148.293653,-5881.074076)
event=2500, t=13.011270, pot=(-5321.543138,-6092.699627)
event=2600, t=13.497357, pot=(-5332.665420,-6304.325179)
event=2700, t=14.054561, pot=(-5428.064131,-6515.950730)
event=2800, t=14.564862, pot=(-5364.476711,-6727.576282)
event=2900, t=15.032234, pot=(-5402.172438,-6939.201833)
event=3000, t=15.565235, pot=(-5618.739712,-7150.827385)
event=3100, t=16.008092, pot=(-5635.462386,-7362.452936)
event=3200, t=16.467806, pot=(-5664.757525,-7574.078487)
event=3300, t=17.021704, pot=(-5678.417629,-7785.704039)
event=3400, t=17.446125, pot=(-5721.010325,-7997.329590)
event=3500, t=17.892553, pot=(-5665.482617,-8208.955142)
event=3600, t=18.404145, pot=(-5716.475902,-8420.580693)
event=3700, t=18.928923, pot=(-5756.971825,-8632.206245)
event=3800, t=19.392760, pot=(-5924.620918,-8843.831796)
event=3900, t=19.877913, pot=(-6015.406704,-9055.457348)
event=4000, t=20.436124, pot=(-6131.678297,-9267.082899)
event=4100, t=20.881960, pot=(-6207.453966,-9478.708451)
event=4200, t=21.350022, pot=(-6209.991789,-9690.334002)
event=4300, t=21.805540, pot=(-6337.848381,-9901.959554)
event=4400, t=22.232708, pot=(-6324.550824,-10113.585105)
event=4500, t=22.637637, pot=(-6272.185857,-10325.210657)
event=4600, t=23.116340, pot=(-6187.725556,-10536.836208)
event=4700, t=23.586094, pot=(-6283.486814,-10748.461760)
event=4800, t=23.987841, pot=(-6278.611514,-10960.087311)
Edge activity in base.net was ignored
Created net.obs.period to describe network
 Network observation period info:
  Number of observation spells: 1
  Maximal time range observed: 0 until 24
  Temporal mode: continuous
  Time unit: unknown
  Suggested time increment: NA
```

Done! We now have a trajectory simulating 24 months of evolution from a "typical" network configuration in this population (to the extent that our data constrains it).

Having achieved that success, you may wish next to go to the movies. If so, the following code will generate an animation of our two-year trajectory, at monthly resolution. (Warning: it takes a while to run.)

