

Project Proposal

Introduction

For my final project I would like to create a cannon which will fire a cannonball at a wooden pallet, causing the pallet to explode. This project will address the use of physics in computer graphics, as well as a small interactive component by allowing the user to fire the cannon by clicking a button. This is an interesting project because of the destruction involved. Destruction is much more complex than just simple physics like rolling a ball, and understanding how realistic destruction is actually done would be very interesting to me.

Challenges

- The physics of shooting the cannonball itself will be a little tricky. I will need to determine how much force the cannon can shoot the cannonball with, and this will need to be transferred into acceleration. Gravity will also be in effect so that will also have to be applied.
- The physics of the wooden pallet exploding will be the most difficult part. I'm not sure what is involved in modelling destruction so I will need to research that. Is each broken piece of wood its own model? Are all the broken pieces initially glued together like a puzzle, or do the broken pieces only get created when the wooden pallet explodes? These are questions I will need to answer as I move forward with this project. Also, each piece of wood that breaks off of the wooden pallet will need to fall to the ground due to gravity, and the force from the cannonball will need to be properly distributed throughout all the pieces. I plan on using the cannon.js library for this so perhaps that library has a good way of implementing this. Regardless, I think the physics involved are fairly complex and therefore it will be quite a challenge.
- There is also the challenge of creating realistic looking cannon, cannonball and pallet models. These models aren't so complex that I couldn't do them myself but I still might look around the web and see if there are some good models I could use in this program. If I were to do them myself I don't think it would be too bad, the cannonball is essentially just a sphere and you could create a cannon with a cylinder for the tube and some rectangles for the base. I want them to look very realistic though so it might be tough to get them looking just right. I will need to apply the proper texture and lighting as well but that shouldn't be too difficult.
- Finally, collision detection between the cannonball and wooden pallet will be another challenge during this project. I believe cannon.js has a good way of handling collision detection but all the splinters breaking off of the wooden pallet will need to have collision detection with each other as well. This will be tricky but hopefully when I have a better understanding of how destruction is done I will know how to do this.

By solving all these challenges I hope to learn some of the various techniques of modelling destruction and physics. The collisions and forces involved will be a challenge to model but hopefully by the end of the project I will have a solid grasp of how modern physics engines handle the destruction.

Implementation Plan

Release 1

In the first release I would like to have all my models in the scene created. This includes the cannon, cannonball, wooden pallet, as well as the room/world the scene takes place in. There will be no physics or interaction yet, the models will all be static.

Release 2

In the second release I would like to add in the ability for the cannon to shoot the cannonball. The cannon should fire when the user clicks the cannon and the cannonball should fire out of the gun. The physics of the cannonball will be implemented, such as the force of the cannon firing it as well as the force of gravity, however collision with the pallet or ground will not be implemented yet.

Release 3

In the third release collision detection will be implemented. This includes collision detection between the cannonball, wooden pallet, and the ground. In this release the wooden pallet will act as a solid object, essentially a wall. It will not be destructible yet.

Release 4

Release 4 will be the final release. In this release the destruction of the wooden pallet will be implemented. If there is time I may add the ability to change the angle of fire for the cannon by dragging the barrel with the mouse. The destruction of the pallet will be the sole focus of this release however.

Team Members

None.