Proposal and Documentation

LeafScape

By *Ryan Batten*

1 Proposal

Goals and Objectives

Project Goal

The goal of this project is:

LeafScape is intended to be a simulation of real-world landscaping that has been focused solely on tree-planting. The user will be able to determine the conditions in which they live before beginning the simulation and be given a choice of what kind of tree to plant, and where to plant it. The tree will grow accurately to the specified conditions and should provide a useful tool to help plan out and experiment with tree choice and placement without the consequences that come inherently with the real world.

- To provide a simple, intuitive tool for personal use to assist in choosing where and what kind of tree to plant on the user's real-life property.
- To provide a low-consequence space for users to test their choices of tree landscaping before taking action in the high-consequence space of the real world
- To simulate the conditions that determine a tree's healthy (or unhealthy) development and growth.

Objectives

To achieve this goal, the project must:
1. Accurately simulate the growth of a tree based on precipitation and temperature.
2. Allow the user to see the difference between a tree which grows healthily and one which does not.
3. Provide feedback on what caused the tree to grow as it did.

Proposed interactive project:

- ***Problem:*** *To create an accurate simulation of the process of growing a tree on one's own property.*
- ***Prediction:*** *I believe the best way to achieve these goals is through a simple and straight-forward approach. Being that it is a simulation of the conditions to grow a tree and not a simulation of the aesthetics of gardening, an extremely realistic style is not necessary. I will rather use a isometric point-of-view that converts the landscape into a grid system and simplify all shapes. Structures will be mere*

blocks, and the trees will be drawn in a simplistic, programmatic manner. The educational genre of the simulation is something between a virtual lab and a game-based model. It will be a space that duplicates a portion of reality to try things out, learn how they work, and experiment without consequence, but it will also have an element of "game-ness" to it, as the goal is to find the best place to plant a specific kind of tree, and there is a sense of challenge to that. As a game it is modeled like a management/god simulation. You have the control over the landscape and what goes into it, and then you view the results of those decisions over time.

- ***Procedure:***
  This simulation will be built using Processing, a programming language built on Java that is intended for creating visualized programs through code. The following contains the steps I will need to take to create it, from start to finish:

1. *Research: First I will need to decide on the species of trees I wish to feature in the simulation, and gather information on them. I will need information such as:*
    a. *The amount of sun required for healthy growth*
    b. *The average temperature required for healthy growth*
    c. *The average ground moisture/oxygenation of soil required*
    d. *The average air moisture/rainfall required*
    e. *amount of space a tree requires, proximity to other trees*
    f. *pH/fertility of soil required*
    **In addition, I will need to map out the united states with the properties applied correctly to each area. I can gather the above information from various weather and geographical research institutions. Information on trees and their relations to the above properties can be attained from various Internet and book sources.*
2. *Create Prototype*
    a. *I will need to create a prototype of the following things:*
        - *Tree growth- applying various factors to trees speed of growth and maximum size*
        - *User Interface- prototype the means by which the user affects change on the piece*
        - *Tree/Structure placement*
        - *Applying time/seasons*
    b. *Some prototyping may be done through repeated editions of paper prototyping and variable spreadsheets*
3. *Expand to full simulation, "slate three"*
    a. *Build "world"*
        - *I will need to create a grid system to represent the landscape and make it scalable to a certain extent.*
        - *I will also need to allow the user to choose a region of the U.S. In which they live to determine their local factors.*
    b. *Integrate tree growth*
    c. *Integrate Title screen and introduction elements for initializing the simulation*
    d. *Integrate Time and Seasons*
4. *Add pedagogical structures*
    a. *Tutorial/walk-through/instructions, "slate one"*
    b. *Pop-ups with hints, suggestions, and feedback*
    c. *pause/speed adjustment*
5. *If extra time is available, increase breadth of simulation*
    a. *more tree species*

b. *more structure variation*
c. *more properties*
d. *increased customization*
e. *more complex, detailed visuals*

