TP Project Proposal

Project Description

The name of this project is 3D Video Title Generator. The project allows the user to create and save a customized 3D title intro for their videos by simply entering a title, an image, and adding particle effects. (TP3 Update: can save frames as a sequence of images)

Competitive Analysis

I like making vlogs so I play with title templates in video editing softwares very often. I've also seen a lot of amazing video intros on YouTube. My project will function similarly to a generator in common video editing softwares, where the user can choose templates, set attributes, and add effects.

For the 3D projection, I watched the related spicy recitation and mini-lecture along with several projection tutorials on YouTube. Unfortunately I did not have enough time to digest all the linear algebra, so I decided to copy-paste part of the 3D projection code from the 3D graphics spicy recitation and focus more on the user interface and customized controls.

Structural Plan

The main file will be the 3d-video-title-generator, which breaks the program down into 8 different modes (TP2&3 update: welcome, edit, background, move title, effects, glow trail, smoke, and fireworks). All the available characters will be stored in a Character class, initialized in a separate file.

Algorithmic Plan

TP3 update: Save frames - I actually went into 112 graphics to see how saveSnapshot() is done and modified it a bit to make it save a sequence with a customized bounding box instead of just 1 image with a set box.

TP2 update: Other tricky parts are figuring out the fade-out effects of particles since 112 graphics does not support alpha change, the blur filter on image manipulation, and the save frames as an image sequence. Here are brief descriptions of the algorithms:

- Alpha change: Have a function that uses a formula to calculate the color of each particle based on current foreground and background color
- Blur filter: Make small squares around each pixel and calculate the average RGB value; put it in pixel

Given that I took other's code for 3D projection, the trickiest part will be incorporating the projection code into my desired functions. Originally, the code served to project a single cuboid from different perspectives, and what I'll work on is to have it project multiple letters that make up the title. To draw the title, the following steps will be performed:

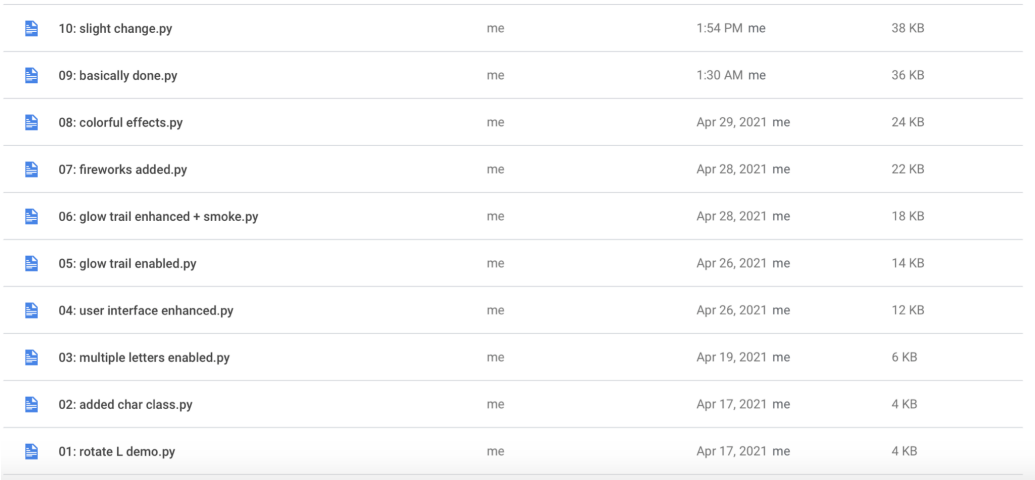
1. For each letter, in 2D, list all the points to be connected in order. This actually took me a while mainly because I had to make a good font and find an efficient way to connect the points.
2. Draw two flat letters in 3D by connecting the 2D points using the 3D projection matrix; the distance between them will be the thickness of the 3D letter.
3. Repeat Step 2 for all the letters in the title; The middle of the title always stays at the center of the canvas.
4. Connect all corresponding points on the two planes to create that 3D look.

Timeline Plan

TP2&3 Update: no loading screen; customized controls over images (filters: brightness, contrast, blur) and particle effects (set/random color); move title with mouse drag and arrow keys; save frames as a sequence of images, numbered in order.
April 18. 3D projection; proper drawing; add a few letters to experiment with spacing and centering
April 25. Add all the letters; add a start screen and a user menu; customized opacity, color, glow
April 30. Add a particle system: Mouse drag particle following + smoke and fireworks template; saving
May 5. Additional features like a loading screen, more customized controls, etc.

Version Control Plan

I'm uploading the python file to Google Drive every time an important feature is added:



10: slight change.py	me	1:54 PM me	38 KB
09: basically done.py	me	1:30 AM me	36 KB
08: colorful effects.py	me	Apr 29, 2021 me	24 KB
07: fireworks added.py	me	Apr 28, 2021 me	22 KB
06: glow trail enhanced + smoke.py	me	Apr 28, 2021 me	18 KB
05: glow trail enabled.py	me	Apr 26, 2021 me	14 KB
04: user interface enhanced.py	me	Apr 26, 2021 me	12 KB
03: multiple letters enabled.py	me	Apr 19, 2021 me	6 KB
02: added char class.py	me	Apr 17, 2021 me	4 KB
01: rotate L demo.py	me	Apr 17, 2021 me	4 KB

Module List

TP2&3 update: numpy, pillow

As of April 25: numpy