Modeling and Simulation Hypotheses Session 1

Objective:
Explain how models are an abstraction of real environments and recognize the rationale for, and limitations of, modeling techniques to analyze problems.

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1/24/2019

Journal: Describe something that can be modeled using a simulation. Go into some detail about why & how.

What can be done with modeling and simulations?

[Modeling and Simulation 101](#)

Take notes

Discuss modeling & simulation

Models:

1. Describe real-world activities
2. Use abstraction
3. Enable low cost testing of hypotheses
4. Can be expressed in computational, mathematical, textual, and/or graphical forms.
5. Can be implemented as computer programs. (simulations)
6. Can use randomness to arrive at their results. (ie: Monte Carlo)

At a Party

Ever notice how people cluster in groups?

Over time, the groups change.

You might notice patterns.

In a non-structured atmosphere, people tend to group in a more random manner.

Can this behavior be modeled and simulated?

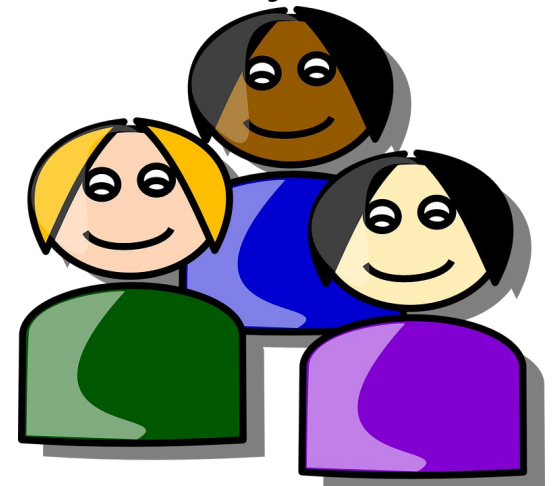**Is there any type of pattern to this grouping?**

Use a computer to model human behavior at a party.

Choose limited factors to study.

You could study height, age, gender, common interests, etc.

NetLogo's "Party" model looks at grouping by gender at parties: why do groups tend to form that are mostly men, or mostly women?

Try a sample simulation

Think about ways to use computer modeling.

Investigate NetLogo.

NetLogo Web

Launch | What's New | FAQ

Search the Models Library:
Sample Models/Social Science/Party

Upload a Model:
Choose File | No file chosen

powered by NetLogo | Party | File: New | Export: NetLogo HTML

1. http://ccl.northwestern.edu/netlogo/

2. Install the program or run the online version

3. Choose the sample:
   Sample Models/Social Science/Party

Number Happy

80

0
0   5
clock

happy?
18

5 3 6 6 8 10 5 9 8 10
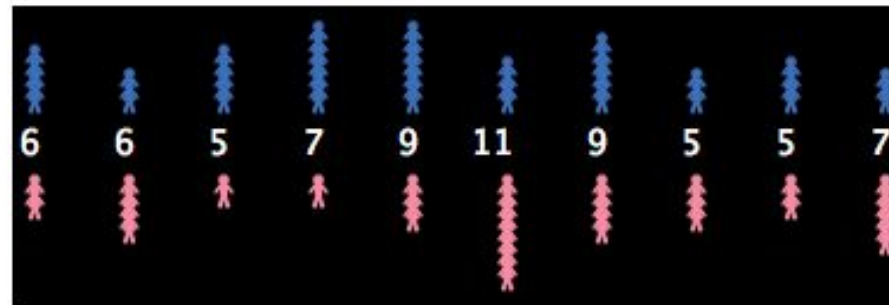
Make a prediction

In the view of the model, you will see pink and blue groups with numbers:

These lines represent mingling groups at a party. Men are shown as blue, women pink. The numbers are the sizes of the groups.

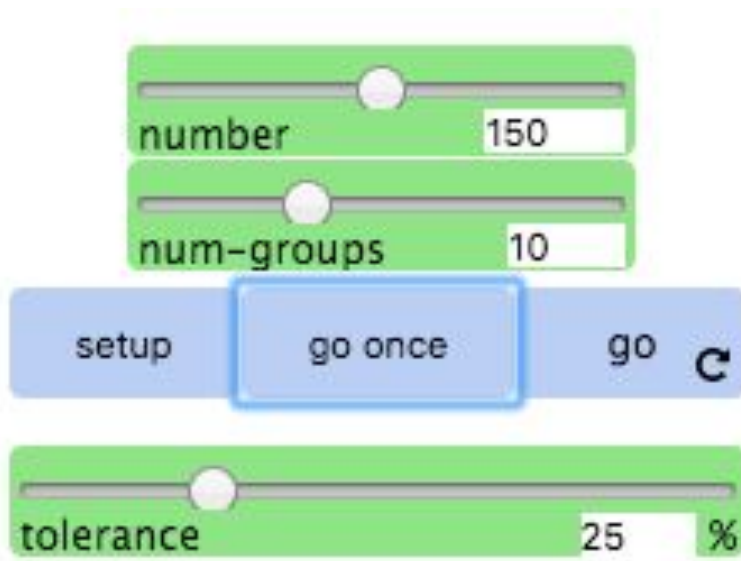*Do all the groups have about the same number of people?*

Do all the groups have about the same number of each sex?

Let's say you are having a party and invited 150 people. You are wondering how people will gather together. Suppose 10 groups form at the party.

How do you think they will group?

Run the simulation

Set number to 150

Set Number of groups to 10

Hit **setup** and then **go once**

Slow down the speed, press [go ↻]
Explain what is happening. Change the tolerance. How is it different?
Press [go ↻] again to stop the simulation

Tolerance

Tolerance here is the % of people of the opposite sex an individual is "comfortable" with.

For example, if the tolerance is set at 25%,

- males are only "comfortable" in groups that are less than 25% female,
- females are only "comfortable" in groups that are less than 25% male.

As individuals become "uncomfortable" and leave groups,
  they move into new groups,
This may cause other people to become "uncomfortable".
This chain reaction continues until everyone at the party is "comfortable" in their group.

Experiment

Using NetLogo = rapid and flexible experiments with a system

Difficult to do in the real world.

Modeling = opportunity to observe with less prejudice.

You can examine the underlying dynamics.

Simulations may challenge many of your preconceived ideas about various phenomena.

For example, a surprising result of the Party model is that even if tolerance is relatively high, a great deal of separation between the sexes occurs.

Emergent Phenomenon

When a group pattern results from the interaction of many individuals.

This idea of "emergent" phenomena can be applied to almost any subject.

What other emergent phenomena can you think of?

Work through the NetLogo tutorial packet either in groups or as a class.

Tutorial #1: Models

- What can you conclude from multiple runs without changing the settings?
- Without including growing grass, can you create a stable simulation?