COS 426 Final Project: Character Animation

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1 Abstract

This paper details the design and implementation of an application to display different walking animations in a 3D character model. It discusses design decisions, implementations, the approach taken, and future work that can be done on the application in order to improve it.

2 Goal

The goal of this project was to create a demonstration that showcases a variety of different walking animations and allows blending between them. It would show how relatively mundane 3D models can have changes in perceived personality by moving differently. The project implements several character animation techniques, including keyframes and rendering in order to accomplish these goals.

3 Previous Work

The inspiration for this project came from simulation games such as the Sims, Second Life, and IMVU, which allow the player to change their walking animation to customize their character. I became interested in how walking and animations could be used to convey a sense of personality, and how variations could convey different characteristics. Such games usually have a skinned mesh for the character and a set of keyframes for the walking animation, which is what I implemented here as well.

This project differs from the previous work in that it allows blending between different animations. Usually in these games, each animation has to be custom made. If a user wants to have an animation that is a cross between two, then the cross must be custom made and scripted.

4   Approach

In order to show the different animations, I used a sandbox, essentially a stage with a grid that allows the user to pick between different animations. I believe that this should work well to show the different animations because it involves few distractions and focuses on the sense of movement. I first thought of the interface and designed it around showing the character model and choosing between a few basic animation choices.
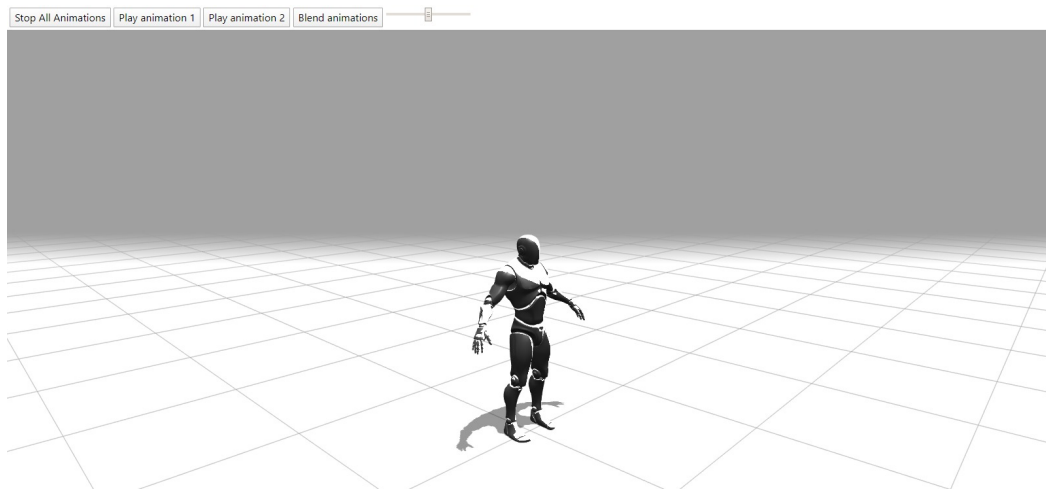
The stage with a gridded floor used to display the model.

5   Methodology

I started from a template for displaying 3D models, deleted the models, and changed the interface to an updated interface using slightly more visually appealing Bootstrap elements. I then added a model of a robot with several joints sufficient for doing the walks. This was done with simple HTML/CSS elements such as dropdown boxes, sliders, and dividing page elements.

Selecting individual animations can be done with buttons. When expanding the application, this would likely have to be changed to a drop-down box with all the possible animations, but since there are only two right now, buttons are more convenient. Animations can be blended with stillness for varying degrees of aggressiveness. The walk has very long strides and impactful footing, so merely adjusting the slider allows the viewer to see a variety of different walking animations, even if the walking animation was blended with nothing.

The controls in this scene allow the user to go through two different animations and blend them together. This allows blending between a walking animation and a running animation, with various levels of jogging in the middle of the slider.

The blending between animations was done with .fbx files that then were used as AnimationClips and a variety of classes present in the Three.js library. For example, the different walking animations are presented as AnimationClips, and an AnimationMixer is used on the model to blend between animations that are played on the model.

