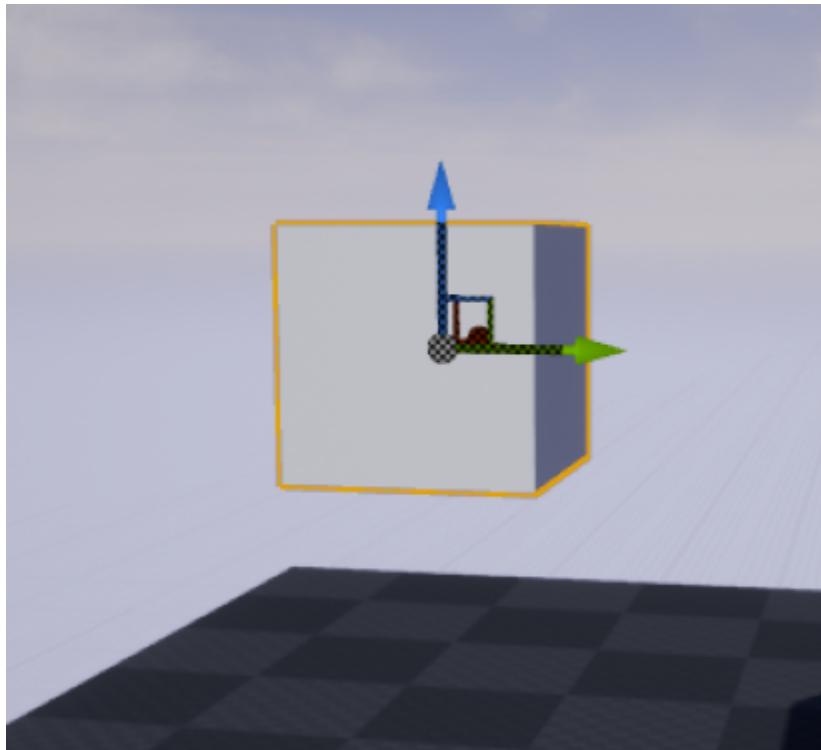


Detailed Description: We built a timed FPS (First Person Shooter) on Unreal Engine.

Choice of Engine: We chose to use Unreal Engine because we didn't want to work on OpenGL. We could've chosen Unity, but we did a comparison between them. And finally decided to choose Unreal because it provided a bunch of in-built functions and libraries as well as the graphical nudge for our project.

An accounting of any assumptions made both when designing the project or when running the program. This could be things like a data format you are using or assumptions about the user's actions. This where you can outline where you cut corners if needed i.e. "We assume that a backend interface for a server would supply data for this object's details".

We picked Unreal Engine because it provided us an environment to drag and drop our objects into the environment. In contrast to OpenGL, we didn't need to manually write codes to translate the position of the object - we just needed to put the object into our environment and adjust it as we needed by pulling/pushing the arrows and keys. This saved us time in setting up the virtual environment as most objects needed to be placed along with their textures in the base.



(Picture of the translation of cube in Unreal Engine)

Model, Texture, and Artifact Catalog. Anything you load into your code needs to be documented. It can be a screenshot of the modeling tool, or a sample of the texture. I want to see it in as close to a raw format as possible without having to actually open a program.

We created several objects and textures/UVs on Blender itself. We're going to walk through every object/texture, how we made them, and what our thought process behind that was.

Skysphere:

We used the concept of building sky cubes/sky boxes from class and built a sky sphere instead. We learned that it was easier to find pictures for the sky spheres because they are in a HDRI format. We tried and tested some pictures from [HDRIHaven](#) before deciding on the one that we did.

To make the sky sphere, we used Blender to build a sphere and flipped all the vertex normals (pointing out to the screen). The “flip” made its normals point inwards, towards the origin. Then, we transported the object to an unreal engine, adjusted it, added the picture as the texture, and finally scaled it so that our base was inside the skysphere.