- ***Data:***

a. *Trees/growth effecting properties*
   - *Species*
   - *Appearance*
   - *Natural Region*
   - *Speed of growth*
   - *sunlight required*
   - *rainfall/moisture required*
   - *type of soil required*
   - *fertility required*
   - *pH required*
   - *space required*
   - *temperature minimum/maximum*

b. *Regions and Their Properties*
   - *Average temperature*
   - *Minimum Temperature*
   - *Maximum Temperature*
   - *pH of Soil*
   - *Fertility of Soil*
   - *Annual Rainfall*
   - *Type of Soil*

- ***Media***
  a. *Processing*
  b. *Images for modeling tree appearance*
- ***Competencies***
  a. *Processing*
  b. *Java*
  c. *3D programming concepts*

- *Conclusion: As a result of this simulation, the user should attain a greater knowledge of what would be best planted on their property. By playing through a scenario repeatedly, they can test different trees and see which will be able to grow to its maximum size, and which will grow the fastest. Rather then gathering feedback through a quiz or traditional means, one will be able to see the results of their choices, and why those choices produced the results, and be able to apply that knowledge in the next iteration of the scenario.*

2 Documentation

Research

Target Audience

The target audience for this project is: The primary target audience for the tree growth simulator would be gardeners or homeowners. Their own goals may be to plant trees on their property, and it is important for them to know how light exposure and direction of light exposure, water, soil nutrient, and water table location effects how a tree grows. The simulation can provide for them a virtual plot of land that they can experiment with placement of trees and how to best plan their own, real-life plots of land

Personas

Persona 1: Steven Johnson

Age: 41
Location: Chicago Suburbs
Job type: 9-5 pm w/ Chicago commute

Steven is a homeowner in the suburbs of Chicago. He has a fairly large home but only a moderately sized plot of property. He lives in a neighborhood of upper-middle class homes that is considered friendly, warm, and inviting. He has only recently bought his home, however, which had been unoccupied for almost a year before he moved in, and the property has clearly been neglected since and before the previous owner moved out.
Steven has a family, a wife and children. He also works a job in Chicago, which is a fairly long commute every morning and evening. Hence, he has very little free time in between the weekends. He wants to improve the appearance of his property, the neighbors will surely expect it and he just doesn't like having a bad looking yard. Without the time to see a landscape specialist, he is unable to gather the information he needs to make the property to look nice, but he knows he wants to plant several trees. He could simply hire a landscape company to do it for him, but why pay someone to do what you can do yourself? He needs a tool that will help him plan out where it would be best the place his trees, the neighboring houses block out sun in certain parts of the yard for the majority of the day, and there are bare plots of dirt with no grass where it is clearly too dry.
This simulation would help him determine where to plant his trees that they will grow the healthiest.

Persona 2: Wanda Grossman

Age: 29
Location: Urban Chicago
Job type: Freelance/self-employed

Wanda is a recent homeowner in Chicago. She lives near the outer-reaches of Chicago where the houses are more affordable, but still near enough the hustle and bustle of the city. Her neighborhood is composed of both extremely old but decently sized houses and smaller but newer homes, all with small plots of land and placed close together. She recently was able to stop renting and buy her own place.

She lives with her boyfriend in a small house. She is very busy as a designer, doing freelance work for whatever companies she can find or whatever work comes her way. Her income is still modest and she has lots of student loans from college. Wanda and her boyfriend would like to do something with the property that they have, but they know little about gardening or landscaping and they don't make enough to hire someone to do it for them. They, likewise, need a tool that can help them plan out what to do.

