

Agent Behavior

I will model four individual types of network behaviors: preferential attachment, resource dependence, homophily, and social influence. Preferential attachment describes the tendency to connect with actors that are already very popular (already in the Model Library). Resource dependence refers to the preference to link with actors that have abundant resources. Homophily describes the tendency to select actors similar to oneself. And social influence describes the influence of one's connections.

This week, I finished modeling the combined version of the four types of network mechanisms into one model. In particular, I did some research on organizational literature and found that these four types could be applied to the interorganizational hyperlink network, that is, the hyperlinking patterns between organizations. Again, users can choose the number of nodes and links in a network by using a slider. The preferential attachment mechanism is in the network because it is an attribute of hyperlink network. At each round, each node has some random probabilities of choosing homophily mechanism and resource dependence mechanism. This is a random probability for each individual organization in the network instead of a universal probability. As such, some organizations are more likely to be shaped by homophily mechanisms (indicating by selecting similar colors) while others more likely to be influenced by resource dependence mechanism (indicating by selecting more wealth). Finally, after the network is formed, I will model the speed of contagion among the connected networks. Again, users can choose the probability for connected nodes to be affected and probability of non-directly-connected nodes to be affected by using sliders. I have two monitors to track the number of affected nodes and non-affected nodes. In addition, I have a monitor to track the number of ticks for the entire network to be affected (indicated by color turning from green to all red).

System Behavior

I want to see which one of the four network mechanisms has the most profound impact on the overall network structure. By "profound" I mean several global network measures, such as clustering coefficient and average degree/ closeness centrality/ betweenness centrality. At the system level, I used several monitors and plots to track network structures. For example, I used two plots to track closeness centrality and betweenness centrality respectively. In addition, I have monitors to track the average degree/closeness/betweenness centrality and clustering coefficient. As for the contagion effects, I have a monitor to track the speed of contagion for the entire network to be affected.

Rationale for Agent Rules

According to Fu and Shumate (2015), homophily and resource dependence theories are two additive network mechanisms rather than two competitive network mechanisms to shape the overall hyperlink network structure. In addition, interorganizational hyperlink networks are shaped by preferential attachment. Extending this line of research, examined several network mechanisms described in Monge and Contractor's (2003) work in an interorganizational network at the same time.

Model Output

Two plots demonstrate the betweenness centrality and closeness centrality of the organizations in the network. In addition, I have four monitors to track the average degree centrality, average betweenness centrality, average closeness centrality, and clustering coefficient. In addition, it will be interesting to see how changing the probability of directly linked nodes to be affected and the probability of non-directly linked nodes to be affected affect network structures, and subsequently, the number of ticks (speed of contagion) for the networks to be affected.

Questions

My only question is about the plot, which seems a little bit weird at this point in terms of auto scaling.

Next Steps

In the next week, I plan to use BehaviorSpace to do some simulations and experiments to see how several inputs change network structure measures and the speed of contagion. In addition, I plan to write the literature review for the final project report.

Model Analysis

In the next week, I plan to use BehaviorSpace to do experiments and see which one of the network mechanism has the most profound impact on each of the global network structure measures. This would include how changing the number of nodes and number of links influence the global network structure; how changing the probability of homophily versus resource dependence influence the global networks structure; and how global network structures influence the speed of contagion.

Advanced Features

In the previous two weeks, I wrote codes for three separate models (resource dependence, homophily, & social influence/contagion), which could be considered as advanced features and additional relevant models.

Monge, P. R., & Contractor, N. S. (2003). *Theories of communication networks*. Oxford: Oxford University Press.

Fu, J.S. & Shumate, M. (2015). *Social Media Activity and Hyperlink Network Analysis: A Holistic Media Ecology Perspective*. Proceedings of the 48th Hawaii International Conference on System Sciences- 2015.