Here's a picture of the texture that we used:



(Picture taken by Greg Zaal, taken from [here](#))

Trees:

We made a couple of trees for the environment to set up the scene. We referenced both the trees from a youtube video, referenced [here](#).

For the first tree, we used the ico-spheres and shaded them smooth so that it was more circular. We left some edges because we still wanted the rustic look of a tree. We used several icospheres with several sizes. For the trunk, we used line points to extrude and create a line graph for the tree and put the “skin” effect on the blender. We made a collage of two textures

into one because that made it easier to use it as one object. Below are the pictures of the tree with the textures that we used.

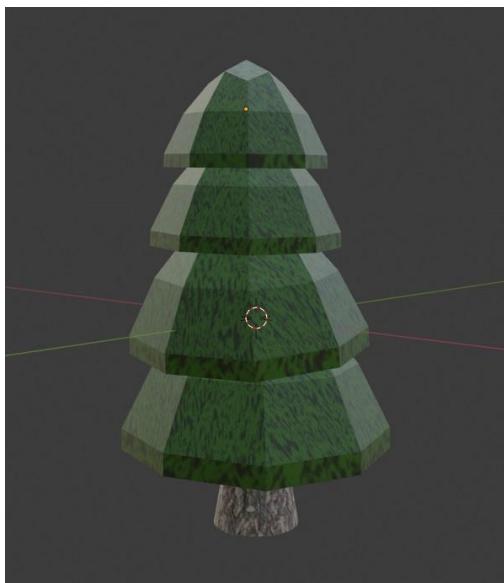


(Screenshot from the Blender file)



(Downloaded Texture for the tree + trunk)

For the second tree, we used cubes to extend and shape it in the form of cones. We intended to make this sort of a pine/christmas tree. We have two textures in the same image here as well - first the tree and then the trunk. Again, we made a collage of both these textures so they're one image. Below are the pictures of the tree with the textures that we used.



(Screenshot from the Blender file)



(Downloaded Texture for the tree + trunk)

Soil:

For the soil, we made round flat planes and put the texture of the soil on it. The texture of the soil is different for both trees. The textures and the screenshots of the trees are below:



