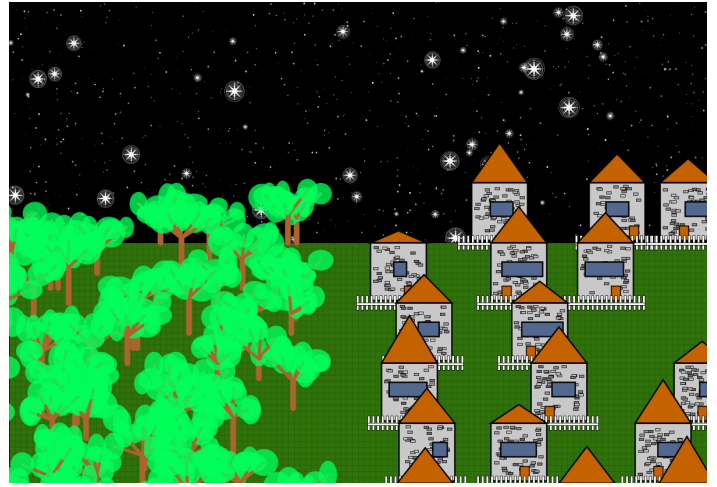


Programming 11

Unit 4: Advanced Drawing Project

In this project, we will be demonstrating our understanding of functions, transformations (including translate, rotate, scale), loops, and randomness to create a program that generates a drawing of a particular theme. The drawing should consist of collections of three different objects. Here's two examples of the output of one such project. Note how each output is different, but similar:



In this example, my theme is "Village on the Edge of the Forest" and the three objects I'm using are houses, trees, and stars. **Note:** this is a drawing, not an animation. **Do not use void draw(), put your function calls in void setup() instead!**

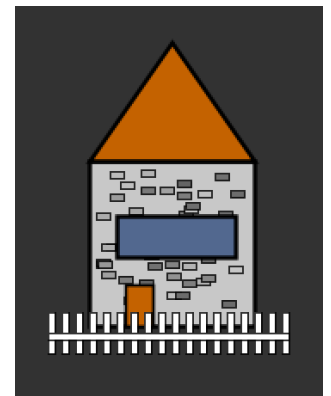
Part 1: Create Your Objects: Each object needs to satisfy the following— criteria:

1. Each object can be drawn by calling its **function**.
2. Use **pushMatrix()**, **popMatrix()**, and **translate()** within the function to position this complex shape.
3. The object's function itself is **decomposed into sub-functions**.
4. Each object should make use of **loops**.
5. Each object should make use of **randomness**.

Let's take a closer look at each object. and see how it satisfies this criteria.

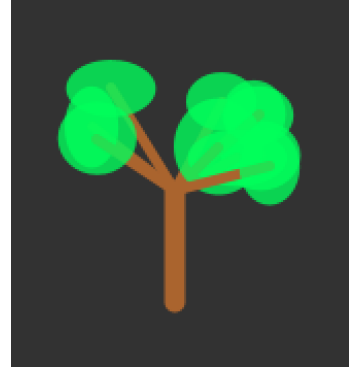
The House:

1. **Function:** This object is drawn by a house function that takes an x and y as parameters, and translates the house to those coordinates.
2. **Sub-functions:** The house function is decomposed into several sub-functions that deal with drawing the roof, walls, windows, door, and fence.
3. **Loops:** Loops are used to draw the fence pickets and to draw the bricks.
4. **Randomness:** There is randomness in the height of the roof, the size of the window, the position of the door, and the position and colour of the bricks.



The Tree:

1. **Function:** This object is drawn by a tree function that takes an x and y as parameters, and translates the house to those coordinates.
2. **Sub-functions:** The tree is made up of sub-functions to draw:
 - a. Tree trunk
 - b. Branches.
3. **Loops:** The branches are drawn by calling the branch function several times in a loop.
4. **Randomness:** The height of the tree trunk, and the coordinates of the end points of the branches are random, as is the transparency of the leaves. There is also a scale.



The Star:

1. **Functions:** The star is drawn by a function that takes an x and y as parameters, and translates the house to those coordinates.
2. **Sub-functions:** The star is made up of sub-functions to draw:
 - a. the triangular points
 - b. the "halo" of concentric circles.
3. **Loops:** The points are made by drawing one triangle and rotating in a loop. The concentric circles are also drawn with a loop.
4. **Randomness:** The size of the star is randomly determined using the scale function.



Part 2: The Big Picture

Once you have created your object functions, use loops to place many copies of these objects on the screen to create your image. This could be randomly positioned over the whole screen, randomly placed in a particular region of the screen, or planned out in a pattern.

Also consider adding additional details. For example, in the example image, I added random small dots across the sky to represent distant stars, and I added a grid to the ground to create some texture.

Project Checklist for an A+ project!

- ✓ Choose an overall theme for your project, and think of three objects go with your theme.
- ✓ Create a function for each object
- ✓ Decompose these functions into sub-functions.
- ✓ Add loops and randomness inside each object function or their sub-functions.
- ✓ Use loops to draw many copies of these objects in different regions of the screen.
- ✓ Make use of translate, rotate and scale throughout your project, though not necessarily in every object.
- ✓ Add visual details in your scene to add texture and complexity to your scene.
- ✓ Strive for complexity. Doing the minimum gets you a minimum mark.