Walking. Note the head position, completely vertical torso, and short strides
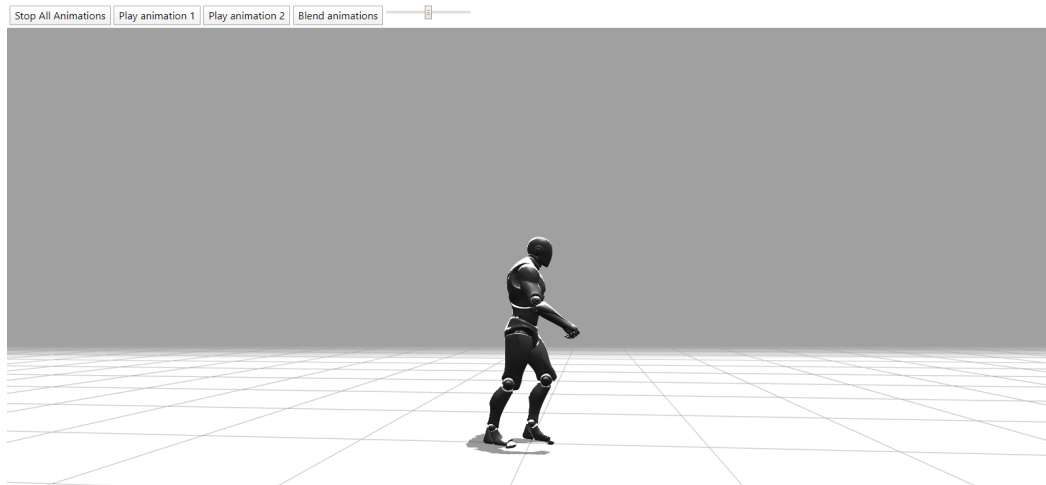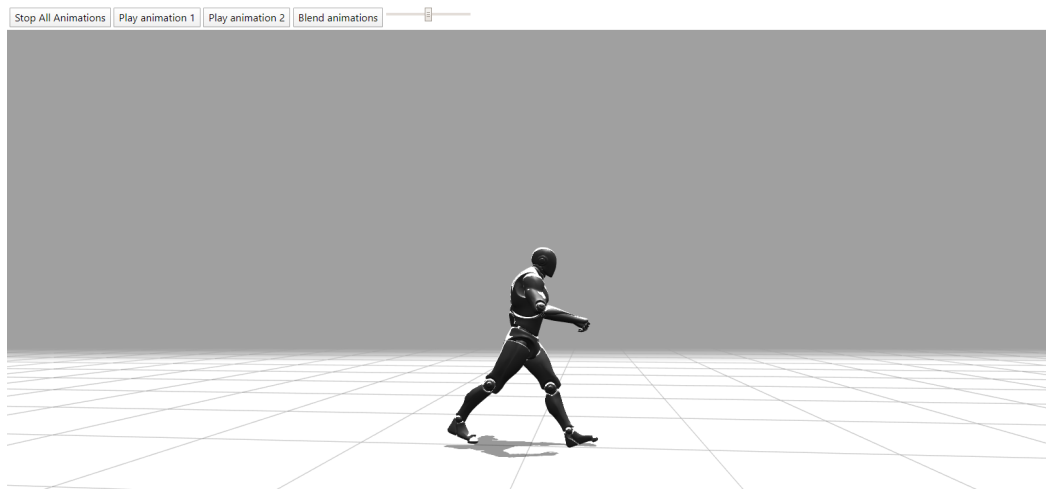
Running. Note the upward head position, slanted torso, foot position, and longer strides.
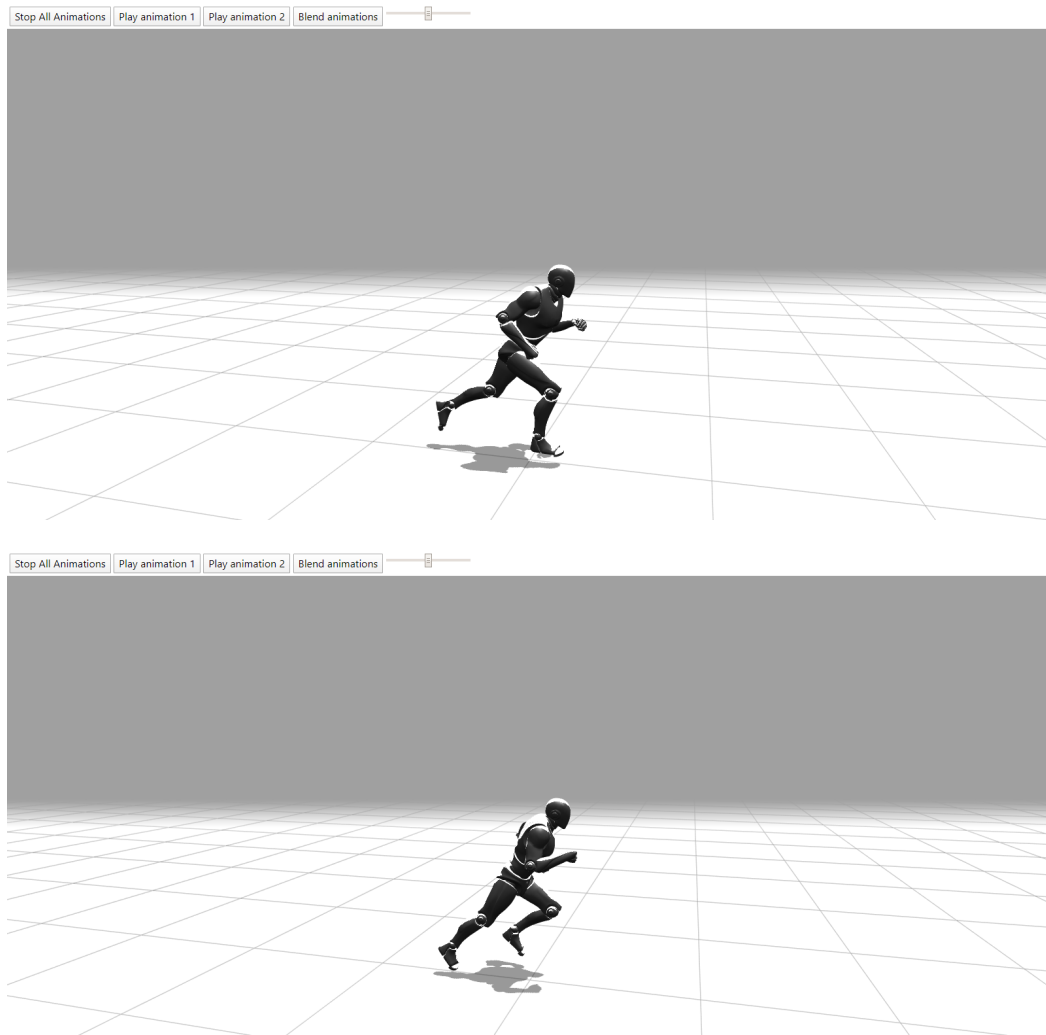
6   Challenges

I ran into challenges during several stages of the project. At first, familiarizing myself with the AnimationClip and AnimationMixer classes and how they operate was a challenge for me. Eventually, I was able to successfully blend between the two animations by using the weight assigned by the slider.

I started out animating with a simpler model and was able to make animations for this model, however, once I substituted it for a more complicated model, I ran into some issues. Making animations in Blender proved to be a big problem. I would have liked to include far more animations, but due to time constraints and difficulty using Blender, this was not possible for me. Instead, I decided to adapt animations from the Unreal Engine animations and modify them to fit the needs of that model.

The biggest challenge in the project proved to be designing the walking animations. Even though there was not much to be done programmatically with designing

the walking animations, animating several keyframes and getting the joints to a natural position was very difficult for me. In fact, in the final product, there are still some aspects of the joints that I am not quite happy with, especially in the arms.

7 Results

The resulting demonstration shows all of the above features. However, more animations could be implemented and perfected. When originally conceiving the project, I decided that the evaluation criteria would be based on how natural the walk looks. I think that the walk is very natural, and the adjuster allows for a variety of different strides and jogs.

The creation of the animation involved a lot of different keyframes, which is likely what makes the stride so smooth. However, this means that it is much more difficult to make more animations after making the first few, and it may be even harder to debug.

8 Discussion and Conclusions

I think that if I started with some of the assets from scratch, they would take a lot more time to construct, but the project would be harder to debug. I relied on a model that I found online, and adjusting it to the scene that I created made it a lot harder.

I believe that this framework provides enough resources to show the different kinds of walking animations, but in the future, more animations should be added for more variety, such as different posture while walking, hips swaying, less arm action, etc. Perhaps for each body part, the animation can be blended as well.

Frankly, this solution to the problem is very minimal and not quite as visually appealing as it should be. Because I ran into so many challenges and spent so much time debugging, there is a lot that could be added. Overall, I feel as though I achieved my basic goals, but I would have liked to have gone far beyond this and reached a level where the project was very polished, with several animations. Additionally, I would have liked to tackle some of the future goals. However, I think that this base can be built upon to work on the future goals without much revision needed to the basic functions.