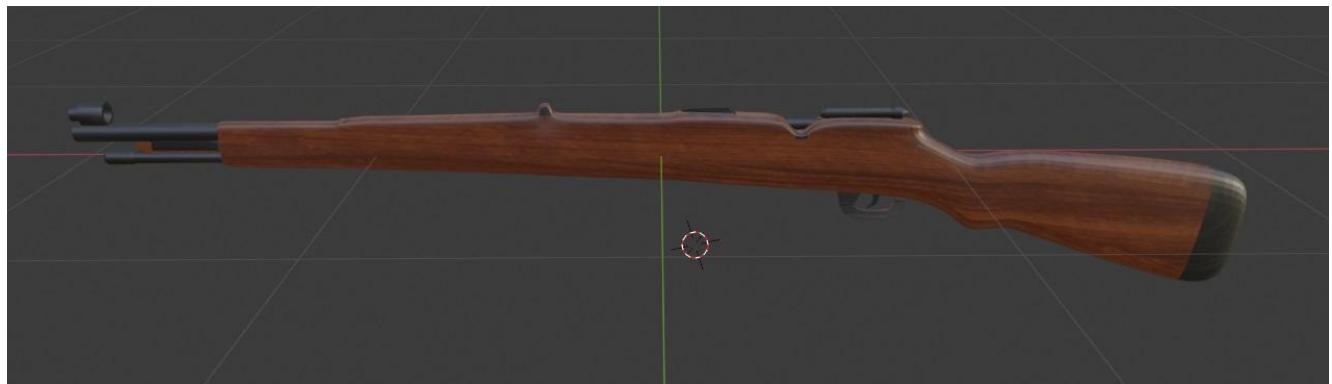
<Texture for Soil1>



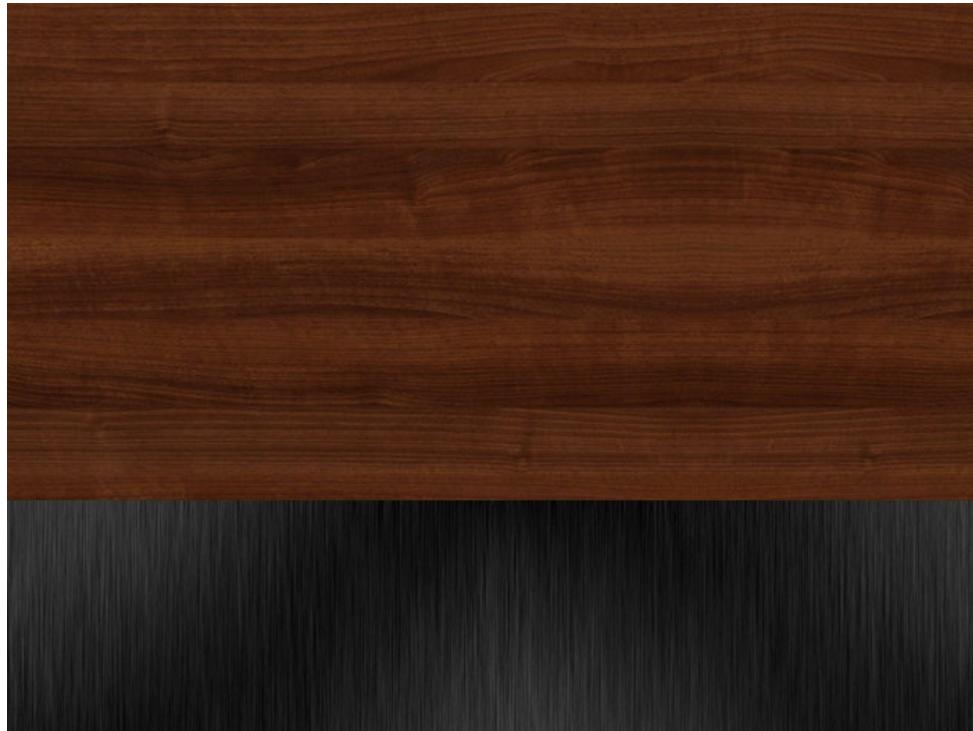
<Texture for Soil2>

Gun:

For the gun, we tried modeling a Kar98 rifle using the video [here](#). We used a cube, sub-divided them a lot more to get a smooth surface and started modeling them. Below are the pictures of the gun with the texture.



(Screenshot from the Blender file)

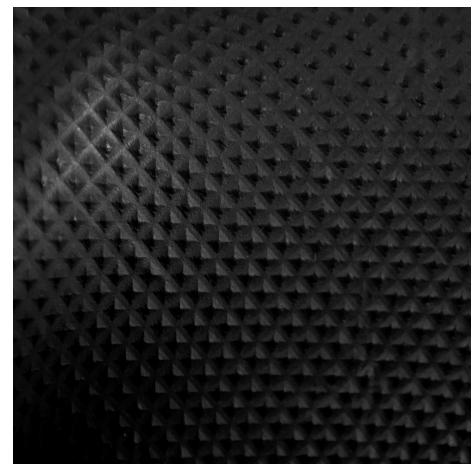
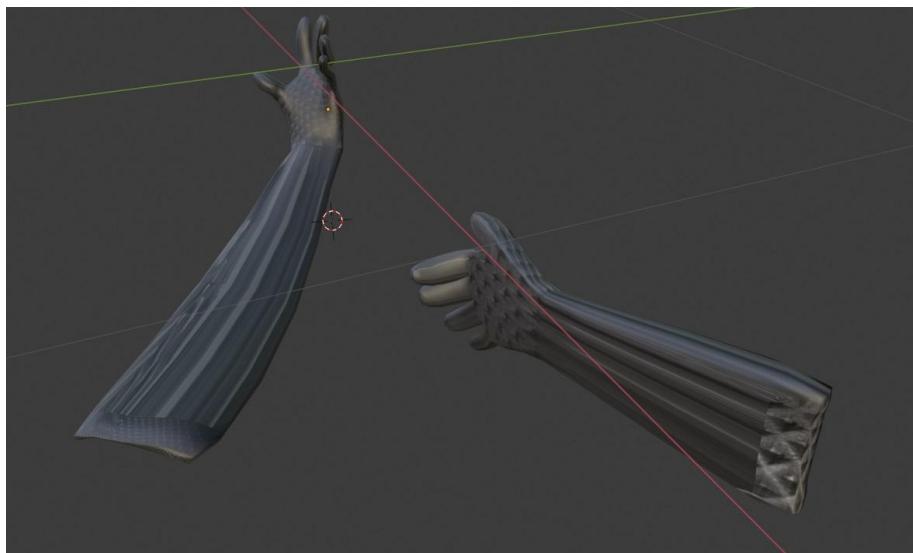


