Computer Graphics Machine Project

Promentilla, Jose Mikhael Uriel

Project Description:

I decided that I would be interested in making a screen saver using 3D models and animation. The project will mainly show a dancing animation of a 3D model girl. There are enhancements made to the project such as adding spotlights, options to change the spotlight color, and finally applied texture.

Project Milestones:

1. Load 3D model using three.js.
2. Animate dance of a 3D model.
3. Create a 3D girl model.
4. Animate dance of the 3D girl model.
5. Add dynamic spotlights.
6. Add option to change the color of the spotlights.
7. Add texture and music.

Loading 3D Models:

There are different file formats for 3D models but I have deemed that using the FBX file format would be the most convenient for both the 3D model and animation. The FBX file format can be used for 3D modeling and is owned by Autodesk. With an FBX file, the 3D model and animation can be contained within it. In order to load a FBX file, there needs to be a FBX loader. Fortunately there is already a FBX loader integrated with three.js. FBXLoader.js was used to load the 3D models and animations.

Animating Dance:

Animation generally takes much time and effort if it was done from scratch. In the software tool Blender, animation is done frame by frame. I was able to find an easier way to animate a dance through Mixamo. Mixamo is an online platform that holds different animations that can be applied to your model. The process for animating a model is as follows:

1. Upload model online (model must be in either a FBX or OBJ format).
2. 3D rigging of model.
3. Apply animation to model.

The 3D models uploaded must follow a pose, typically the T-pose for 3D rigging. 3D rigging is a process of creating a skeleton for your 3D model in order to apply animation to it. The key areas in 3D rigging are often the chin, wrists, elbows, knees, and the groin. Through 3D rigging, animations can be applied to any humanoid model as there is an overall pattern to the structure and movements of humanoid models.

Creating a 3D Humanoid:

For this project, I used the software tool Vroid Studio in my modeling instead of Blender. Vroid Studio is used for Virtural Reality modeling and is specialized towards creating 3D avatars. As such, the models created in Vroid are in the format of VRM which is a file format for VR. VRM is actually a variation of glTF 2.0 file format which allows Blender to import the VRM file via import glTF option. The overall process for the conversion of files is as follows:

1. Using Vroid Studio create a 3D avatar in .VRM
2. Using Blender import 3D avatar as .glTF
3. Using Blender export 3D avatar as .FBX
4. Using Mixamo import 3D avatar as .FBX
5. Using Mixamo apply animations to 3D avatar
6. Using Mixamo export 3D avatar with animation as .FBX
7. Using FBXLoader.js load 3D avatar and animation into the project

Unfortunately, the problem with this many conversions is that there is no way for the model to retain its textures. I was only able to apply the texture towards the end of the project.
In order to make up for this, I decided that I would use spotlights to add colors to the 3D model.

Adding Spotlights, Texture, and Music:

1. Add three different spotlights each with different colors.
2. Move spotlights using tween.js.
3. Add GUI for the option of changing the spotlight colors.
4. Apply texture to 3D model.
5. Add appropriate music to dance.

I was inspired by one of the examples provided in the three.js website and decided to add it to my project. Colors can be reflected off of models through the colors of the light source. Furthermore, new colors can be created from mixing the different colors of the light source. Using three spotlights with distinctive colors (red, green, and blue), the intersection of the lights produced a beautiful array of colors. The position of the spotlights can be moved using the tween.js. Tween.js is also used for animations but focuses more on changing the properties of an object. I also added an option to change the color of the floor and the colors of the spotlights. This way, the user can see a wider variety of illumination. As a final touch, I applied a texture to the 3D model and played the appropriate music to the dance animation. The results is a 3D avatar dancing to the music with spotlights illuminating the floor beautifully.

Resources Used:

Packages:

https://github.com/mrdoob/three.js
https://github.com/tweenjs/tween.js/

Software Tools:

https://www.blender.org/
https://vroid.com/
https://www.mixamo.com/

Examples:

https://threejs.org/examples/?q=fbx#webgl_loader_fbx
https://threejs.org/examples/?q=light#webgl_lightprobe_cubecamera
https://threejs.org/examples/?q=spotli#webgl_lights_spotlights
https://tympanus.net/codrops/2019/10/14/how-to-create-an-interactive-3d-character-with-three-js/