```
# Render two years, in monthly intervals
snsim%n%"slice.par"<-list(start=0,end=24,aggregate.dur=0.25, interval=1,rule="latest")
render.d3movie(snsim, vertex.col="sex", edge.lwd=2, vertex.cex=0.5, mode="kamadakawai")
```

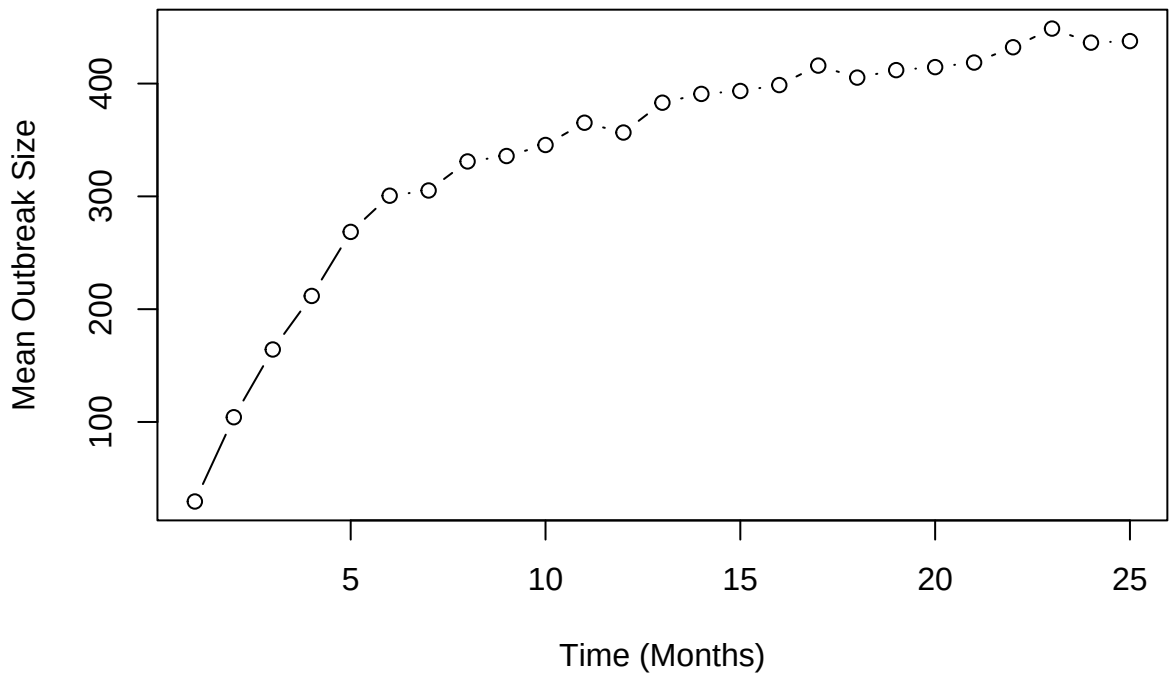
Looking at the model, we can see that we have a giant component, with various minor components that frequently join with or break off from it. A large fraction of the giant component is biconnected, though it is decorated by trees. In this particular run, we see that the component becomes somewhat larger and more cohesive with time (something that we would expect to see fluctuate over long time periods); below, we look at the implication of this for a hypothetical disease outbreak.

Having access to dynamic models of partnership networks allows us to investigate a range of questions,

particularly those related to sexually transmitted infections (STIs). Here, we provide one very simple example. While some STIs, such as HIV, have a relatively low infection rate and remain active for very long periods of time (in the case of HIV, indefinitely), others may spread and clear quickly. While the forward-reachable path is essential for understanding the spread of the former, the latter "see" something closer to the cross-section of the network when introduced to the population. Considering a highly idealized "infectious/fast clearing" infection, we can imagine that the number of persons potentially infected in an outbreak started by a single infective will be approximately the number of persons in their component within the contact network. If we further assume that infections are introduced to the focal population at random, then it is apparent that the maximum expected outbreak size will be $\sum_i |C_i|^2/n$, where $|C_i|$ is the size of the ith component, and n is the number of individuals in the population. This is thus a natural (albeit very simplified) measure of outbreak risk. Is this constant over time, or does it fluctuate? This is easy to investigate, for our trajectory, using `network.extract` to extract snapshots from the trajectory and the `component.dist` function to get component size information. Let's look at a monthly time series:

```
meanobsize<-function(z){
  cs<-network.extract(snsim,at=z)
  sum(component.dist(cs, connected="weak")$csize^2)/network.size(cs)
}

obrisk<-sapply(0:24,meanobsize)
plot(obrisk,xlab="Time (Months)", ylab="Mean Outbreak Size", type ="b")
```



Interesting! Our intuition that the giant component seemed to be growing is borne out here: this measure is obviously very sensitive to large components, because those are the ones that contribute most aggressively to the outbreak risk. In particular, the expected maximum outbreak size grows quickly at first, then leveling off for the next several months. Eventually (unless our starting network turned out to be very unlucky), this number would be expected to come back down, fluctuating over long periods of time; since our ties last an

average of 8.3 months, however, we could easily end up in a high-risk or a low-risk regime for a number of years. Although this is a simplified and synthetic example, it thus illustrates how this approach can be used to probe complex questions from relatively easily acquired data.

5.2 Approach to Equilibrium

In our protein aggregation example, we showed how EGPs could be used to study a system that starts far from equilibrium, and eventually converges to it; in that case, the intermediate states observed along the way turn out to mirror experimentally observed phenomena, giving us another check on the validity of the model. This case illustrates a more general application of EGPs: using them to study the "approach to equilibrium." This may be of direct empirical interest, or it may be a "gendankenexperiment," intended to probe mechanisms of structure formation.

Here we illustrate another simple example, in this case using data on emergent multiorganizational networks collected by Drabek et al. (1981). The network consists specifically of organizations responding as part of a remote area search and rescue operation in response to a tornado in Wichita Falls, TX, in 1979; each node represents a responding organization, with ties indicating reported communication ties between organizations during the response. As the term "EMON" implies, networks such as this one are not already established, but emerge as organizations mobilize and coordinate in response to a disruptive event. It is thus interesting to probe the process by which EMONs "coalesce," and the potential impact of different social mechanisms on that process.

To begin, we preprocess the raw EMON data (found in the `emon` data set within the `network` package), for subsequent use. Since communications here are, in context, clearly two-way, we symmetrize the reported ties. We make use of several covariates from the original data sets, including codes for organizational type, location (local vs. non-local), and a measure created by Drabek et al. for the extent to which each organization was perceived by their informants to be important in command roles during the response. (We must correct the raw data here by replacing several `NA`s with 0s. The organizations coded as `NA` by Drabek et al. were not truly "missing," but were not involved in the initial part of the response. We can thus safely regard them as having no command power, translating to an implicit score of 0.) We save all of this in a network object for subsequent use.