Hand:

We built the hands to give an effect of someone holding the gun. We used the armature and bone structures in Blender to give the hand some movement, and positioned it to hold the gun. The forearms are thin because from the perspective we're playing in the game, we wouldn't see the entire hand. The texturing on the hand is dark (a glove texture).

One of the problems we encountered with sending the hands over to Unreal Engine was the armature (bone structure) on the fingers weren't linking well. So, blender was just passing the open hand object into the space. We couldn't quite figure out why this error was occurring.

Anyways, here are the pictures of the hand, the textures, and the hand holding the gun.



(Screenshot and texture for hands)

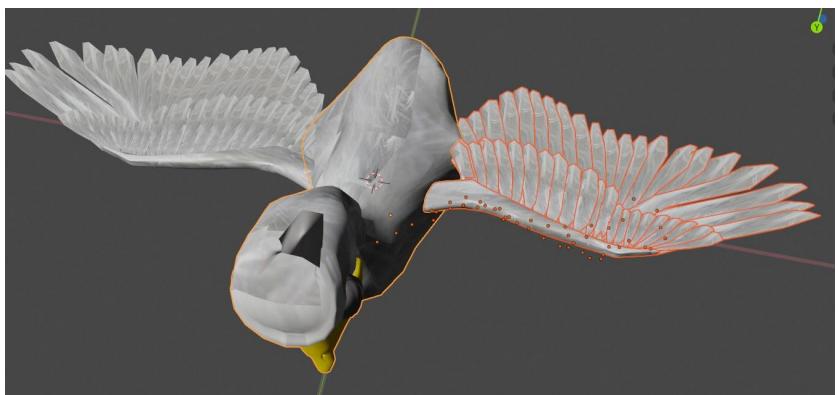
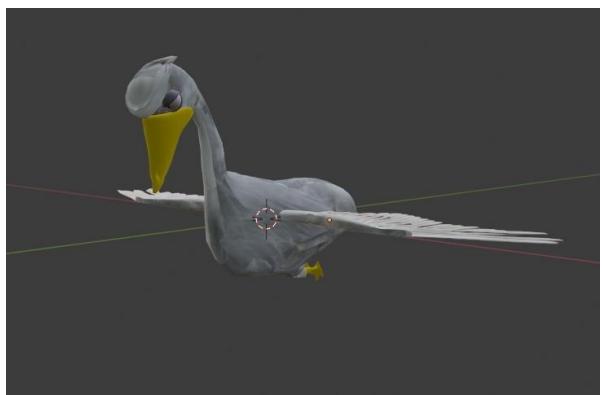
Both:



Bird:

The bird and wings were made using cubes (a lot of them). The bird has feather textures, and each feather/wing is an element of its own. It was an intensive process, but we're happy with the final outcome.

