LIGHTING AND RENDERING - FUSION ENERGY GENERATOR

Francisco Múrias Mira Cabral Pinto (V8232778@live.tees.ac.uk)
MA 3D Games Art, Teesside University, 2019

PROJECT AIMS

To create a semi-realistic sci-fi scene, using up-to-date practices such as modular workflow and tiling materials, that allowed me to implement a visually interesting and stylized lighting solution featuring dynamic lights, volumetric smoke and particles, and achieve a stylized exaggerated science fiction look.

INSPIRATION AND PRE-PRODUCTION

The scene was initially inspired by several concept images featuring a focal object in the centre accentuated by contrasting red to blue lighting.

This highly contrasting use of colour was a basis for my idea of having a focal object be a power source and the idea of creating a fusion core / energy generator room emerged.

With these main inspirations in mind, I built a reference board with several examples from games such as Titanfall 2, Metal Gear Solid V, and Destiny 2, that more directly inspired the assets in the scene, such as the generator, the hexagonal dome, the terminal computer, the platform and the bridge. The appearance of these assets needed to reflect an industrial sci-fi aesthetic, evoking the feeling of a machine room with flowing electricity, leading to a central focal point.

Scenes such as Jordan Pascal's sci-fi generator, helped better define what this environment needed to feature: the generator, the bridge, fans on the sides and an walkable platform facing the central focal point.

FRAMING AND BLOCKOUT

The structure is based in a hexagonal shape. All the perspective lines point to the focal object, the fusion core and the environment is populated with long halogen-like lights that indirectly lead the eye to it.

The layout consists of a main platform, with a walkway leading to the fusion core. Initially I had laid out a structure below the main platform that could also be explored by the player. However, this was later removed and replaced with pipes as the time was better spent polishing the focal areas.

The hexagonal theme that shaped the overall structure worked also as an influence for the shape of the generator platform, as well as the generator frame itself and the hexagonal door. All the elements worked together to create a cohesive scene.
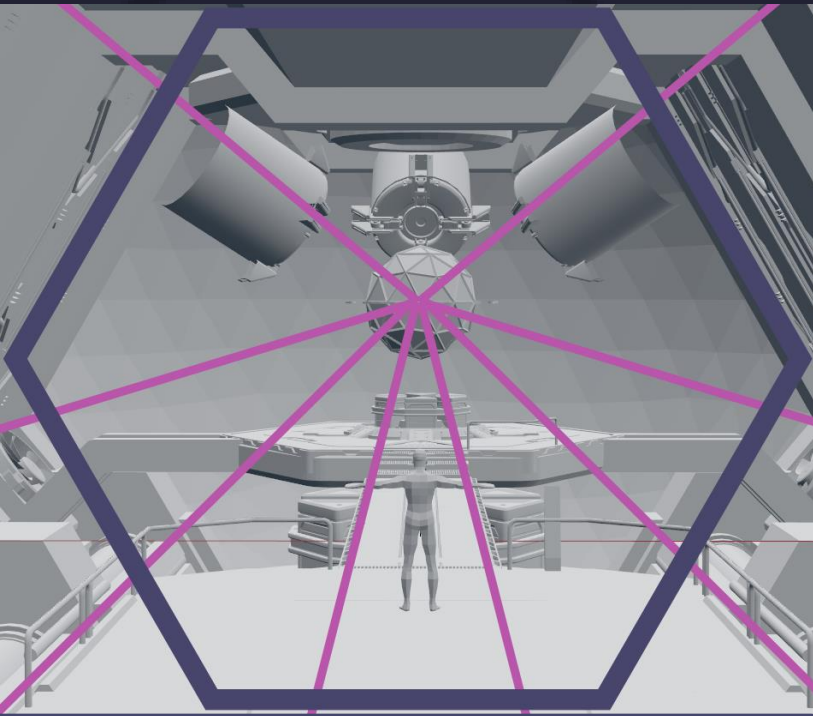
MODELLING

After the initial block out, I defined the most important objects in the scene, such as the generator, the beam emitters, the bridge and platforms, the terminal computer and the main door. These would be the "hero pieces" of my scene and would require the most time investment with regards to modelling. I took advantage of techniques such as face weighted normals to better define my shapes and create that distinct hard surface sci fi feel in the mesh.
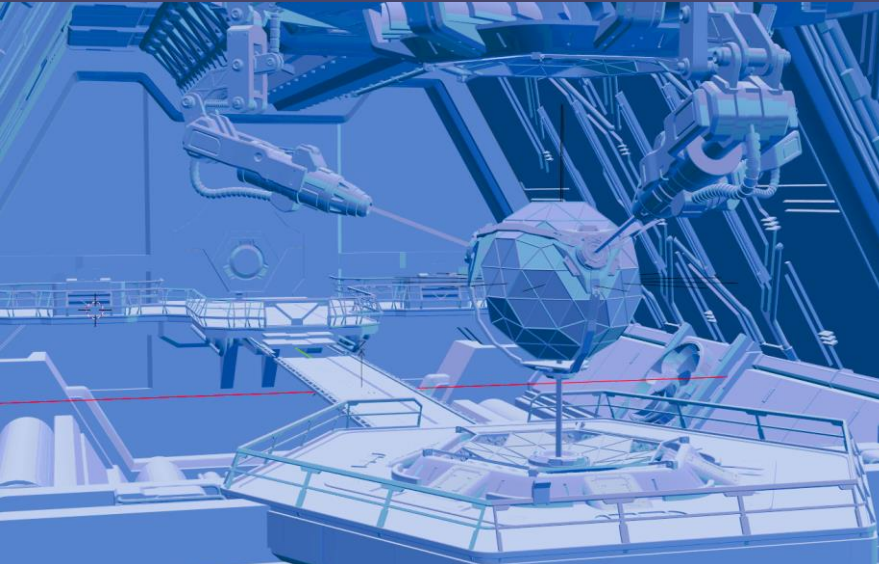
Modularity