```
data(emon)
enet<-network(symmetrize(emon[[7]]),directed=FALSE)
crs<-emon[[7]]%v%"Command.Rank.Score"
crs[is.na(crs)]<-0
enet%v%"CRS"<-crs
enet%v%"Loc"<-emon[[7]]%v%"Location"
enet%v%"Type"<-emon[[7]]%v%"Sponsorship"
```

We now need a model for the network itself. Note that, in using this model for our purposes, we are implicitly assuming that the network collected by Drabek et al. at the conclusion of the event represented an approximate equilibrium state! That may or may not be true, but it's not an immediately unreasonable assumption: the event had concluded (and the response ended) by the time the retrospective inquiry was made, so we are not observing a system part-way through convergence to equilibrium. Of course, it might have been kinetically trapped (and then disbanded) prior to convergence - we cannot be certain. However, we can still ask what we *would* conclude, *if* our assumptions held. That's how theory works.

On substantive grounds, we could reasonably expect that CRS will be strongly related to conclusion ties - organizations performing command and control will have to communicate with other organizations - and we may likewise expect differences in activity by organizational type. Further, we may posit that organizations with similar relationship to the event site (local vs. non-local) will be more likely to communicate than ones who are differently situated. Finally, we might reasonably expect that transitive closure will either be enhanced (e.g., due to a need for multi-way negotiation) or *suppressed* (e.g., if we have the emergence of coordinating organizations that broker contacts among other organizations in the response). To capture this, we add a GWESP effect. The result is as follows:

```r
set.seed(1331)
emfit<-ergm(enet~edges + nodecov("CRS") + nodefactor("Type") +nodematch("Loc")
    + gwesp(0.75,fixed=TRUE))
```

```
Starting maximum pseudolikelihood estimation (MPLE):

Obtaining the responsible dyads.

Evaluating the predictor and response matrix.

Maximizing the pseudolikelihood.

Finished MPLE.

Starting Monte Carlo maximum likelihood estimation (MCMLE):

Iteration 1 of at most 60:

1 Optimizing with step length 1.0000.
The log-likelihood improved by 0.9183.
Estimating equations are not within tolerance region.
Iteration 2 of at most 60:
1 Optimizing with step length 1.0000.
The log-likelihood improved by 0.1532.
Estimating equations are not within tolerance region.
Iteration 3 of at most 60:
1 Optimizing with step length 1.0000.
The log-likelihood improved by 0.0856.
Convergence test p-value: 0.5057. Not converged with 99% confidence; increasing sample size.
Iteration 4 of at most 60:
1 Optimizing with step length 1.0000.
The log-likelihood improved by 0.0506.
Convergence test p-value: 0.4916. Not converged with 99% confidence; increasing sample size.
Iteration 5 of at most 60:
1 Optimizing with step length 1.0000.
The log-likelihood improved by 0.0106.
Convergence test p-value: 0.0016. Converged with 99% confidence.
Finished MCMLE.
Evaluating log-likelihood at the estimate. Fitting the dyad-independent submodel...
Bridging between the dyad-independent submodel and the full model...
Setting up bridge sampling...
Using 16 bridges: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 .
Bridging finished.