Scenarios

There is only a single scenario in this simulation. The user then specifies the dimensions of his or her property and a grid will be laid out to that size. Then the user will be allowed to place blocks to represent structures on their property (house, shed, garage, etc.) before beginning the simulation. Time will not start until the first seed is placed. After placing structures (or not, should the user choose), they will be able to choose a tree species to plant and plant it as they choose on the grid as seeds. Once the first seed has been placed, time will begin and the tree will begin to grow. At this point the user can pause or change the speed of time. From this point it is mostly observation, though time will be accelerated so change should happen fast. At any time during the simulation the user can place more structures or seeds for up to a certain number. The simulation will inform the user when the tree has reached its maximum size (which may not be the maximum size for a healthy version of the same tree). From this point the user receives an analysis of the conditions the tree was in and what effect those conditions had.

Content

The Specific content in project will be:

- 4 tree types, each with differing attributes to grow in differing climates.
- 9 regions, each to represent a section of the U.S. with varying climate attributes.
- 4 structure sizes, to block sunlight from certain areas
- 4 time speeds to speed up or slow down the simulation experience
- a way to view a specific trees statistics
- a way to view the current climate conditions
- a way to view a tree's preferred climate
- a rotate option, to view the simulation from a different angle
- a play/pause option, to stop the simulation experience when necessary

Correlation to Goal

The content supports in the project goal in the following ways:

- gives the user control over the environment
- gives the user feedback to learn the consequences of their actions
- gives the user the ability to customize the experience of the simulation to themselves

Assessment

Indications of the project's success

The project will be deemed successful if the following are true:

- The user can grow a tree within 30 feet of its prime height.
- The user can determine if a tree will grow successfully in a specific climate.
- The user can make a conscious decision about where and what kind of tree to plant in the real world.

User Testing

The project will be tested for functionality by:

- how many times a user must play the simulation to achieve the above indications
- how well the trees they chose grew.

The project will be tested for usability by:

- how easily the user navigates the simulation space
- how easily the user "breaks" the simulation

Scope

Estimated

Time

Estimated time available to complete project (in hours): 40 hours

Assets

Assets available to complete project:

- 40 hours of work time
- Adobe Illustrator and Photoshop for asset creation
- Processing for the creation of the project
- 1 person to develop and create the project

Scope estimate

Project Scope based on time and assets:

- Start Screen

    a. Start Simulation
        i. Simulation screen
            A. Add Structure button
                - 1x1
                - 2x2
                - 2x3
                - 2x4
                - 3x3
                - 4x4
            B. Add Seed button
                - 4 tree types
            C. Play
                - Pause
            D. Change Speed
                - 1x
                - 2x

- 4x
- 8x

E. Change Region
- selectable map

F. Tree pop ups

b. Tutorial
   i. Simulation Screen (guided)
      A. see above

c. Instructions
   i. Instructional Screen
      A. Short description of how to play

d. About
   i. About Screen
      A. Creator
      B. Description of Purpose
      C. Description of Design

Actual

Time

Actual time to complete project (in hours):
50 hours

Assets

Actual assets used to complete project:

- 40 hours of work time
- Adobe Illustrator and Photoshop for asset creation
- Processing for the creation of the project
- 1 person to develop and create the project

Scope estimate

Final project Scope:

- Start Screen

e. Start Simulation
   i. Simulation screen
      A. Add Seed button
         - 4 tree types

      B. Play
         - Pause

      C. Change Speed
         - 2x
         - 4x
         - 8x
         - 16x

      D. Change Region
         - 9 regions

      E. Check Tree
         - Tree statistics

f. Instructions
   i. in browser instead of in game

g. About

i. About Screen
    A. Description of design
    B. Creator and references

Notes on scope changes

- I was unable to find the time or learn a good way to place structures and determine sunlight dynamically, so structures were cut out altogether.
- Due to time contraints, the tutorial portion of the simulation was cut out and replaced with instructions in browser that could be seen at all times during the simulation
- Due to using a new piece of technology under the time contraints, a selectable map was substituted by buttons to choose a region and a key map for what the regions were.
- For the same reason, the pop ups were substituted with a button and box that would be brought up when checking a tree's stats.

