A preview of ndtv package for animating dynamic networks

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Statnet workshop

Introduction

Wouldn't it be great if you could actually see the networks you are simulating?
The `ndtv` package makes movies from `networkDynamic` objects.
This example runs a very basic `stergm` simulation.

Preparation

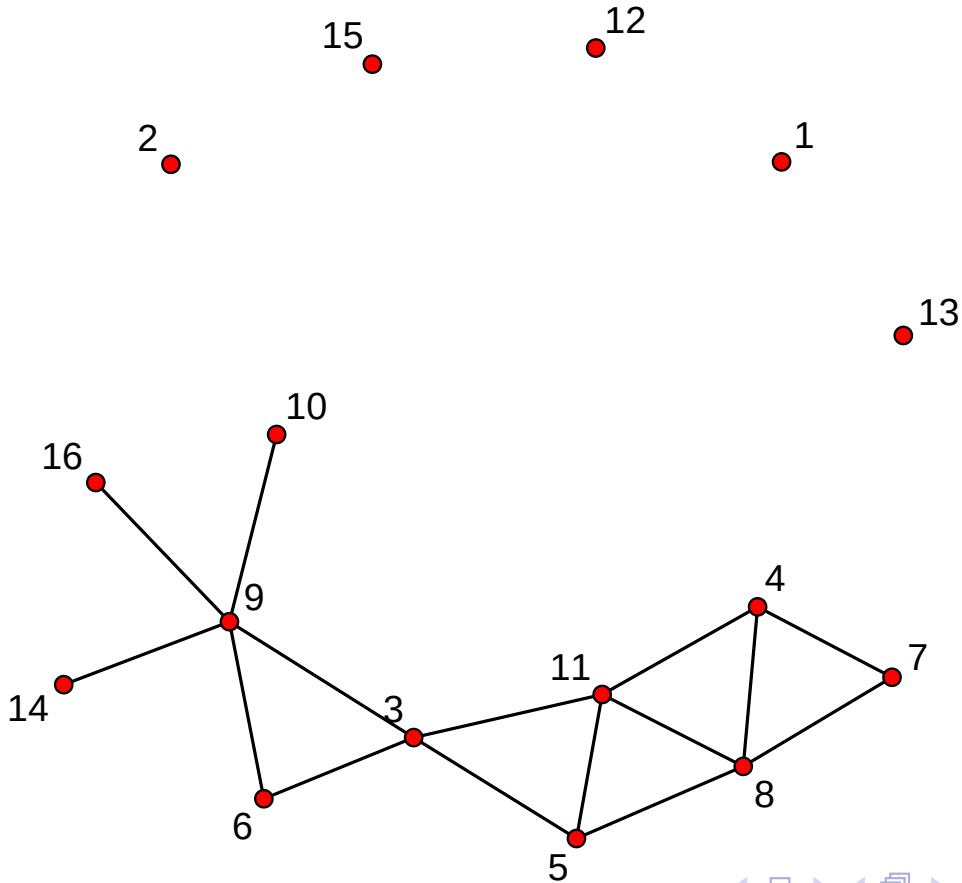
First load in the necessary libraries.

```
> require(networkDynamic)   # dynamic network extensions
> require(ergm)             # network statistical modeling
> require(sna)              # network descriptive stats
> require(animation)        # animations of R plots
> require(ndtv)             # dynamic network animations
```

Start with a static network

Load in a very familiar network

```
> data("florentine") # an example network
> plot(flobusiness,displaylabels=T)
```



Estimate a model

Define basic `stergm` model with formation and dissolution parameters.

```
> theta.diss <- log(9)
> stergm.fit.1 <- stergm(flobusiness, # fit stergm
+   formation= ~edges+gwesp(0,fixed=T),
+  dissolution = ~offset(edges),
+  targets="formation",
+  offset.coef.diss = theta.diss,
+  estimate = "EGMME" )
```

(time passes, lots simulation status output)

Simulate from the model

Simulates 100 discrete time steps from the model and saves them as a `dynamicNetwork` object.

```
> stergm.sim.1 <- simulate.stergm(stergm.fit.1,
+                       nsim=1, time.slices = 100)
```

(this is fast!)

Render the movie

We give some parameters to say what time range to render, and ask it to build the animation.

```
> render.par=list(tween.frames=5,show.time=T,
+                 show.stats="~edges+gwesp(0,fixed=T)")
> render.animation(stergm.sim.1,render.par=render.par,
+                  edge.col="darkgray",displaylabels=T,
+                  label.cex=.6,label.col="blue")
```

(this takes some times, produces output)

Action!

Replay the movie in an R plot window

```
> ani.replay()
```

Here is a url to the movie: `http://csde.washington.edu/~skyebend/sna_health/stergm.sim.1.mp4`

Save the movie

Use the `animation` library to save out the movie in `.mp4` format (using ffmpeg).

```
> saveVideo(ani.replay(),video.name="stergm.sim.1.mp4",
+                       other.opts="-b 5000k",clean=TRUE)
```

The Details

There is a bit more going on under the hood.

- `compute.animation` extracts sequence of networks, applies layouts, stores coordinates in network
- `render.animation` plots using `plot.network` on stored coords, computes tween frames
- `animation` library provides plot caching, and outputs as video in multiple formats.