This model was fit using MCMC.  To examine model diagnostics and check
for degeneracy, use the mcmc.diagnostics() function.
```

```r
summary(emfit)
```

```
Call:
ergm(formula = enet ~ edges + nodecov("CRS") + nodefactor("Type") +
    nodematch("Loc") + gwesp(0.75, fixed = TRUE))

Monte Carlo Maximum Likelihood Results:

                     Estimate Std. Error MCMC % z value Pr(>|z|)
edges                -7.581360   1.774218      0  -4.273  < 1e-04 ***
nodecov.CRS           0.075713   0.021692      0   3.490 0.000482 ***
```

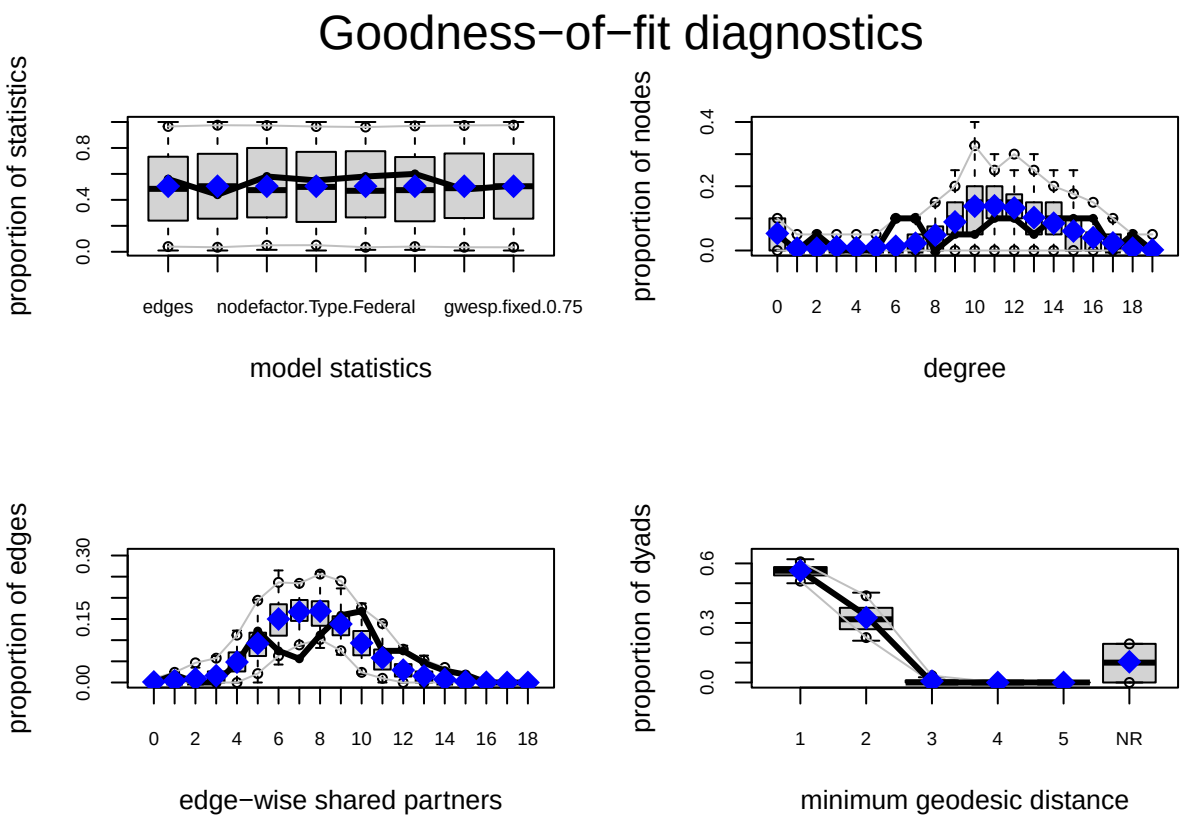
```
nodefactor.Type.County   0.055026   0.377114      0   0.146 0.883989
nodefactor.Type.Federal  0.002118   0.551260      0   0.004 0.996935
nodefactor.Type.Private  0.400653   0.432050      0   0.927 0.353755
nodefactor.Type.State    2.774897   1.145850      0   2.422 0.015448 *
nodematch.Loc            3.165757   1.086335      0   2.914 0.003566 **
gwesp.fixed.0.75         1.663721   0.726064      0   2.291 0.021939 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

     Null Deviance: 263.4  on 190  degrees of freedom
 Residual Deviance: 180.9  on 182  degrees of freedom

AIC: 196.9  BIC: 222.9  (Smaller is better. MC Std. Err. = 0.2164)
```

This seems reasonably promising. However, if we are going to use this model to capture the forces that drove the emergence of the EMON, we want to be sure that it is capable of reproducing the EMON's structural properties. For this, we use the `ergm gof` function, which gives us some simple model adequacy checks:

```
set.seed(1331)
emgof<-gof(emfit)
par(mfrow=c(2,2))
plot(emgof)
```



Not bad! We do a pretty good job of recovering the degree and ESP distributions, as well as the overall connectivity pattern and isolate count. It is possible that the model could be improved, but we'll call it good enough for rock 'n roll.

Now, let's simulate. Here, we want to study the *coalescence* of the EMON from a prior null state - it didn't

exist before the event - so we need to replace the graph in our original formula with an empty graph. We then simulate 25 parallel trajectories using `simEGPTraj`, checkpointing each 25 times. We do not have a clear timescale here, so instead focus on the event count; preliminary exploration suggested that 150 events was sufficient to see the network coalesce (it being rather small).

```
# Create an empty copy of the EMON object
enull<-enet
enull[,]<-0

# Simulate multiple trajectories, starting with the empty graph
set.seed(1331)
etraj<-simEGPTraj(enull~edges + nodecov("CRS") + nodefactor("Type") +nodematch("Loc")
    + gwesp(0.75,fixed=TRUE), coef=coef(emfit), process="LERGM", events=150,
    checkpoints= 25, trajectories=25)
```

```
Initializing simulation: max events=6, max time=inf, initial pot=(0.000000,0.000000)
event=0, t=0.000000, pot=(0.000000,0.000000)
Initializing simulation: max events=6, max time=inf, initial pot=(-6.614965,0.000000)
event=0, t=0.000000, pot=(-6.614965,0.000000)
Initializing simulation: max events=6, max time=inf, initial pot=(-6.068909,0.000000)
event=0, t=0.000000, pot=(-6.068909,0.000000)
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```

```
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```

```
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```

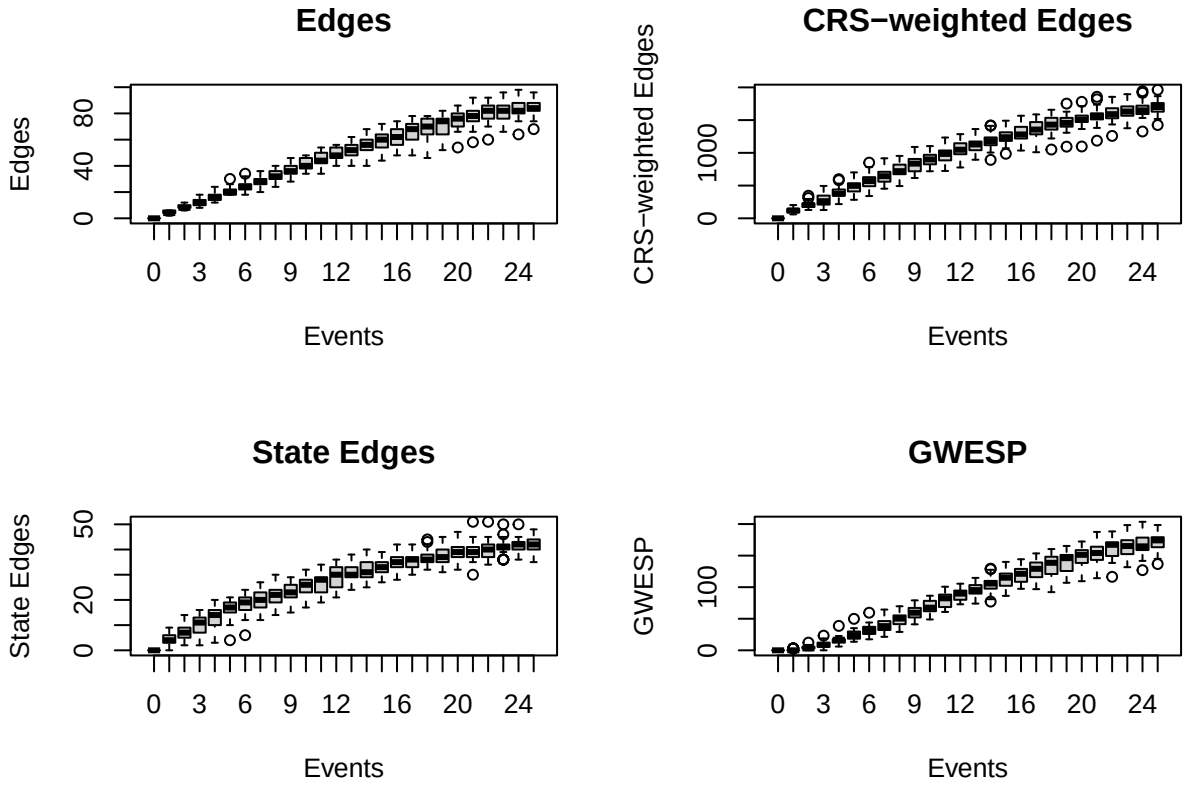
As always, it's a good idea to cast eyes on the simulation where feasible. Although we do not have a `networkDynamic` object here, we can still animate the checkpoints themselves with `ndtv`. To do this, we have to coerce the checkpoints into a `networkDynamic` object using the `network.list` argument to the eponymous command. For example:

```
# Animate the first trajectory, scaling vertices by CRS and
# coloring by location
render.d3movie(networkDynamic(network.list = etraj[[1]]), vertex.cex = 0.25 +
   2 * crs/max(crs), vertex.col = "Loc")
```

