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EECS 372

Designing and Constructing Models with Multi-Agent Languages

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Final Project Progress Report

Agent behavior: How do the agents behave/work?

System behavior: How does the overall system behave/work?

Rationale for agent rules: Why did you give the agents these rules?

Model output: Do you think your model currently provides a good description of the system’s behavior? Why or why not?

Questions: What questions do you have about your model?

Next steps: Briefly list your next steps for improving the model.

Notes / Notable changes:

Last week, Got rid of hubnet and orientation – isn’t necessary given new scope

(Need intro paragraph highlighting the shift in this week’s progress towards using a network model. Maybe something like the following)

The focus of my recent progress has been including an underlying network by which the agents are linked. The network serves two purposes: provide a social network by which agents influence each others’ attitudes and describes current sexual relationships where STD transmission may occur. The remainder of my effort has been towards merging this network model with the safe sex model I have been working on.

Slight revising – start with the relationship between attitudes and practices and how those affect each other – good place to start.

What I want people to get out of this model:

Arthur – We want to look at how we can target information campaigns. We would like to motivate people to read the literature. It would probably be most interesting for people to look at combination of histories and their own sexual behavior in comparison.

(Are the above items mostly notes? not sure how this would get included in the report)

One of the initial challenges I faced this week was the construction of the network. As an alternative, Arthur suggested using a pre-created network and not worrying about dynamically generating a network as agents move. He emphasized that we should be measuring things ACROSS a network rather than focusing on setting up a network.. However, creating the network was proved to be problematic, and it was difficult to leave the mindset of creating a network. The in class work shopping was useful in shifting my mindset. Further feedback was received from Dave and Bryan to help elaborate on the concept of measuring across the network. Bryan have me some concrete advice about getting started with networks. He suggested I use my Facebook network to replicate clusters of social circles. Unfortunately, my data was too large to clearly display any effects in a model. As an alternative, I decide to use a past student’s project that I found on modeling commons. Sullivan Sophia’s model on management styles has been a good starting point for the clusters of friend groups - with a few social butterflies that connect between groups.

(THe above is an attempt to rewrite the following paragraph)

Arthur guided me to pre-create a network, and not worry about figuring out a way for moving agents to form their own. He emphasized that we should be measuring things ACROSS a network rather than focusing on setting up a network. However, this proved problematic and was difficult to leave this mindset, with work shopping in class being useful in this regard. Feedback was obtained not only from Arthur but also from Dave and Bryan to help elaborate on the concept of measuring across the network. Bryan gave me some good advice about getting started with networks –originally I tried using my Facebook network to replicate clusters of social circles, but my data was too large to clearly display any effects in a model. Therefore, I decided to use a past student’s project I found on the modeling commons (Sullivan Sophia re: management styles) as a starting point for the clusters of friend groups (with some social butterflies that connect between groups) for my model.

(I’m going to try to roll the next three items into a semi-coherent paragraph)

Arthur suggested looking at the root cause of the motivation to look at safe sex - was it from parents, schooling or peer pressure? I consequently networked with peer to develop the methodology.

One of them even suggested revisiting ideas of John Locke, such as concepts of basic knowledge and the social contract.

Through this brainstorming, I was reminded that since my model is interested in the evolution of attitudes towards safe sex (and their consequent effect on behavior) as the outcome of the model, they can’t be predetermined.

As I develop the model of the social influence of attitudes on safe sex, it is important to consider what are the key concepts involved in this influence. Arthur suggest looking at the root cause of the motivation to have safe sex. Are parents, schooling, or peer pressure the root of people’s motivations? <Not sure what is meant by “I consequently networked with peer to develop the methodology” but I feel like it needs to be said here> Another suggestion was to revisit the ideas of John Locke and the concepts of basic knowledge and social contract. This brainstorming and investigation process reminded me that my model is more interested in the evolution of attitudes towards safe sex (and their consequent effect on behavior). Since the intended outcome of the model is the evolution of these attitudes, root causes cannot be predetermined.

Key Changes:

I was considering using on-birth-control (boolean) as a variable that impacts female agents. My initial assumption was that a female that uses birth control might be less likely to have safe sex (protected, with a condom or otherwise). However, I couldn't find extensive literature to substantiate this claim. As a further point, eliminating this parameter simplified the model, so as not to present an overwhelming number of variables to the user.

