Harvest Moon High Level Design (HLD) Document By Vikram Aikat

1. Introduction

The Harvest Moon simulation will be made using Agent Sheets, and it will model the following story.

Ernie has recently purchased a farm in rural North Carolina. The previous owner has abandoned this farm a while back, and thus it is in a bad shape. Ernie is unsure of whether or not to continue farming on this farm, and wants you to create a model to simulate what could be done.

The farm is in a very badly kept state, so Ernie will be calling in his good friend and colleague Dr. Panoff to help distribute fertilizer across the farm to help the soil improve. The soil is all set at different levels, so Dr. Panoff must fertilize it.

Because the farm was left unattended, there are many weeds and rocks lying around that need to be removed. No plant can grow where there is a weed or rock. Aaron will be working with Ernie and Dr. Panoff to remove the weeds and rocks from the farm. Dr. Panoff is using a magical fertilizer, so once you remove a weed or rock, it will never grow back. (Until you reset the model of course)

The plants will grow at a constant rate. This rate is then changed based on the soil that the plant is on top of. The better the soil the higher the growth rate. If the soil is bad, the growth rate will be reduced. If the soil is okay, the growth rate will remain the same.

The plants must start from seeds, and grow into full plants. When the plants are at their maximum size, the farmer (Ernie) will harvest them. Ernie will then sell those plants for a profit. After harvesting them, the plants will start growing from seeds all over again. A certain amount of time steps in Agent Sheets should correlate to one day in the real world. The amount of money Ernie makes per day should be graphed.

2. Subject Matter Experts Agreement List

Name	Title/Role	Mandatory Reviewer (Y/N)	Approved
Apprentice Name	Developer	Y	
Supervisor Name	Supervisor	Y	
Mentor Name	Mentor	Y	

3. Requirements

You must complete and abide by the following:

- ○ Make the following agents:
  - ■ Farmer, this will have 3 depictions
    - ● Ernie
    - ● Dr. Panoff
    - ● Aaron
  - ■ Plant, this will have 3 depictions
    - ● Seed
    - ● Growing Plant
    - ● Fully Grown Plant
  - ■ Soil, this will have 5 depictions
    - ● Bad Soil
    - ● Okay Soil
    - ● Good Soil
    - ● Rocks
    - ● Weeds
  - ■ Walkway
- ○ There should be a depiction of the farmer Agent for the farmer that is harvesting (Ernie), this agent should be depicted as Ernie's Head.
- ○ There should be a depiction of the farmer Agent for the farmer that is fertilizing (Dr. Panoff); this should be depicted with the Shodor Logo.
- ○ There should be a depiction of the farmer Agent for the farmer that is removing the weeds and rocks (Aaron), this should be depicted with the letters "BCCD"
- ○ Ernie will be growing *plantus ernesticusedinboros,* and this should be depicted as however you want, but must be in Ernie's favorite color. You will have to ask him what it is.
- ○ The rocks and weeds will have a variable that will diffuse out over the walkway. Aaron (the depiction, not the person) will be able to "smell" where the hazards are, and move towards them.
- ○ The growth variable will also diffuse over the walkway and Ernie will be able to "smell" this and walk in the direction of the most fully grown plants.
- ○ The soil will have a variable that will diffuse out over the walkway. Dr. Panoff will be able to "smell" this and walk in the direction of the worst soil.

- ○ *Optional: When Ernie harvests a plant and sells it, his depiction will show a dollar sign over his head for a few time steps.*
- ○ The plants will have different adjectives describing them. They will have a seed stage, a growing stage and a fully-grown stage.
- ○ The plants will grow, going from a seed to a plant to a fully-grown plant.
- ○ The farmer will harvest the fully-grown plants and sell them for a profit.
- ○ The plants must be fully-grown for the farmer to harvest them.
- ○ The plants will change their adjectives over time, at a set rate. The farmer will move towards the plant when it is fully grown
- ○ ***Tip: This harvest/growth process can be done in the following way:***
    - ■ As the plant grows, it has a variable that increases over time.
    - ■ As the variable reaches certain amounts, it will change from a seed to a growing plant, and at another amount it will go from a growing plant to a fully-grown plant.
    - ■ When this variable reaches a certain amount, the farmer will move towards it and harvest it.
    - ■ After harvesting it, the plant will lose the entire amount in that particular variable.
    - ■ The farmer will sell the plant for the amount that the plant had when it was harvested.
    - ■ This amount will be added to a different variable, associated with the farmer, which will be his profit.

a. An AgentSheets model showing the interactions of agents which exhibit the following behaviors:
  i. *Ernie (Farmer depiction)*
    1. *To harvest the fully grown plants*
    2. *To sell the plants after harvesting them.*
  ii. *Dr. Panoff (Farmer depiction)*
    1. *To fertilize the soil*
  iii. *Aaron (Farmer depiction)*
    1. *To remove the weeds and rocks*
  iv. *Seed (Plant depiction)*
    1. *Grow over time into a growing plant.*
  v. *Growing Plant (Plant depiction)*
    1. *Grow over time into a fully-grown plant*
  vi. *Fully-Grown Plant (Plant depiction)*
    1. *Be harvested by the farmer*

2. *Continue to grow over time*

    vii.*Bad Soil (Soil depiction)*

        1. *Limit the growth of the plant*

        2. *Turn into okay soil*

    viii.*Okay Soil (Soil depiction)*

        1. *Turn into good soil*

    ix.*Good Soil (Soil depiction)*

        1. *Enhance the growth of the plant*

    x.*Weeds (Soil depiction)*

        1. *Prevent plant growth*

    xi.*Rocks (Soil depiction)*

        1. *Prevent plant growth*

    xii.*Walkway*

        1. *Allow farmers to walk*

b. A graph showing the increase in total profit over time as well as the increase in daily profit per day.

c. Users should be able to change the properties of the simulation to alter the plants' behaviors, the farmers' behaviors and the soils' behaviors.