The behavior of the process is instructive. First, we see the emergence of small, tree-like chains of coordination among responding groups (often involving high-CRS nodes); these "nucleation sites" then begin to undergo triadic closure, while also pulling in new organizations. Eventually, the "mature" core of the network largely stabilizes, with some coming and going of peripheral organizations into the remaining isolate pool. Though details vary cross replicates, this general qualitative pattern seems characteristic. Even without detailed network data, the presence of absence of such a pattern might be assessed by informant interviews following an event like the one being modeled; thus, we can see examining that even this simple model begins to lead to testable hypotheses about future events.

We can, of course, also make quantitative assessments. For instance, as events accumulate, do we see distinct patterns in terms of where the initial edges go? Let's take a look, using the model statistics for the very beginning of the trajectory:

```
par(mfrow=c(2,2))
boxplot(t(sapply(etraj,function(z){attr(z,"stats")[,"edges"]})), xlab="Events",
    ylab="Edges", main="Edges")
boxplot(t(sapply(etraj,function(z){attr(z,"stats")[,"nodecov.CRS"]})), xlab="Events",
    ylab="CRS-weighted Edges", main="CRS-weighted Edges")
boxplot(t(sapply(etraj,function(z){attr(z,"stats")[,"nodefactor.Type.State"]})),
    xlab="Events", ylab="State Edges", main="State Edges")
boxplot(t(sapply(etraj,function(z){attr(z,"stats")[,"gwesp.fixed.0.75"]})),
    xlab="Events", ylab="GWESP", main="GWESP")
```



We can see several things here. First, we can see that the system is initially driven to create edges, and the edges thus created are stable enough to accumulate - we do not see a pattern of transient edges that appear and disappear in the early phases of coalescence. As expected, we see that edges are accumulating quickly within State and high-CRS organizations, though the former begin very quickly to saturate (as evidenced by the leveling off of the growth curve). Cohesion (as evidenced by the GWESP statistic) has a somewhat flatter curve than might be expected, with only a fairly small lag versus edge formation. This comports with what was seen from the animation: as soon as a small, tree-like component of organizations forms, it begins to undergo transitive closure and coalesce into a cohesive group. This process is notably less complex than the one we saw in the amyloid case! it also gives us insights into how networks like those observed by Drabek et al. may arise.

Appendix: EGP Properties

The following tables (adapted from Butts (2024)) are useful references for key properties of the EGPs supported by the `ergmgp` package. Table A1 provides formation on the rate structure for each EGP, including the pairwise transition rates, the rate of exit from a current state, and the equilibrium ERGM form. Table A2 describes a number of properties that distinguish the various EGPs, including whether they have a maximum transition rate, the potential that drives the dynamics, whether the model is separable in formation versus dissolution, and the properties of neighboring states to which the process is sensitive. These may be helpful guides when choosing an appropriate EGP for a particular application.

