Final Project Progress Reports
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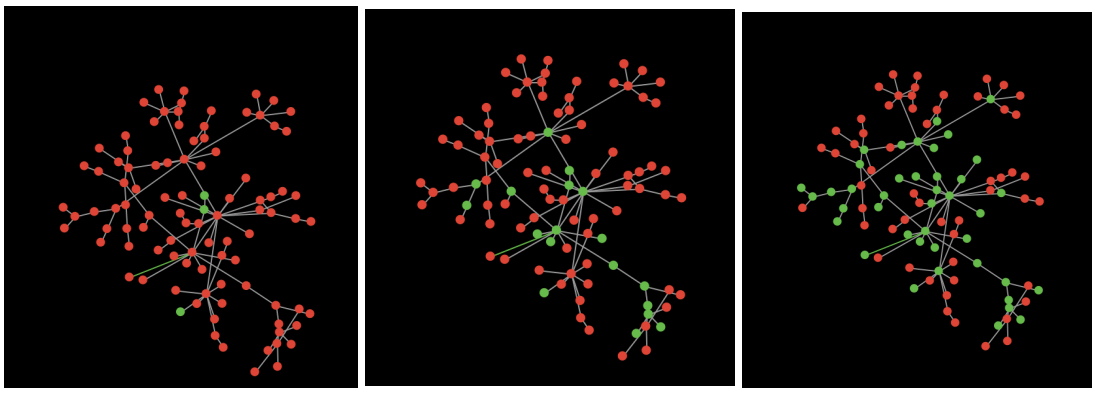
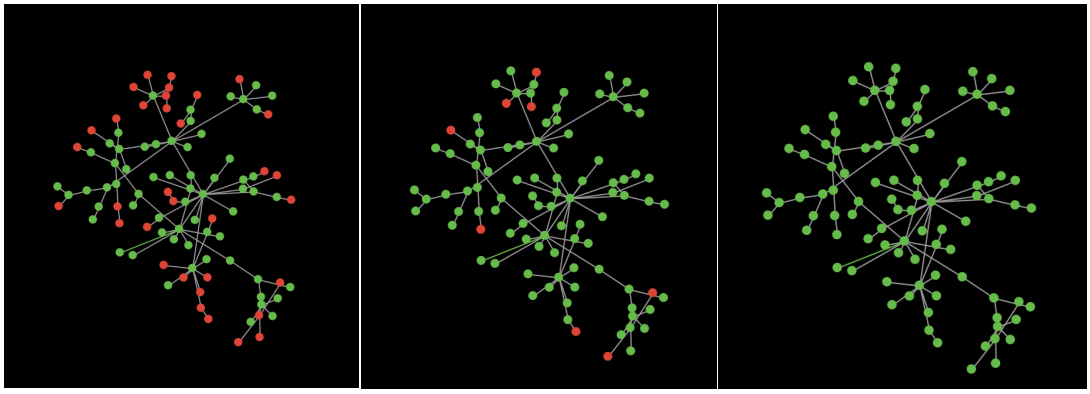
Agent Behavior

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.

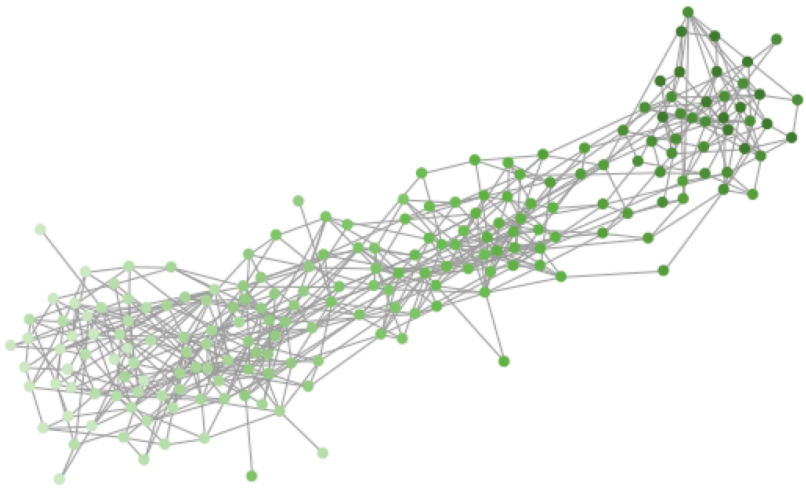
This week, I finished modeling three types of network mechanisms. First, for the resource dependence network phenomena, I create a random network with a random number of agents. You can use a slider to set the number of agents you want and the number of links among agents. Each agent has wealth between 0 and 10 and the color of the agent represents it level of wealth. The lighter the green, the more wealth the agent has. Each agent links with another agent that has a higher wealth the agent's. You can also use a slider to subjectively control what you think the "high" level of wealth is. For example, you can ask turtles to only link to turtles with wealth higher than 5.

For the contagion/social influence (in conjunction with the preferential attachment), I first created a preferential attachment model. After the preferential attachment model is generated, one node or several nodes of the network is affected by green (you just click the "go once" button once and the preferential attachment model will be generated). Then you can click the "go-once" button several times to see how many steps it takes to finish the entire contagion. Usually, it is about 4-5 ticks. Again, users can control the number of links in the number. They can also use sliders to determine the probability of contagion from direct and indirect networks. There are several measures using nw extension, such as between centrality, affected agents, not-affected agents etc.





For the homophily phenomena, I create a random network with a random number of agents. You can use a slider to set the number of agents you want and the number of links among agents. Each agent has a certain color, representing their level of similarity. Within a certain range, agents link with agents similar to their own color. Not unexpected, the model generated was a segregated model into three parts, the lighter green, medium green, and dark green.



System Behavior

At the system level, 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 centralization, clustering coefficient, clique, density, and average degree/ closeness centrality/ betweenness centrality/egenvector centrality. I will start this part next week.

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 network structure. Extending this line of research, I am interested in several other network mechanisms described in Monge and Contractor's (2003) work, such as preferential attachment and social influence.

Model Output

I will add several monitors to track the networks measures, including centralization, clustering coefficient, clique, density, and average degree/ closeness centrality/

betweenness centrality/egenvector centrality. In addition, I will add some plots to track the degree distribution of the agents in the model. Further, these distributions will be compared across the four types of mechanisms.

Questions
I have completed the three network mechanisms (resource dependence, homophily, and social influence). Up to this point, all individual models needed for the combined model are ready. In addition, I added some measures to describe the network structures, including centrality measures and centralization measures. I researched on the [nw] extention from GitHub on several network measures.

Next Steps
In the next week, I plan to come up with several combined models, such as the combination of homophily and resource dependence, preferential attachment and social influence, and homophily and contagion. In addition, the three models finished this week need to be refined, adding more user-friendly sliders and monitors to give the users more freedom to control agents' network behavior.

Model Analysis
I have not started model analysis. 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.

Advanced Features
I will use the [nw] extension from GitHub to model some extra network properties.

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.