Alcohol BAC was also a suggested as a parameter for influencing the propensity to practice safe sex, but again retaining this variable made the model more complex and was not necessarily supported uniformly in the literature. I wanted to focus more on attitudes influencing safe sex behaviors and vice versa, rather than other external parameters that could influence tendency to practice safe sex (such as affordability or availability of condoms). One could interpret this that the propensity to practice safe sex is about the same regardless of BAC level.

I made a couple of useful changes to the visualization of the model. Gender was being represented in both color and shape. This redundancy was unnecessary, and I needed to use color to display other model attributes. I chose to represent attitude with color. Lastly, a designator (red dot) is used to indicate the presence of an STD.

(This probably needs to be moved to the next steps section, where you reference this again)

According to statistics, only X % of people use condoms correctly. When condoms are used correctly (the assumed protection method for this model) , they are X% effective. When they are used the way most people use them (not perfect use), only Y% correct. This is implemented into the model. [Citation needed]

Items that were removed:

(Not sure what to do here. Is this intended to be a bulleted list of items removed along with some rationale? Or should this be converted into flat prose to describe these changes? Also, under changes above, you describe two important things that were removed (on-birth-control and BAC). How are those changes/deletions different from these?)

;past-sexual-partners ;; list of past sexual partners - used to generate a count - dont really need this, not question trying to address

graphs/plots over time:

attitudes

safe sex behaviors

agent variables:

has-had-std?

get-treated --> not sure yet how this will be handled, maybe just get treated/cured automatically in 1-2 ticks if symptomatic?

inform-sexual-partners --> depends on how vocal they are, would impact a non-symptomatic partner getting tested/treated

; change factor ranges from 0-10 to 0-100 to make more sense as probabilities

;; taking out dynamically changing parameters for now ;; Temporary variable to use to check for slider adjustments ;; during the simulation and adjust model appropriately

The model currently has male and female agents as breeds. I debated whether this was necessary. On one hand, it is not needed because the model is going more towards homophily and being about the formation of social networks. Also, it was unclear to me whether I should emphasize gender as a factor. I could remove gender for simplicity and focus on the spreading of attitudes rather than an anticipated oscillating disease in population due to one gender being more symptomatic. On the other hand, there are likely many factors about gender that influence attitudes and behaviors regarding safe sex. For example, a male may be more unwilling to use protection, regardless of learning about the benefits from it, because he prefers the physical sensation of unprotected sex. As a result, I have opted to leave male and female agents as breeds.

As of now, I have decided that all variables should have a normal distribution among the agents, as in the AIDS model. This way, it is more reflective of a university setting where many different young adults of different backgrounds come together. Admittedly, this may be less useful if one wanted to figure out how to target a unique cultural or one with specific geographic constraints. The variables now with a normal distribution include outspokenness, tendency to couple with others, tendency to stay in a relationship, and possibly (if time) tendency to be monogamous vs. have multiple sexual partners at once.

(Side note, I think a Poisson distribution of number of simultaneous partners would be a better option for this last variable)

I thought about how or whether to incorporate memory into the model. Instead of explicit memories and to simplify programming, I decided there will be a variable that changes how much an individual is influenced by the behavior of their peers. The intent here is to model the effective result of memory as a change in attitude. I don’t believe it is necessary to track specific memories themselves (like interactions with very opinionated individuals, or an agent, their partner, or close friend getting an STD).

I anticipate that there likely won’t be a stop condition for this model, and I will need to review the last couple chapters that were posted to better understand what I need to do to handle this. I’m hoping that the model will move towards some sort of pseudo steady state. Ideally, I’d then be able to pick a point that feels sufficiently far along to draw some conclusions.

\*\* research question needs to be really clear!!!

Assumptions I’ve made that simplifies, keep list and justify each one so you don’t forget why you did something! (I think you have a lot of this above, most of them listed under changes. Simplification include birth control, BAC, and memory. Interesting to note you considered simplifying gender and opted not to - with justifications)

Still need to:

(try to group these next steps into basic model development vs researching statistics)

Right now, since I was building off of another network model, I still have remnants from that model that need to be removed. However, thoroughly going through another model with a network and revising the code helped me gain a better understanding of the network model and what is necessary in my safe sex model.

I also need to figure out a better way to change a link breed back and forth or erase it. I’m currently have a mechanism to achieve this effect, but I suspect there’s probably a simpler way.

I also need to find statistics for things like prevalence of different types of sex education, such as what are the factors that more inform sexual choices. I’ve done some research on this and will continue to read articles in order to try and choose the best parameters, and discuss them in the model’s accompanying paper. This includes official statistics for how many people use condoms correctly, how accurate they are when they are (and aren’t) used correctly – these will be set inside the model and not alterable by the user.