Class	Event Rate ($a \to b$)	Exit Rate ($a \to$ any)	Equilibrium
Competing Rate SAOM	$\exp[q(b)]$	$\sum_{b\in\mathcal{H}(a)} \exp[q(b)]$	$\exp(q(a))/Z$
LERGM	$A\left[1+\exp[q(a)-q(b)]\right]^{-1}$	$A\sum_{b\in\mathcal{H}(a)}\left[1+\exp[q(a)-q(b)]\right]^{-1}$	$\exp(q(a))/Z$

Class	Event Rate ($a \to b$)	Exit Rate ($a \to$ any)	Equilibrium
Change Inhibition	$A \min(1, \exp(q(b) - q(a)))$	$A\lvert\mathcal{N}^+(a)\rvert + A \exp[-q(a)] \sum_{b \in \mathcal{N}^-(a)} \exp[q(b)]$	$\exp(q(a))/Z$
Differential Stability	$A\lvert\mathcal{H}(a)\rvert^{-1} \exp(-q(a))$	$A \exp(-q(a))$	$\exp(q(a))/Z$
Const. Diss. CSTERGM	$I(b \in \mathcal{H}^-(a)) \exp[\theta_d] + I(b \in \mathcal{H}^+(a)) \exp(q_f(b) - q_f(a))$	$w_e(a) \exp[\theta_d] + \exp[-q_f(a)] \sum_{b \in \mathcal{H}^+(a)} \exp[q_f(b)]$	$\exp(q_f(a) - \theta_d w_e(a))/Z$
Const. Form. CSTERGM	$I(b \in \mathcal{H}^+(a)) \exp[\theta_f] + I(b \in \mathcal{H}^-(a)) \exp[q_d(b) - q_d(a)]$	$(M^* - w_e(a)) \exp[\theta_f] + \exp[-q_d(a)] \sum_{b \in \mathcal{H}^-(a)} \exp[q_d(b)]$	$\exp(q_d(a) + \theta_f w_e(a))/Z$
General CSTERGM	$I(b \in \mathcal{H}^+(a)) \exp[q_f(b) - q_f(a)] + I(b \in \mathcal{H}^-(a)) \exp[q_d(b) - q_d(a)]$	$\exp[-q_f(a)] \sum_{b \in \mathcal{H}^+(a)} \exp[q_f(b))] + \exp[-q_d(a)] \sum_{b \in \mathcal{H}^-(a)} \exp[q_d(b)]$	$\exp(q_d(a) + q_f(a))/Z$
CTERGM	$\exp[q(b) - q(a)]$	$\exp[-q(a)] \sum_{b \in \mathcal{H}(a)} \exp[q(b)]$	$\exp(2q(a))/Z$

Table A1: Continuous time graph processes with known equilibria. $A \in \mathbb{R}^+$; $q(a) = \theta^T w(a) + \log h(a)$, with q_f, q_d indicating formation/dissolution potentials; w_e is the edge statistic; $\mathcal{N}^+/\mathcal{N}^-$ indicate Hamming neighbors of higher/lower potential, $\mathcal{H}^+/\mathcal{H}^-$ indicate Hamming neighbors formed by edge addition/deletion; and M^* is the maximum edge count. All rates defined up to a homogeneous scale transformation.

Class	Max R_{ab}	Driving Potential	Separable?	$\mathcal{N}^+$ Sensitive?	$\mathcal{N}^-$ Sensitive?	$\mathcal{H}^+$ Sensitive?	$\mathcal{H}^-$ Sensitive?
Competing Rate SAOM	∞	Target	No	Yes	Yes	Yes	Yes
LERGM	A	Difference	No	Yes	Yes	Yes	Yes
Change Inhibition	A	Difference	No	No	Yes	Yes	Yes
Differential Stability	∞	Source	No	No	No	No	No
Const. Diss. CSTERGM	∞	Difference	Yes	Yes	Yes	Yes	No
Const. Form. CSTERGM	∞	Difference	Yes	Yes	Yes	No	Yes
General CSTERGM	∞	Difference	Yes	Yes	Yes	Yes	Yes
CTERGM	∞	Difference	No	Yes	Yes	Yes	Yes

Table A2: Qualitative properties of model classes; graph processes vary in whether change rates are bounded (maximum R_{ab}), the nature of their driving potential, formation/dissolution separability, and in whether their rates vary across graphs with higher or lower potential ($\mathcal{N}^+/\mathcal{N}^-$ sensitivity) and/or for edge formation versus dissolution ($\mathcal{H}^+/\mathcal{H}^-$ sensitivity).

References

Bonacich, Phillip. (1987). "Power and Centrality: A Family of Measures." *American Journal of Sociology*, 92, 1170-1182.

