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Course: CS151
Section: A
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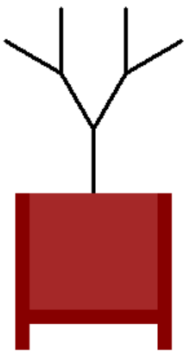
Project 7 Report: L-Systems Scenes

Title: L-Systems in Turtle

Abstract:
This project was made possible with lecture notes and slides covering L-systems. Every piece of information was necessary here, as I was very confused as to how to begin programming the L-system. Other than that, the usual turtle commands proved helpful, and so did for and while loops. My outputs are as follows: a branched-plant in a plant pot and 2 trees with shadows to learn how to use arguments and command lines with L-systems, 3 abstract shapes to practice making my own L-systems, including a new tree, a cool circle, and an interesting geometric design, a grid of three different types of trees to practice iterations of L-systems, a full scene using turtle and L-systems, and an extension for that same scene with new characters in the interpreter.

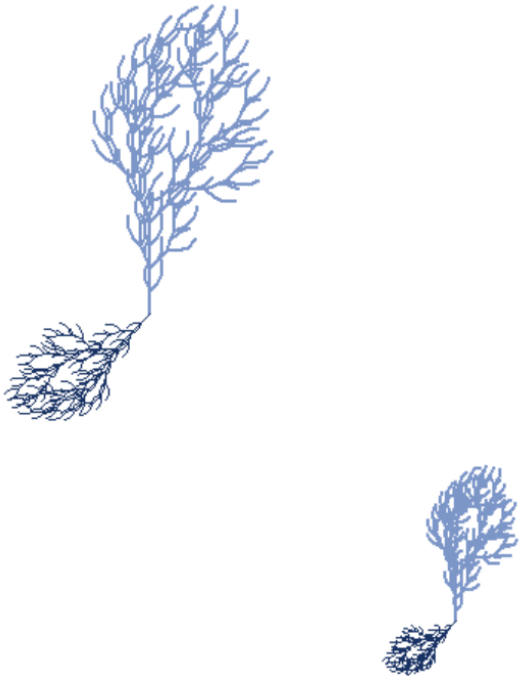
Results:

IMAGE 1:



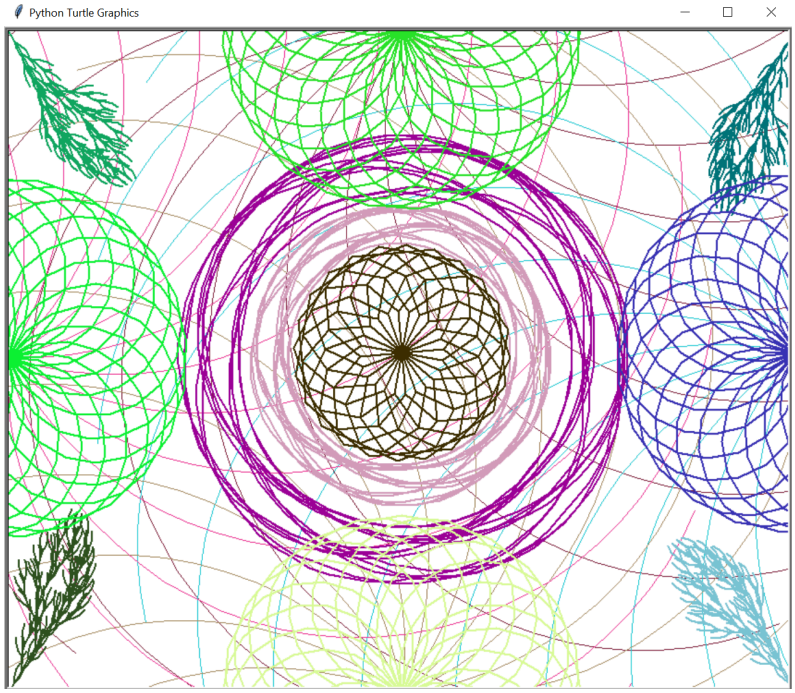
This is my first image, the branched plant from the test code. While it was already made, I called it with command line arguments, specifying the txt file name, scale, and angle which the L-system would take in. This image is from test7_2.py

IMAGE 2:



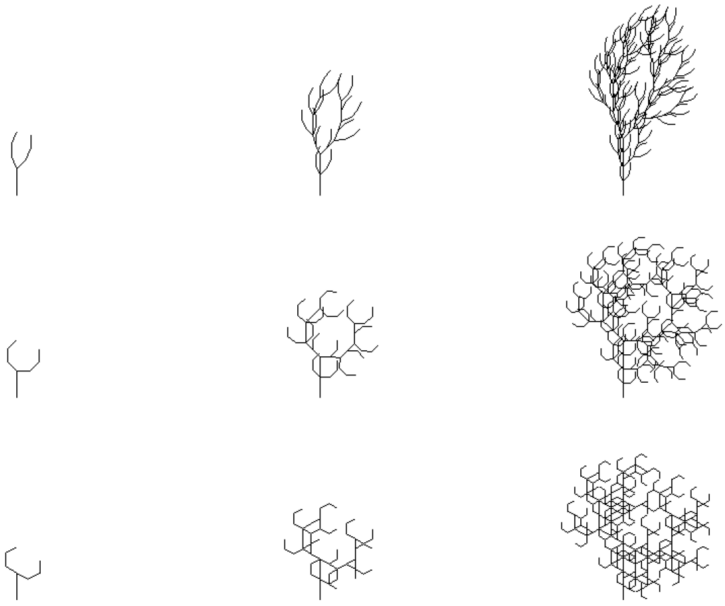
This image is from test7_4.py and shows 2 trees with shadows. Again, I did not code the images in or make the txt file system that the L-system code is getting information from, but this task and the one prior did help me learn how to use arguments, parameters, and command line arguments to call and modify L-systems.

