Fashionista Phil: Trending Now - High Level Design (HLD) Document

1. Introduction

Fashionista Phil is devoted to the world of non-hipster fashion and wants to understand color trends within the fashion world. He has hired you and your programmer to build a model that will simulate (not predict) color trends for a ten-year period or longer. He wants to see a nice graph that representing each color's rise or fall. Phil also wants to be able to stop the model at anytime and be able to see a color trending.

Create a world of 'x' number of people who at the start of the model will be assigned a random color and a random percentage to resist change. Each person will move around the world randomly. When two people meet they will assess each other.

When two people meet one of three things will happen.

1. Person 1 adopts Person 2's color.
2. Person 2 adopts Person 1's color.
3. Nothing

Keep in mind as more and more people wear color 'y', the color will start trending (becoming popular). As the popularity of color 'y' trends upward, the more influence the color has when two people meet. At some point the trend will become too popular and people will start look for a new color (except the hipsters).

2. Subject Matter Experts Agreement List

Name	Title/Role	Mandatory Reviewer (Y/N)	Approved
Jack Shade	Developer	Y	
Phil List	Supervisor	Y	
Amalan I.	Intern-apprentice wrangler	Y	
Mentor	Mentor	Y	

3. Requirements

a. A [Javascript/Agentsheets] model showing the color trends throughout a 10 year period, as expressed by Agents within an environment:

i. Environment

1. An environment should be created with a width and height between 10 and 25 units each
2. The environment should have time steps of .5 second for every 3 months passed, totaling 10 years

ii. Agents

1. A random number of Agents should be generated with a minimum of 10 and a maximum of 50. There are two types of Agents
2. Normal Agents
    a. All Normal Agents have a randomly assigned resistance to change and are given a random position within the environment
    b. These Agents also have a randomly assigned color depiction
        i. Possible color depictions are **RED**, **ORANGE**, **YELLOW**, **GREEN**, **BLUE**, **or PURPLE**.
    c. Adjacent Agents will interact with one another within the environment, resulting in one of three possible outcomes:
        i. Agent 1 will adopt the color of Agent 2
        ii. Agent 2 will adopt the color of Agent 1
        iii. Neither Agent will adopt the other's color, but instead keep the same depiction.
    d. The outcome of an interaction between two Agents should be random, but it should be influenced by an Agent's resistance to change.
    e. The outcome of an interaction among three or more Agents will be determined by two different factors
        i. If the adjacent Agents have three or more different colors, all agents should keep their own color (It's too hard for an Agent to choose from so many colors!)
        ii. If the adjacent Agents have only two different colors, the same outcome should occur as in step 3, but the resistance of the less common color should be lower

3. Hipsters
    a. A random number of Hipsters should be created with a minimum of 5 and a maximum of 15. Hipsters should be given a random position in the environment as well.
    b. Hipsters have a 100% resistance to change, regardless of the number of Agents in an interaction
    c. All Hipsters should have the same, randomly generated color depiction.
4. Counter
    a. A counter Agent counts the total number of Agents with each color depiction, as well as the Agent type (Normal or Hipster)
5. Trend
    a. Calculate the trend of a color based on the number of people wearing it. Trend affects only Normal Agents. If the Trend becomes too common, it should become less popular
6. EXTRA – Celebrity
    a. Create one or more celebrities with an assigned color and a very high resistance to change greater than 90%.
        i. In any interaction with a celebrity, the resistance to change of the Normal Agents is lowered by a constant amount (up to you to decide). This goes for group interactions in which only two different colors are present as well.
    b. Hipsters will have a 100% chance of changing their color to be different from that of the celebrity when an interaction occurs. Once 1/5 of all Hipsters have changed their color, the color of all other Hipsters will change as well, without any interaction occurring, so that all of the hipsters now have a different color from that of the celebrity.
7. Your model should include a graph which displays the number of Agents with a given color depiction as a function of the amount of time that has passed. Be sure to include the number of hipsters in this graph as well. Use the Counter Agent to gather this data.

4. Timeline

This is due within five days of receipt of the task (that would be Friday, June 20 for those receiving this Monday, June 16). It is better to complete this sooner, so that you can begin implementing an HLD that one of your classmates has written.

5. Desired Behavior / Components

Example:

a. Environment
    i. Create an environment 20 rows tall and 20 columns wide
    ii. Give the environment time steps every .5 seconds totaling 20 seconds
b. Normal Agents
    i. Create 20 Agents with randomly assigned positions in the environment. Give each Agent a randomly assigned resistance to change with a range from 30% to 90%
    ii. Give each Agent a random color depiction from the color options
    iii. Move Agents randomly around the environment
c. Hipsters
    i. Create 5 Hipster Agents with randomly assigned positions in the environment. Give each Agent a 100% resistance to change
    ii. Give each Hipster the same color depiction
    iii. Move Hipsters randomly around the environment
d. Counter
    i. Create a counter Agent who counts the total number of Agents with each color depiction every time step.
    ii. The counter should distinguish between Agent types of each color (Normal, Hipster, Celebrity)
e. Trend
    i. Calculate the Trend of a color based on the number of Normal Agents whose depiction has this color. To find the Trend, take the number Agents with this color and divide it by the total number of Agents to find the percentage of Agents with this color.
f. Interactions
    i. Each time step, make all Agents check to see if any other Agents are adjacent.
        1. To make sure that there are not four possible outcomes (the fourth being both Agents changing color) only check down and to the left of any given Agent. If there is a single adjacent Agent in these directions, calculate the probability of the first Agent to change to the color of the second Agent
            a. Use a random number generator to calculate the probability by multiplying by (1 + the Trend), then compare this result to the Agent's resistance to change.

If the resulting number is less than the Agent's resistance (i.e. the resulting number is 0.73 and the Agent's resistance is 80% or .8) then the Agent should not change its color; if the number is greater than the Agent's color resistance, then the Agent should change its color.

b. If the Trend becomes greater than 70% of the total, it should instead be subtracted from 1 then multiplied by the random number to express the over-abundance of the given color.

2. If there are multiple adjacent Agents, check in all direction to see if the Adjacent Agents have either the same color as the first Agent, and if all of the adjacent Agents have the same color
    a. If only two different colors exist within the interaction, then count the number of each Agents with a specific color. If there is less of one color, make sure to lessen its resistance. Then calculate the probability of the Agent changing its color using the same method.
    b. If multiple colors exist, then no Agent's should change their color.

g. Graph
    i. Use the Counter Agent to create a graph which displays the number of Agents with a given color and the types of Agents which have those colors. The graph should be a function whose y axis is the number of Agents and whose x axis is the amount of time that has passed.

6. Conclusion

The goal of this activity is to help Fashionista Phil find accurate data about fashion trends, but also to gain a more thorough understanding of agent-based modeling in general. This activity also helps simulate the real-life experience of working as both a software project manager and a software engineer and the complications that both positions might face.