Butts, Carter T. (2025). "A Perturbative Solution to the Linear Influence/Network Autocorrelation Model Under Network Dynamics." *Journal of Mathematical Sociology*, forthcoming.

Butts, Carter T. (2024). "Continuous Time Graph Processes with Known ERGM Equilibria: Contextual Review, Extensions, and Synthesis." *Journal of Mathematical Sociology,* 48(2), 129-171. DOI:

10.1080/0022250X.2023.2180001

Carnegie, Nicole B.; Krivitsky, Pavel N.; Hunter, David R.; and Goodreau, Steven M. (2015). "An Approximation Method for Improving Dynamic Network Model Fitting." *Journal of Computational and Graphical Statistics,* 24(2), 502-519.

Drabek, Thomes E.; Tamminga, H.L.; Kilijanek, T.S.; and Adams, C.R. (1981). *Data from Managing Multiorganizational Emergency Responses: Emergent Search and Rescue Networks in Natural Disaster and Remote Area Settings.* Program on Technology, Environment, and Man Monograph 33. Institute for Behavioral Science, University of Colorado.

Grazioli, Gianmarc; Yu, Yue; Unhelkar, Megha H.; Martin, Rachel W.; and Butts, Carter T. (2019). "Network-based Classification and Modeling of Amyloid Fibrils." *Journal of Physical Chemistry, B,* 123(26), 5452-5462. DOI: 10.1021/acs.jpcb.9b03494

Hanneke, S. and Xing, E. P. (2007). "Discrete Temporal Models of Social Networks." In Airoldi, E. M., an Stephen E. Fienberg, D. M. B., Goldenberg, A., Xing, E. P., and Zheng, A. X., editors, *Statistical Network Analysis: Models, Issues, and New Directions.* ICML 2006 Workshop on Statistical Network Analysis, Pittsburgh, PA, USA, June 29, 2006, Revised Selected Papers, volume 4503 of *Lecture Notes in Computer Science*, pages 115–125. Springer-Verlag.

Klumb, Chad; Morris, Martina; Goodreau, Steven M.; and Jenness, Samuel M. (2024). "Improving and Extending STERGM Approximations Based on Cross-Sectional Data and Tie Durations." *Journal of Computational and Graphical Statistics*, 33(1), 166–180. https://doi.org/10.1080/10618600.2023.2233593

Koskinen, Johan H. and Snijders, Tom A.B. (2007). "Bayesian Inference for Dynamic Social Network Data." *Journal of Statistical Planning and Inference,* 137(12): 3930–3938. 5th St. Petersburg Workshop on Simulation, Part II.

Krivitsky, Pavel N. (2012). "Modeling of Dynamic Networks Based on Egocentric Data with Durational Information." Upenn Department of Statistics: Technical Reports and Preprints, 12(1), 1-32.

Krivitsky, Pavel N. and Handcock, Mark S. (2014). "A Separable Model for Dynamic Networks." *Journal of the Royal Statistical Society, Series B,* 76(1), 29-46.

Krivitsky, Pavel N. and Morris, Martina. (2017). "Inference for Social Network Models from Egocentrically Sampled Data, with Application to Understanding Persistent Racial Disparities in HIV Prevalence in the US." *The Annals of Applied Statistics,* 11(1), 427-455.

Lakon, Cynthia M.; Wang, Cheng; Butts, Carter T.; Jose, Rupa; Timberlake, David S.; and Hipp, John R. (2014). "A Dynamic Model of Adolescent Friendship Networks, Parental Influences, and Smoking." *Journal of Youth and Adolescence,* 147, 1-20. DOI: 10.1007/s10964-014-0187-7

Lusher, Dean; Koskinen, Johan; and Robins, Garry. (2012). *Exponential Random Graph Models for Social Networks: Theory, Methods, and Applications.* Cambridge University Press: Cambridge.}

Schweinberger, Michael; Krivitsky, Pavel N.; Butts, Carter T.; and Stewart, Jonathan. (2020). "Exponential-Family Models of Random Graphs: Inference in Finite-, Super-, and Infinite-Population Scenarios." *Statistical Science,* 35(4), 627-662. http://dx.doi.org/10.1214/19-STS743

Snijders, Tom A. B. (2001). "The Statistical Evaluation of Social Network Dynamics." *Sociological Methodology,* 31:361–395.