4. Timeline

Your project is due by 6/28/2013. If you can finish it earlier that will be great.

5. Desired Behavior / Components

Ernie:

To harvest the fully grown plants

    a. Walk towards areas of high growth

    b. When adjacent to a fully grown plant, harvest it, turning it back into a seed

To sell the plants after harvesting them

    a. After harvesting the plants, add the growth value of the plant to your total profit.

Dr. Panoff

To fertilize the soil

    a. Walk in the direction of areas with low soil lever

    b. When adjacent to soil, the soil will gain soil level, becoming fertilize

Aaron

To remover the weeds and rocks

a. Walk in the direction of high rock/weed level
b. When you are adjacent to a rock/weed remove the rock/weed
c. Replace the rock/weed with a depiction of bad soil

Seed:

Grow over time into a growing plant

a. Slowing increase a certain variable called growth
b. When growth reaches a certain amount, change from a seed to a growing plant

Growing Plant:

Grow over time into a fully-grown plant

a. Slowing increase a certain variable called growth
b. When growth reaches a certain amount, change from a growing plant to a fully grown plant

Fully Grown Plant:

Continue to grow over time

a. Slowing increase a certain variable called growth

Be harvested by the farmer

a. Attract the farmer
b. When adjacent to the farmer, turn back into a seed, setting growth to zero

Bad Soil:

Limit the growth of the plant

a. If a plant is on top of the bad soil, the plant will not gain growth as fast

Turn into okay soil

a. After gaining enough soil level, change into okay soil

Okay Soil:

Turn into good soil

a. After gaining enough soil level, change into good soil

Good Soil:

Enhance the growth of the plant

a. If a plant is on top of good soil, the plant will gain growth faster.

Weeds:

Prevent plant growth

a. No plant can grow in a spot where there are weeds

Rocks:
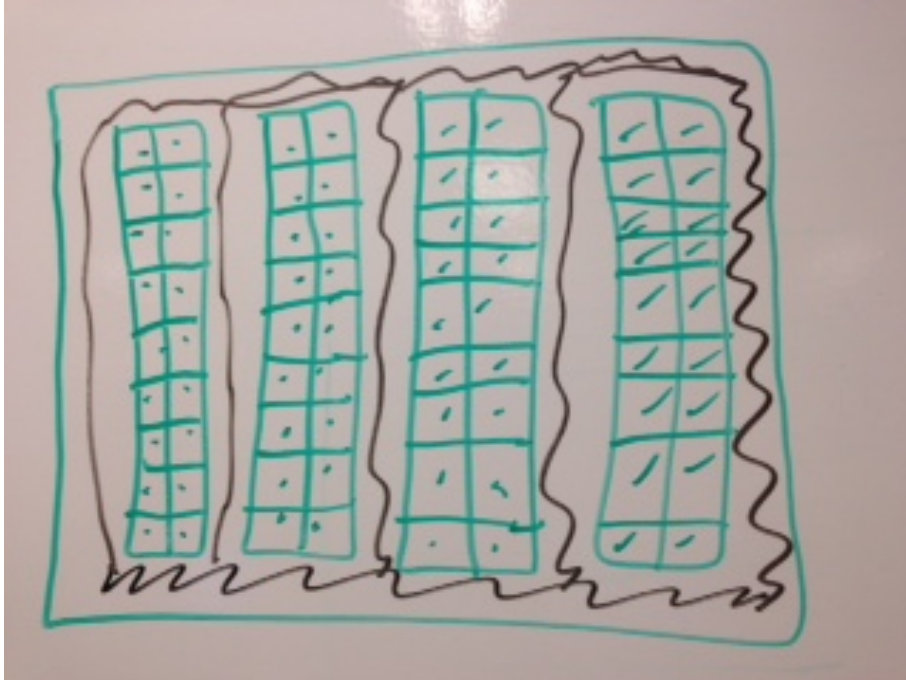
Prevent plant growth

a. No plant can grow in a spot where there are rocks

Walkway:

Allow farmers to walk

a. Farmers may only walk on the walkway

All of the grids with a green mark in them represent soil. The black lines represent the walkway for the farmers. I want your model to look like this, except bigger, with more groups of soil. Remember to only make it 2 units wide, as otherwise you will have soil that in inaccessible to the farmers.

6. Conclusion

The goal of this activity is to understand how to design an AgentSheets model based on a story. If you have any questions about my requests, please talk to me.
The final goal of this is to properly model that way that Ernie can work towards improving the farm and making a profit.

And up to date HLD for this can be found at:

http://shodor.org/~vikrama/Summer/Harvest_Moon_High_Level_Design.pdf