IMAGE 3:



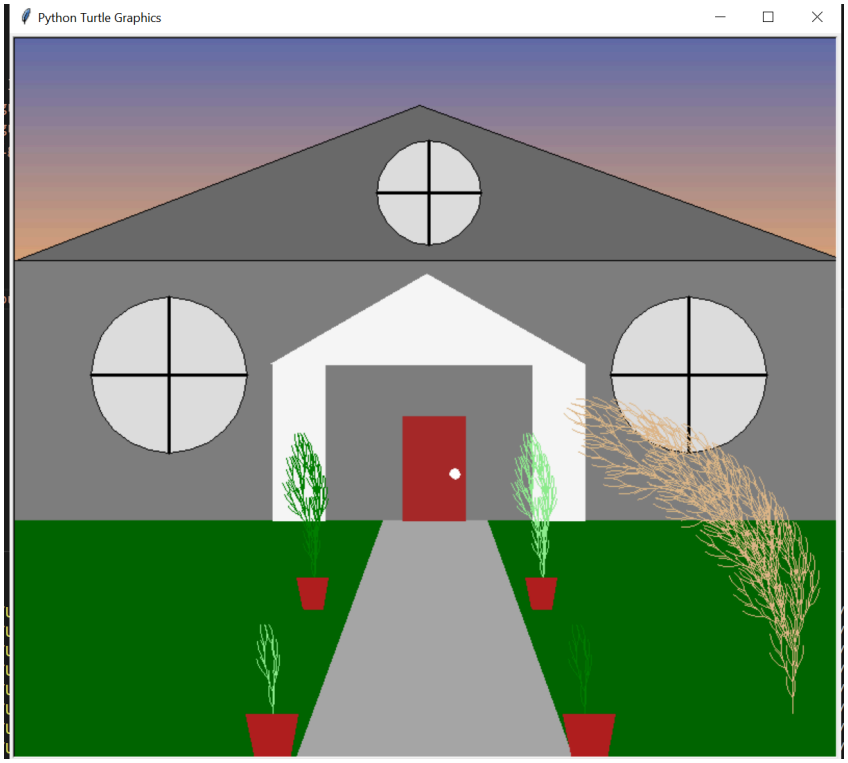
This is an abstract scene I made from 3 abstract shapes which I created using 3 different L-systems. Each has a different source file: abstract1.txt for the circle, abstract2.txt for the geometric shape, and abstract3.txt for the tree. I mainly was just messing around with the rules here and seeing what I could make. I think the circle is really cool because it isn't just a regular circle with one line going around. The shape is cool because it showed me very rigid repetition around a point, and the tree was fun because I was able to recreate a similar system as from systemB. Finally, I put all these shapes together with different headings, angles, scales, along with random colors, and got this cool abstract scene.

IMAGE 4:



This is a grid of 3 different trees. This task was to teach iteration. The left-most trees are one iteration of the l-system, the middle, 2 iterations, and the far right, 3. This grid of trees demonstrates how much more complex the system gets with each iteration. This was fun to make because I used a nested for loop inside another for loop. I used my knowledge of lists to iterate through each angle, and my knowledge of loops to move the coordinates of each tree on each iteration. Thanks to that, I made my code for this really efficient and short, which I was not expecting at all. I am quite proud of my code here.

IMAGE 5:



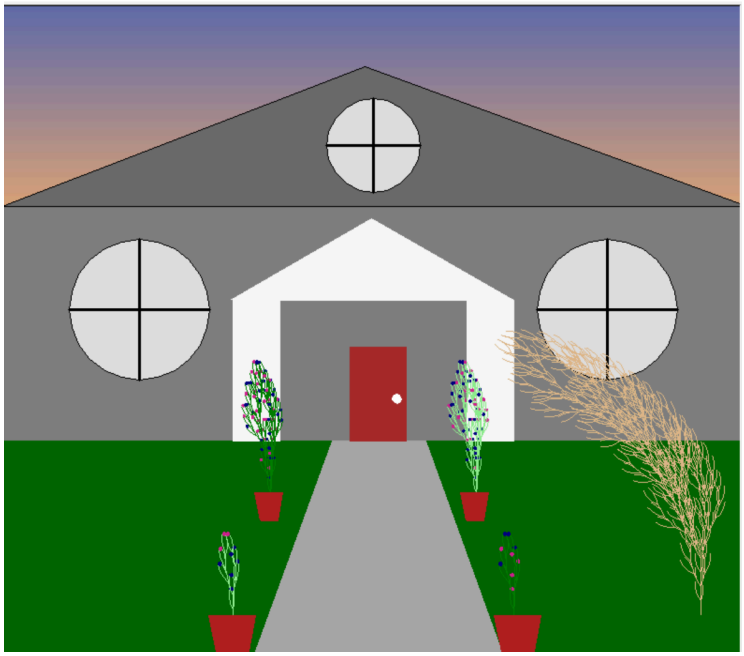
This is my final scene. Although I am not super happy with how the house turned out, I figured it is alright as I have already demonstrated that I know how to more complexly use turtle in past projects, so I am not too concerned about that. My main focus here was on the sky, which I made using a gradient formula as I did in my Zelle project to get a cool sunset, and getting the L-systems in as plants. Here, I created 2 new L-systems: scenePlants.txt and sceneTree.txt. Each has a different rule. The front 2 plants in the pots along the path iterate twice, while those behind iterate 3 times. This is seen with the changes in complexity between the potted-plants. I also changed the color of them, alternating between green and light green. Finally, I used sceneTree.txt to call in the other l-system and rule to make a more complex and larger tree in the yard. This I wanted to have a different color so I did a beige-ish color called ‘burlywood.’

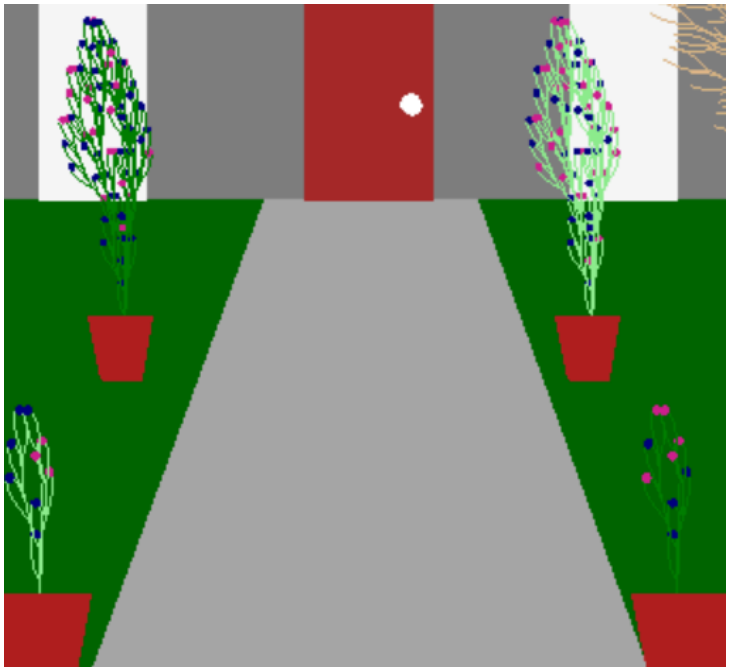
Reflection and followup questions:

Addressing how your understanding of the lecture concepts you identified in the abstract made this project achievable.
Lecture concepts I identified in the abstract made this project possible by using different concepts in different images. Loops, as mentioned, were crucial in making my grid. Without them, it would have been very tedious and time consuming to put in each tree, with a different iteration, different position, etc. Loops made this much smoother.

Additionally, turtle skills were used all throughout the project, but that is fairly basic at this point. Finally, l-system understanding was the hardest part for me to grasp, although I am happy to say I believe I got the hang of it.

Extensions:
If you do an extension for this project, include a **screenshot file of the extension work** (deep extensions are better). Explain specific extensions, the extension description and process, and resulting extra extension image(s) that are included to demonstrate your work beyond the required images.





My extension is the same scene as my scene.py, the only difference is a new command in the rule of the l-system scenePlants.txt. The rule here has only been changed with 1 character: ‘b’. This character represents different berries, blueberries and cherries which are growing on the plants in the pots. I did this by adding a new elif statement to my interpreter which reads ‘b’ and makes a circle, randomly either navy blye or dark red. Although it is not possible for blueberries and cherries to grow on the same plant, I still decided to go through with this. But, I do realize now that it would not be all that difficult to make them different plants. All I would have to do is make different elif statements for ‘b’ and maybe ‘c’ and just have them make circles of different colors; then, all I would have to do is make a duplicate l-system text file and replace the ‘b’ in one with ‘c’.

Sources, imported libraries, and collaborators are cited, **or a note is included indicating that none were referenced:** This ensures you are properly crediting the people and sources who help you achieve your results. Not listing them in the report is considered plagiarism or stealing. Please code with honor.

https://docs.python.org/3/library/turtle.html
https://matplotlib.org/stable/gallery/color/named_colors.html
CS151 A – Google Classroom: L-systems (Lectures, Colaboratories, Notes)

- `lsystem.py`: Shows lsystems functions
- `turtle_interpreter.py` draws your lsystems
- `abstract.py`: Draws and animates your abstract scene.
- `grid.py` draws your 3 X 3 grid of lsystem trees
- `scene.py` draws your final lsystem scene

Include your required images in your report Google Doc and include your Lab 08 file in your zip file.