Production Guide

Look and Feel

This project's "look and feel" can be described as:

Mechanical but unimposing

Correlation to Goal

The “look and feel” supports the project’s goal in the following specific ways:

- Keeps the user conscious that it is a technological simulation, but not making it seem to unapproachable.

Visual Specifics

Color Palette

List the primary colors and their RGB and Hexadecimal numbers

Color Name	RGB Number	Hexadecimal Number
Summer Green	31, 152, 8	#1F9808
Grey	200, 200, 200	#C8C8C8
Sky Blue	152, 192, 196	#9CC0C4
Black	0, 0, 0	#000000
Spring Green	109, 227, 0	#6DE300
Fall Yellow	222, 201, 43	#DEC92B
White	255, 255, 255	#FFFFFF

Typography

List the font usage, name and size

Usage	Font Name	Font Size
Interface Font	Arial Bold MT	24
Title Screen Font	TrebuchetMS Italic	30

Media Specifics

Additional media (images, audio, etc.) to be used will be, specifically:

- 4 images for trees
- 1 image for key map

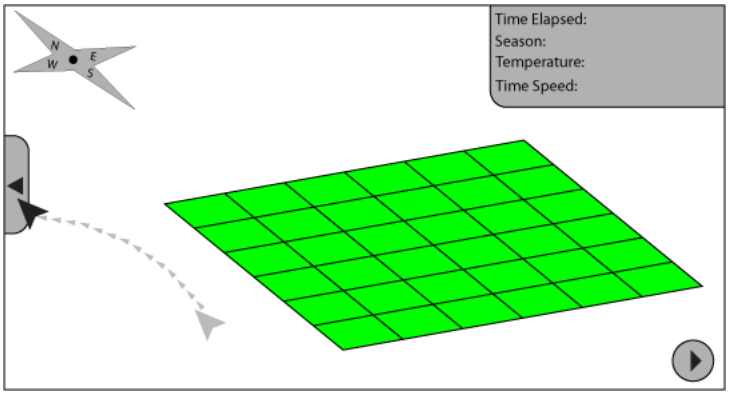
File Structure

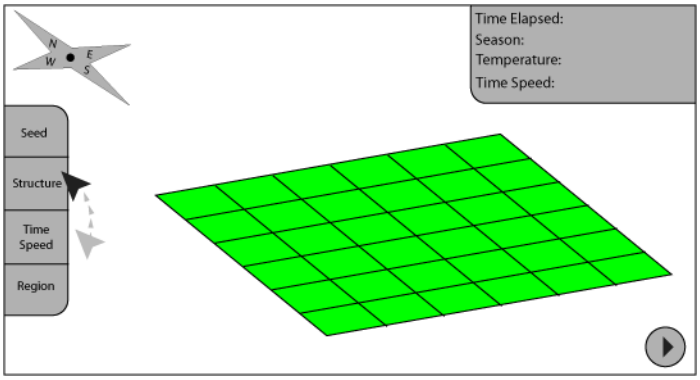
- *Main Folder*
  - *All of the .pde processing files*
  - *Folder: applet*
    - *exported java applet files and .html file*
  - *Folder: application.linux*
    - *exported linux application files*
  - *Folder: application.macosx*
    - *exported osx application files*
  - *Folder: application.windows*
    - *exported windows application files*
  - *Folder: Data*
    - *All Assets including fonts and images*