It would also be nice if I could find a study that actually explored platonic and sexual networks in a young adult-demographic, though I have not yet found a study to provide me with data to base a network upon.

After further discussing attitude with Bryan, I liked some ideas we discussed. Most importantly, predisposition (as in propensity to practice safe sex) is a better description than attitude, and it consists of two parts – the probability of practicing safe sex, and the probability of vocalizing your opinions to others about safe sex, including if you get an STD or not. Events in an agent’s “sex life” (getting infected by a sexual partner, having a close friend get infected, having a close call, developing a strong opinion through discussions) can affect both an agent’s tendency to practice safe sex and tendency to vocalize their opinions about safe sex. For instance, if an agent contracted an STI from having unprotected sex with another agent, they might resort to either victimization (being ashamed and never talking about sexual matters with friends) or alternatively becoming an advocate and vocal supporter and encouraging friends to practice safe sex. Having these events impact the variables directly also helps avoiding dealing with explicit memories.

(The following was in the middle of the above paragraph but it completely disrupted the flow. I’d suggest moving this up to the section on next steps, perhaps under a group of research next steps)

Though I have not yet found a research article to back this up, I am hoping that someone has researched the shame associated with revealing to friends that one has contracted an STD. I am especially interested in any potentially discovery that one gender is more likely to discuss these intimate matters with friends than another.

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What about couples that are monogamous, or students that don’t engage in sex? My comments on my original design document from the TA Arthur brought up further considerations, such as factors influencing probability of using protection, including alcohol use and knowledge of STIs. I am still pondering how I could potentially include these behavioral characteristics, and what data I might be able to use that would support their inclusion in the model.

**Discussing the model and the ways it could expand made me realize that I will likely remove sexual orientation as an adjustable factor in the model,** in order to focus on other parameters and not have too many options that would overwhelm the user.

After peers and TAs pointed out the relevance of using networks in this model,…

Incorporating network connections could potentially be a reasonable way to model friend circles, which could influence behavioral choices and attitudes towards sex and using protection.

I had originally been primarily interested in seeing how an STI that is symptomatic for only one gender travels through the population and potentially reaches some sort of stable state. However, based on the feedback I have received, I think I will focus more on the sexual attitudes and behaviors of agents in relation to the spread of STIs. Hopefully this will also more clearly distinguish my model from the AIDS or Virus model, which was a concern that both the TA and I had. I still need to find some supporting articles/other research in order to root some of the assumptions of my model.

The updated plans for my model are as follows:

System behavior:

The NetLogo system will model the spread of sexually transmitted infections (STIs) between young adults (male and female), based on their attitudes and behaviors regarding safe sex.

Agent behavior and rationale:

Turtles will move around randomly mostly within a specified area, in order to try to recreate circles of friends or divisions of populations. This has not yet been implemented, but the NW extension or links may be used to confine movement. If a turtle is closely linked to another turtle of the appropriate gender to mate with, there is a probability they will mate. If they mate, there is a probability they will use a form of protection. This probability will be influenced by attitudes and behaviors towards safe sex that a given turtle has, and these attitudes are influenced by the other turtles (“friend group”) that the turtle is linked with. If the coupled turtles use protection, there is a probability of using it correctly – if protection is used correctly, it is assumed that the disease will not be passed on. If the protection is used incorrectly or no protection is used, there is a higher probability that the infection will be passed to the partner of the agent.

Depending on the disease and whether an agent is male or female, the agent will feel symptoms. It will be assumed that if the agent detects symptoms, they get checked by a doctor, are diagnosed, and are gradually cured of the infection. Additionally, there is a chance that a turtle will randomly get tested, despite whether they are currently symptomatic – this probability may also be impacted by their attitudes towards safe sex.

I am still trying to determine appropriate parameters to choose for the HubNet model. My plan is to ask HubNet users to answer a couple of survey questions (worded in ways that are relatable to real life, as discussed above) that will influence who their agent is linked to (based on similar attitudes towards safe sex), and their agent’s probability of mating with or without protection. However, since most HubNet models that I have seen demonstrate more control (specifically, the ability to move the agent) and I am not yet fully aware of HubNet’s capabilities (like if you can even ask users to answer questions before participating in a simulation), I may have to reevaluate this portion of the project further.

Model output:

There currently is no model output to compare to the described ideal system behavior.

Questions and Next steps: