Complex Systems 270 - Fall 2014, Project 1

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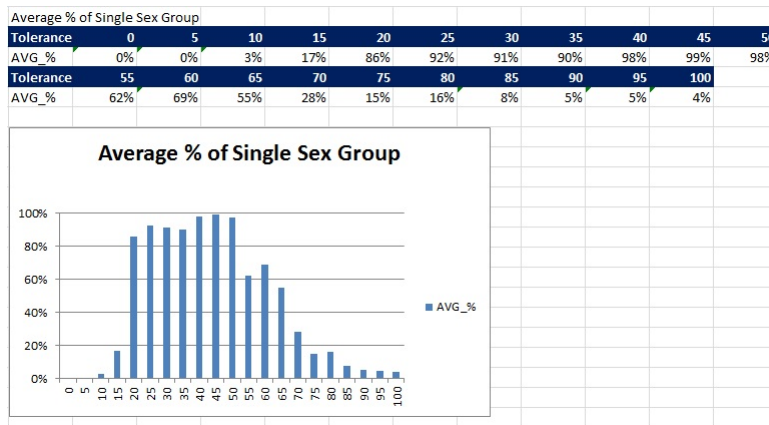
September 2014

Extending the Party Model
Upto 90 Point Mark, Question Answer Homework Style Document
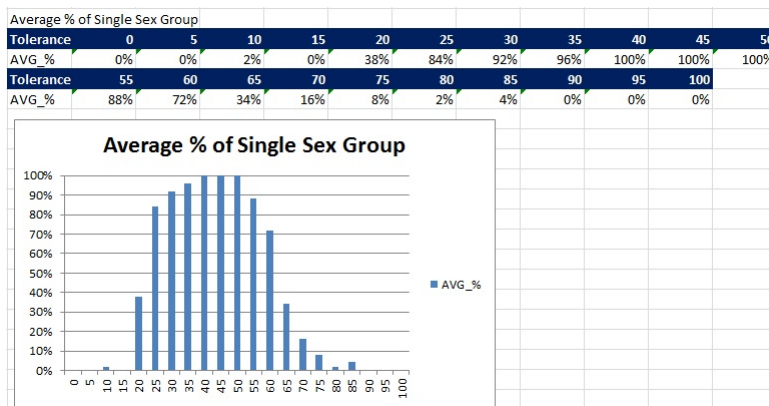
Basic Level

1. For tolerance levels at 5-point intervals between 0 and 100 (0, 5, 10, 15...), run the model 10 times and calculate the average % of single-sex groups. Draw up a chart for that. Is there some other chart that would show us interesting differences in behavior with different settings, at a glance? If so, make it.

We can use Behavior Space to gather the data we want.
["tolerance" [0 5 100]] will make tolerance levels at 5-point intervals between 0 and 100. Repetitions was set to 10 to run the model 10 times. Also, we set time limit at 200 as we saw that in some cases, the simulation never seemed to end (the number of happy people kept fluctuating, particularly at low values). As a result of the Behavior Space simulations, we got an Excel file which contained the data. Plotting the graph we are asked to using the data, we get:

Average % of Single Sex Group

Tolerance	0	5	10	15	20	25	30	35	40	45	50
AVG_%	0%	0%	3%	17%	86%	92%	91%	90%	98%	99%	98%
Tolerance	55	60	65	70	75	80	85	90	95	100	
AVG_%	62%	69%	55%	28%	15%	16%	8%	5%	5%	4%	

We reduced the number of groups from 10 to 5, and gathered the data in the same manner to produce a different chart.

Average % of Single Sex Group

| Tolerance	0	5	10	15	20	25	30	35	40	45	50
AVG_%	0%	0%	2%	0%	38%	84%	92%	96%	100%	100%	100%
Tolerance	55	60	65	70	75	80	85	90	95	100	
AVG_%	88%	72%	34%	16%	8%	2%	4%	0%	0%	0%	

In this case, people with a higher tolerance started to mix more than in the previous Behavior Space set of simulations.

2. Is there a 'tipping point' for tolerance at which groups go from single-sex to mixed?

In the first graph on the previous page, the 'tipping point' for tolerance at which the groups start mixing is approximately 55%. It the second graph, the 'tipping point' for tolerance at which the groups start mixing is approximately 65%. So, there does seem to be a single tipping point every time, but it may not be the same. In fact the relation seemd to be a factor of the number of groups. The more the number of group, the higher the tipping point, and vice versa.

3. Change the color of males and females to something else.

The Party Model without any modifications represents males by the color blue and females by the color red. This can clearly be seen in the code and the creator of this model, Uri Wilensky, clearly states that he does not intend to propagate any stereotypes and we can freely change the color of the males and the females. Changing all occurrences of the word "red" to "green" and all occurrences of the word "blue" to "yellow," we now represent females by the color green and males by the color yellow. Doing this, we get a model that looks as follows:
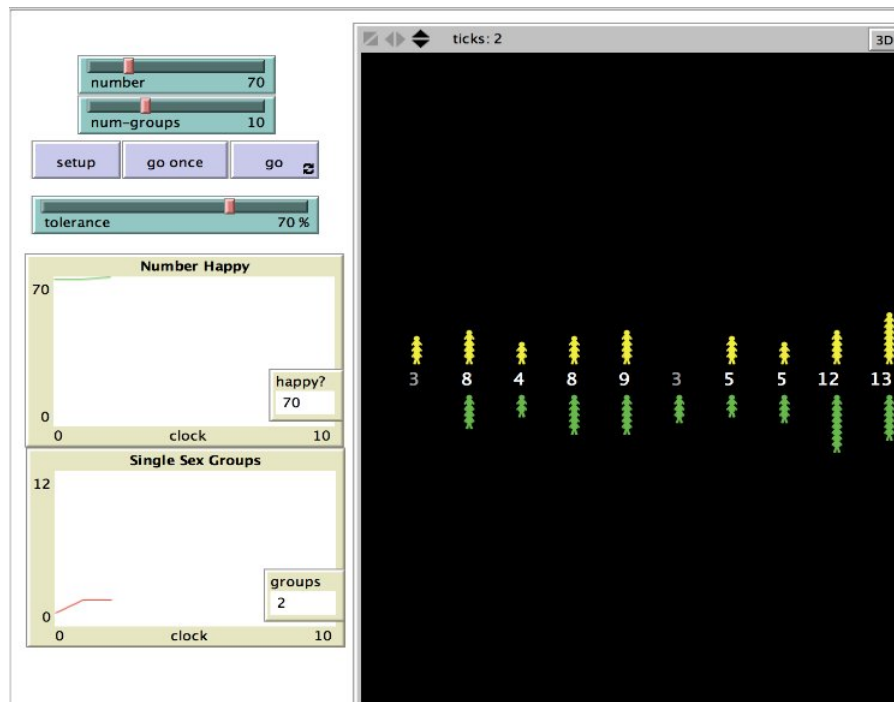
Next Level

4. In the original model, is it possible to have an initial grouping such that the party never reaches a stable state?

Yes. In the original model, if the tolerance is set too low, the turtles (pictured as humans) seem to keep moving from group to group for an indefinite amount of time. This is because the turtles are too intolerant of members of the opposite sex and have to move to a new group even if a few or even one member of the opposite sex is part of the group in consideration. This makes the groups highly unstable, disbanding very easily.

5. Make happy males one color of blue, unhappy males a different color. Make happy females one color in the red range, unhappy females a different color.

To change the color of the males and females based on whether they are happy, we decided to update to the *update-happiness* subroutine that in the initial model without any modifications just sets the turtles-own variable *happy?*. At the end of this procedure we call color-turtles which look as follows:

```
to color-turtles ;; turtle procedure
ifelse happy? [
  ifelse woman? [ set color red + 2 ] [ set color blue + 2 ]
  ] [
  ifelse woman? [ set color red - 2 ] [ set color blue - 2 ]
  ]
end
```

The code above produces the following as an example:
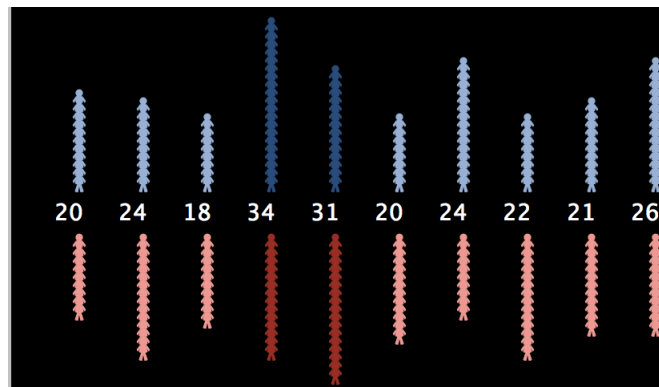
6. Set a maximum group size, so that if there are too many people in the group, they become unhappy. Also a minimum group size, so that if there are too few people in the group, they become unhappy.

By "default", the *update-happiness* procedure just checks the number of males and number of females in a group and then finds the proportion of the opposite sex in "this" group for the turtle. After this, the turtles-own *happy?* variable is set as the Boolean comparison:

$$\frac{\# \text{ of opposite sex in this group}}{\text{total } \# \text{ of people in this group}} \leq \frac{"global" tolerance}{100}$$

Where the tolerance is a variable that applies to everyone and is set by the user.

To change whether the people in the group are happy based on the group size, we appended to the end of the function this simple line of code:

if total < min-size OR total > max-size [set happy? false]

Next Level

7. Create sliders so that each group has their own tolerance. Women's tolerance for men may be different than men's differences for women.

The "original" model has a single slider that controls the tolerance of all people regardless of their gender. The tolerance is then used only in the *update-happiness* subroutine for a Boolean condition, as explained in the previous question. So, we added an additional slider and named the now two sliders appropriately. One was named to "female-tolerance", while the other was renamed to "male-tolerance". Finally, the Netlogo code for update-happiness looked as follows:

```
to update-happiness ;; turtle procedure
  let total count turtles-here
  let same count turtles-here with [color = [color] of myself]
  let opposite (total - same)
  ;; you are happy if the proportion of people of the opposite sex
  ;; does not exceed your tolerance
  ifelse woman?
  [
    set happy? (opposite / total) <= (female-tolerance / 100 )
  ]
  [
    set happy? (opposite / total) <= (male-tolerance / 100)
  ]
  ;; check if group size in bounds
  ;; if total < min-size OR total > max-size [ set happy? false ]
  ;; color-turtles
end
```

Note that there are some lines commented above since those lines of code were used to complete objective posed by other questions.

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8. Now make it a 3-attribute or 3-group model. Instead of male/female, create liberals, conservatives, and moderates. (You might use NetLogo's breeds feature to implement that.) Each group should have their own slider. Adjust the display so that we can see this work.

Following the steps specified and changing the code appropriately, we came up with the following:
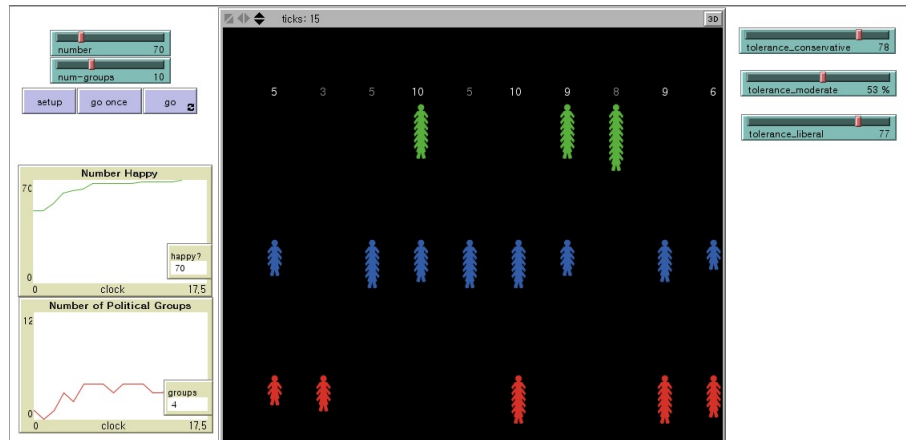
9. Are there any important differences in how the model functions when we got from 2 groups to 3?

We did not to use breeds in the implementation. We instead chose three different colors to represent the liberals, moderates, conservatives much like the initial model does primarily because it was easier to work with all turtles at once using the ask-turtles command for many of the models we ended up making.

```
to choose-political_affiliation ;; turtle procedure
  set color one-of [blue green red]
end

to-report liberal? ;; turtle procedure
  report color = blue
end

to-report moderate? ;; turtle procedure
report color = green
end

to-report conservative? ;; turtle procedure
  report color = red
end
```

The original model cannot express three groups visually, so we had to change the format. Therefore, we changed our group-site and spread-out-vertically to a more suitable format for the 3 groups model. First, we changed our pycor for group-site from 0 to 45 to locate it higher than before. And then, we make every turtle move south instead of moving south or north depending on their sex (now political group). Also, we set different xcor and ycor for each group to locate them at different places. Except these changes, everything works in much the same way with as the original model. Every group has a Tolerance that defines their comfort level with members of different political preferences. If there are too many people who have different political preferences in a turtles's group, the turtle will move to a different group just as before.

10. If there are differences we could see in a flash from a chart for different parameters, create it for us.

Just like the basic level question 1, we wanted to know how tolerance levels affect the number of single political preference groups.

Low: 0-35, Middle: 35-65, High: 65-95

3 Low		2 Low, 1 Middle		2 Low, 1 High		1 Low, 1 Middle, 1 High	
Tolerance	Pol_Group	Tolerance	Pol_Group	Tolerance	Pol_Group	Tolerance	Pol_Group
30, 30, 10	9	15, 85, 15	9	90, 20, 30	10	5, 90, 45	10
25, 20, 30	8	30, 95, 25	10	10, 30, 75	10	15, 90, 60	8
		25, 5, 35	9	5, 25, 85	10	60, 95, 30	7
		45, 25, 25	10	0, 70, 25	10	55, 25, 80	10
		30, 0, 60	10	30, 80, 0	10	50, 95, 5	8

3 Middle		2 Middle, 1 Low		2 Middle, 1 High	
Tolerance	Pol_Group	Tolerance	Pol_Group	Tolerance	Pol_Group
45, 60, 40	10	15, 40, 55	10	45, 50, 80	9
55, 55, 50	10	55, 10, 65	10	90, 45, 60	7
60, 60, 55	10	0, 60, 40	10	55, 60, 90	5
45, 40, 55	10	60, 55, 5	10	50, 90, 45	8
65, 65, 65	7	50, 60, 10	10	60, 45, 80	9

3 High		2 High, 1 Low		2 High, 1 Middle	
Tolerance	Pol_Group	Tolerance	Pol_Group	Tolerance	Pol_Group
80, 80, 70	0	10, 70, 95	4	95, 90, 10	1
95, 90, 95	0	80, 15, 75	4	85, 60, 80	1
95, 85, 70	1	90, 85, 40	2	80, 75, 60	2
90, 90, 95	0	85, 95, 5	3	85, 50, 85	3
90, 75, 75	0	95, 10, 95	2	85, 75, 45	3

Since there are multiple tolerance values in the 3-party simulation, there can be no single 'tipping point' for the simulation, rather there is a correct mix of tolerance levels that seems to encourage group mixing. The conditions optimal for group mixing (i.e. minimizing the number of single political groups) looks to be: having at least two groups with a tolerance of 80 or higher.

One interesting situation is when every group choose tolerance of 65%. I think most of people have a middle level of tolerance. They might think, as long as there are 35% of people who think like me in a group, I am willing to talk with 65% of people in a group who have different opinion from me. It sounds

like pretty reasonable way to think, and also it seems like it will make different types of people join together in a group. However, When every single individual decide to move in same way, it ends up with 7 single political preference groups, which is a lot. I think this shows that how simple choice of individual can leads to complex result that we do not expect.

One good way to mix people when there are a lot of middle tolerance people is making more groups which have different political preference. For example, if there are 4 different types of people in a party, then people might think that since there are 25% of people who have same preference with me, I am willing to talk with rest of 75%. And the result is going to be like this.
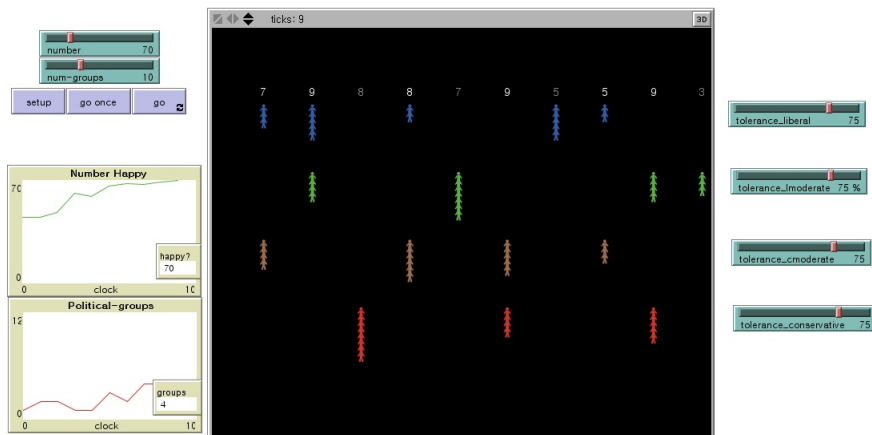
Also, if there are 5 different types of people in a party, then people might think that since there are 20% of people who have same preference with me, I am willing to talk with rest of 80%. And the result is going to be like this.
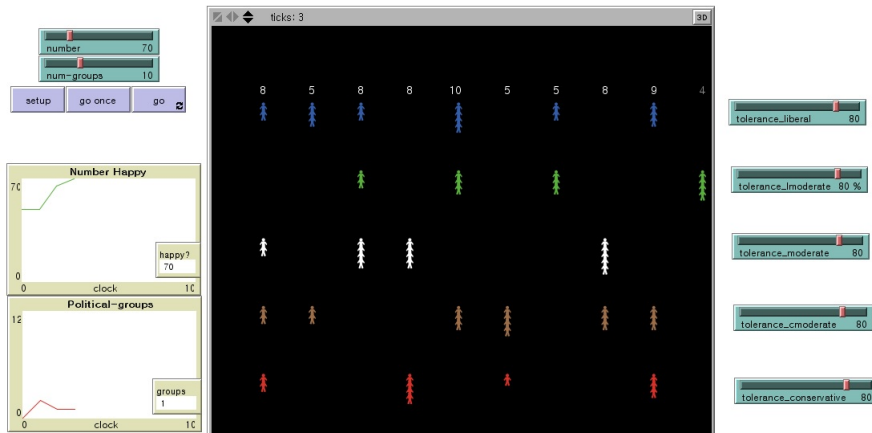
Therefore, it is always good to have different types of people in our society to mix every types of people well.

Bibiliography

Wilensky, U. (1997). NetLogo Party model. http://ccl.northwestern.edu/netlogo/models/Party. Center for Connected Learning and Computer-Based Modeling, Northwestern University, Evanston, IL.

"NetLogo 5.1.0 User Manual." NetLogo 5.1.0 User Manual. N.p., n.d. Web. Sept. 2014.

"Group Dynamics." Wikipedia. Wikimedia Foundation, 25 Sept. 2014. Web. Sept. 2014.

Hollis, Nigel. "Why Good Advertising Works (Even When You Think It Doesn't)." The Atlantic. Atlantic Media Company, 31 Aug. 2011. Web. Sept. 2014.