We wanted to add animations so that the bird moved throughout the space. However, we had some troubles with sending the bird with the animation over to Unreal Engine. The bird has been animated well in Blender, but it just doesn't work on Unreal. [Here](#)'s the link of what it was supposed to look like. Below are the pictures of the bird and the textures:



(Screenshot from the Blender file)



(Downloaded Texture for Feathers)

Coins:

We used a cylinder to make a coin. We then added textures for the cylinders and made them into coins. We actually made it for three different coins, but we only used one for this case. I've attached the pictures for the texturing the objects on blender below:



<Screenshot of the Coin>



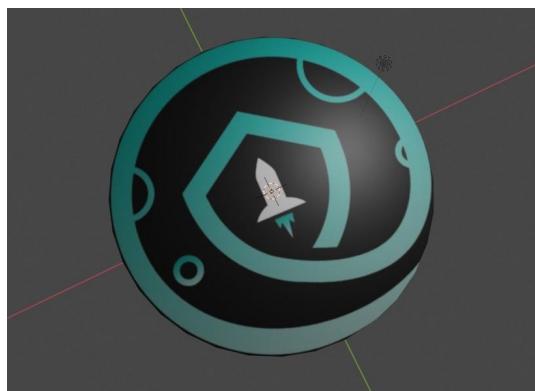
<Texture of the Coin>



<Screenshot of the Coin>



<Texture of the Coin>



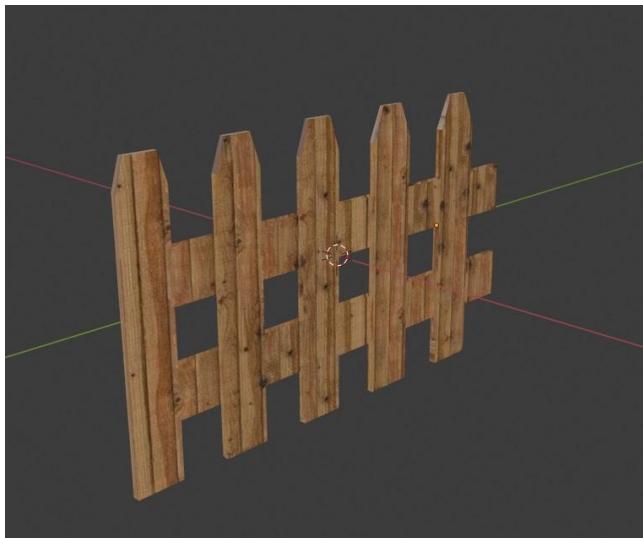
<Screenshot of the Coin>



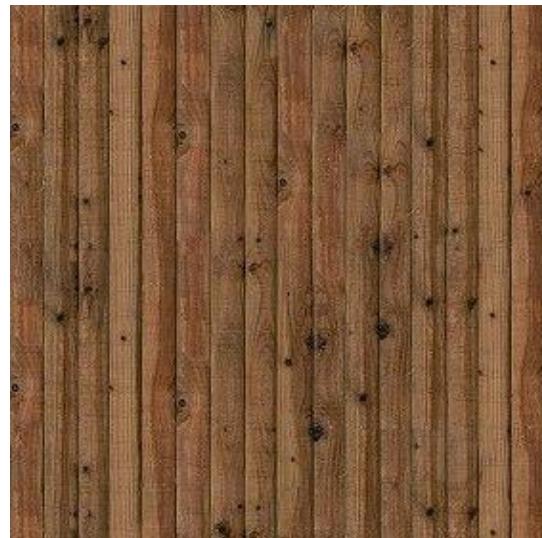
<Texture of the Coin>

Fence:

We made the Fence using cubes and gave it a wooden texture. The purpose of the fence was to set a boundary so that people wouldn't be able to move out from that place. Below are the pictures for the fence and its texture.