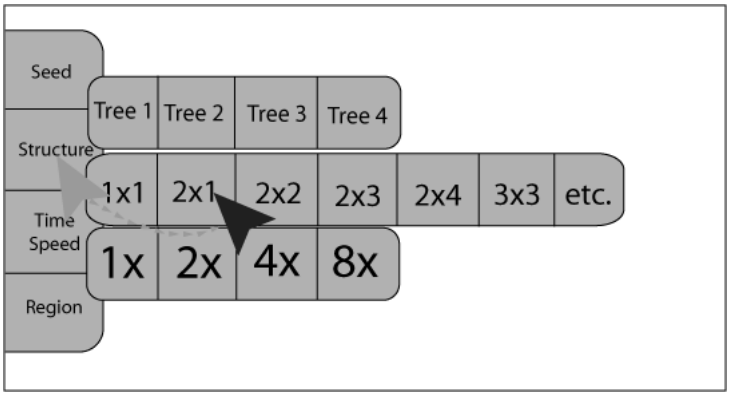
Naming Convention

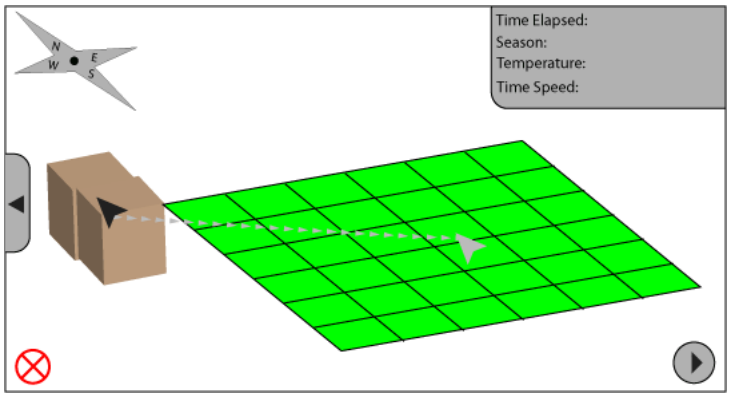
- Variables: lowercase first word, Upper Case Second Word If Necessary
- Functions: lowercase first word, Upper Case Second Word If Necessary
- Class names: Upper Case all words
- Subclass names: Upper Case all words
- All variables, functions, class names, and subclass names should be descriptive of what they do/are and not abbreviated

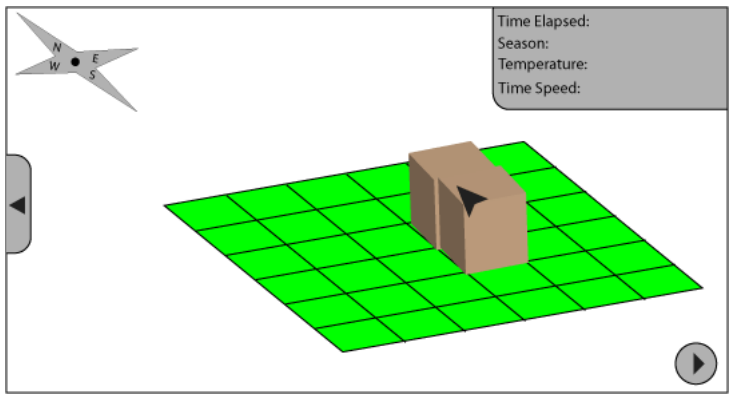
Storyboards






Seed
Structure
Time Speed
Region
Tree 1
Tree 2
Tree 3
Tree 4
1x1
2x1
2x2
2x3
2x4
3x3
etc.
1x
2x
4x
8x


Time Elapsed:
Season:
Temperature:
Time Speed:


Time Elapsed:
Season:
Temperature:
Time Speed:

3 Project

Location and Additional Details

URL address:
http://iam.colum.edu/students/rbatten/sim2/projects/TreeScape2_0/applet/index.html

Description of file:
Java applet/html file

Special instructions:
If unable to view applet, the windows application can be downloaded from the same url above.

4 Credits

Credits

Project and Documentation Credits

- *Designed using Processing:* http://www.processing.org
- *All botanical data derived from Northeastern Area State and Private Forestry:* http://na.fs.fed.us/
- *All climate data and region map derived from National Oceanic and Atmospheric Administration:* http://www.noaa.gov
- *Portions of code derived from the Processing.org Learning section (open source) and then altered to actually work.*
- *All tree images created by Ryan Batten using Adobe Illustrator and Photoshop*