The Fine Print

We chose an easy network to demo

- Real-world networks harder than simulation output
- This is an easy network because it is discrete, small, sparse, no node dynamics
- Saving the videos to disk requires installing some additional non-R software.
- It currently doesn't scale very well, limited to 1000 vertices

Features

- Can plugin in multiple layout types
- Can use some common exteral programs to do layouts, like GraphViz and MDSJ
- Can aggregate network slices from continuous event data
- Data and functions easily customized in R

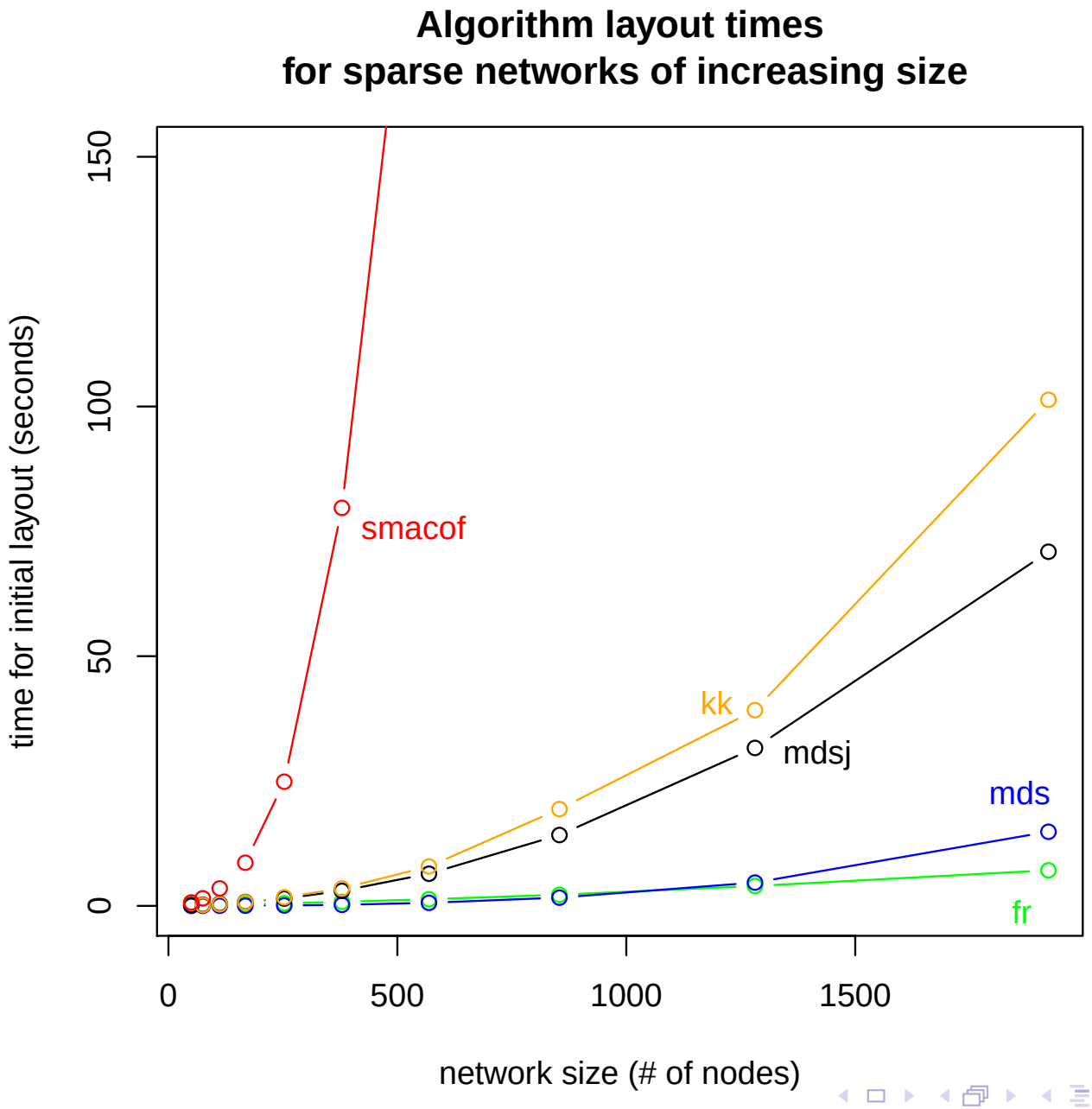
Concurrency and Reachability movie

This five minute movie is a dynamic representation of an infection spreading through a transmission network over time.

- Small network extracted from a large simulation
- Edge timing tweaked to illustrate infection paths
- Uses multiple layout types

`http://csde.washington.edu/statnet/movies/`
or
`http://www.youtube.com/watch?v=r3LYA5kirjA`

Layouts: Speedy vs. Stable



The Teaser

Coming soon to a repository near you!

- Dynamic attributes of nodes and edges
- Edit and adjust positions after calculating

References


Bender-deMoll, S., Morris, M. and Moody, J. (2008)
Prototype Packages for Managing and Animating Longitudinal Network Data: dynamicnetwork and rSoNIA
Journal of Statistical Software 24:7.


Hunter DR, Handcock MS, Butts CT, Goodreau SM, Morris M (2008b).
ergm: A Package to Fit, Simulate and Diagnose Exponential-Family Models for Networks.
Journal of Statistical Software, 24(3). http://www.jstatsoft.org/v24/i03/.


Butts CT (2008).
network: A Package for Managing Relational Data in R.
Journal of Statistical Software, 24(2). http://www.jstatsoft.org/v24/i02/.


Skye Bender-deMoll and McFarland, Daniel A. (2006)
The Art and Science of Dynamic Network Visualization.
Journal of Social Structure. Volume 7, Number 2
http://www.cmu.edu/joss/content/articles/volume7/deMollMcFarland/