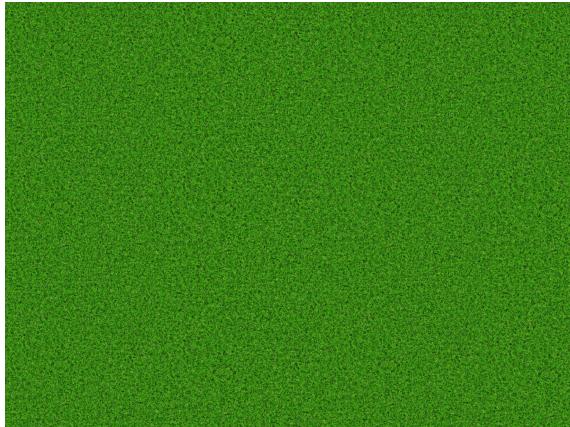


<Screenshot of the Fence>



<Texture of the Fence>

Base (Grass):



(Texture for the base)

Object Setup:

We made all of our objects using Blender. The process, pictures, and textures are all attached in the Model/Texture/Artifact segment above. We set up the UVs manually for all the models and artifacts so that the texture mapping worked well if the same texture was attached in the file.

Environment Setup:

To set up the environment for the project, we created a new project on Unreal Engine. Then, we loaded all of our objects to the Unreal Engine. For some of the complex objects like the bird and the gun with the hand, we've used the Send to UE plugin in Unreal as well as Blender. We watched a video for it, which can be found [here](#). Whereas, for the rest of the objects we exported them in the form of the .fbx files. The .fbx files store data about cameras, lights, meshes, and other elements of the 3D scene - they also store the bone structure data and animations. However, we did run into an issue with passing the bone structures and animations through the .fbx files - they weren't cooperating at all.

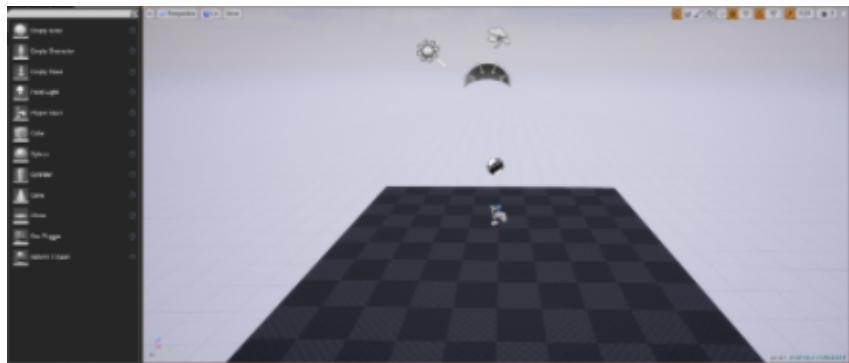
So, for the grass, we put the textures in the grid floors or the base that unreal engine provides - the black and white grid on the image. Next, we implemented the trees into the program by uploading the .fbx files into the engine. We dragged and dropped the object into the base and linked the material (textures) into the objects. We did the same for the soil textures and objects and set up a tree w/ a soil.

We added a sky sphere into the project by adding a sphere with flipped normals (discussed above) and placed a material (texture) onto it. We got the concept for this from [here](#).

After the trees were set up, we also pulled in the fence objects and made several copies of it to cover the entire end of the base - to stop it from going out of the project.

Next, we made an actor (*a term used in Unreal Engine for objects w/ functions attached to it*). And placed the camera on it. We then placed the perspective of the hand holding the gun in front of the camera. This is how we got the first person perspective as we're moving the "actor" around, and it moves with the camera and the hand/gun. We also linked the "muzzle flash," an artifact built-into the engine, to flash after every shot/click.

Finally we put the birds and translated them into the air. We also added the dogecoins (or the coins) into the environment, but it only spawns when we hit the bird.



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