For all remaining assets such as the walls, the floor panels, the fans, and the railings, my goal was to use a modular workflow that would allow me to reuse these pieces and iterate on their positioning. Since my scene was symmetrical, I would start from the rough shape of the walls and extrude and cut up the panel shapes. All of my walls use the same 3 or 4 panel modular panel pieces, rotated and flipped around to cover the entire scene. For the platform, I designed the floors so that they would interconnect. Then, I designed the railings from a universal shape, and curved it for each of the angles needed in the corner pieces.
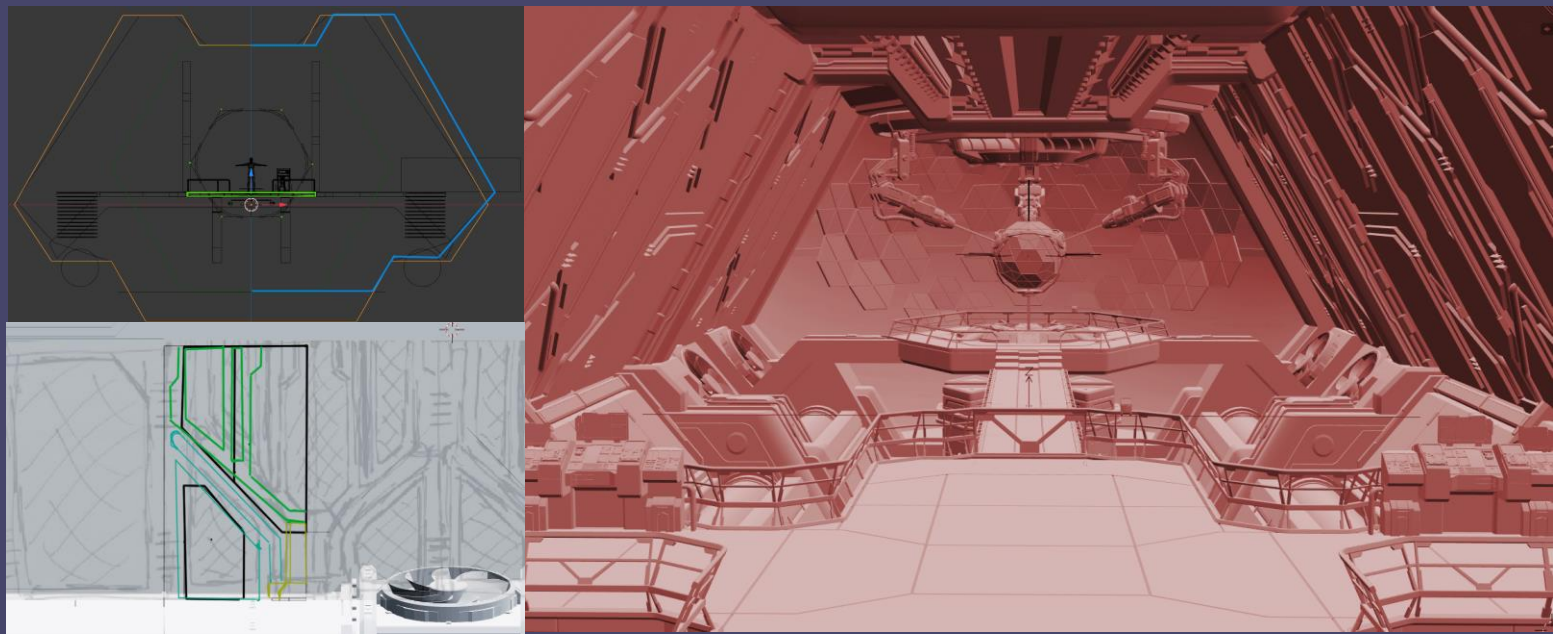
MATERIALS

I made extensive use of the smart material feature of substance painter, and started by creating the materials I used. I created several metallic materials as well as an insulating material featuring a hexagonal pattern that I would use for most of the wall panels, further adding to the hexagonal theme already present in the scene.

Following that, I used three separate workflows for the materials:

Hero pieces:

For the "hero pieces" I mostly followed the classic high-to-low workflow. I outlined the different sections of the mesh where I would use different materials and then created a non-repeating UV map for that asset. After that, I used Substance Painter to bake all the high poly details into the mesh and took advantage of the smart materials created before to quickly get a base texture.

Tiling assets:

For the remaining tiling assets like the wall panels and the pipes, I created tiling UVs that would allow me to use repeating tiling textures to keep a consistent textel density even for the largest of assets. This provided an improved iteration with the materials inside unreal engine.

Animated Materials:

For the animated materials, such as the material of the fusion core and the terminal screens, I created more complex material nodes for each inside unreal:

For the screens, I created a single sci-fi UI texture in photoshop and then made use of panner nodes to overlay it with scanlines of different sizes, giving the impression of a computer screen with some visual glitches.

For the material of the energy core in the centre of the scene, I used UE4's "Motion_4WayChaos" Material function present in the engine content, with a cloud noise texture to create the feeling of a contained field of energy.

I then used a "DeriveHDRfromLDR" node to convert the result to a HDR Emissive that would better help light the surrounding space.
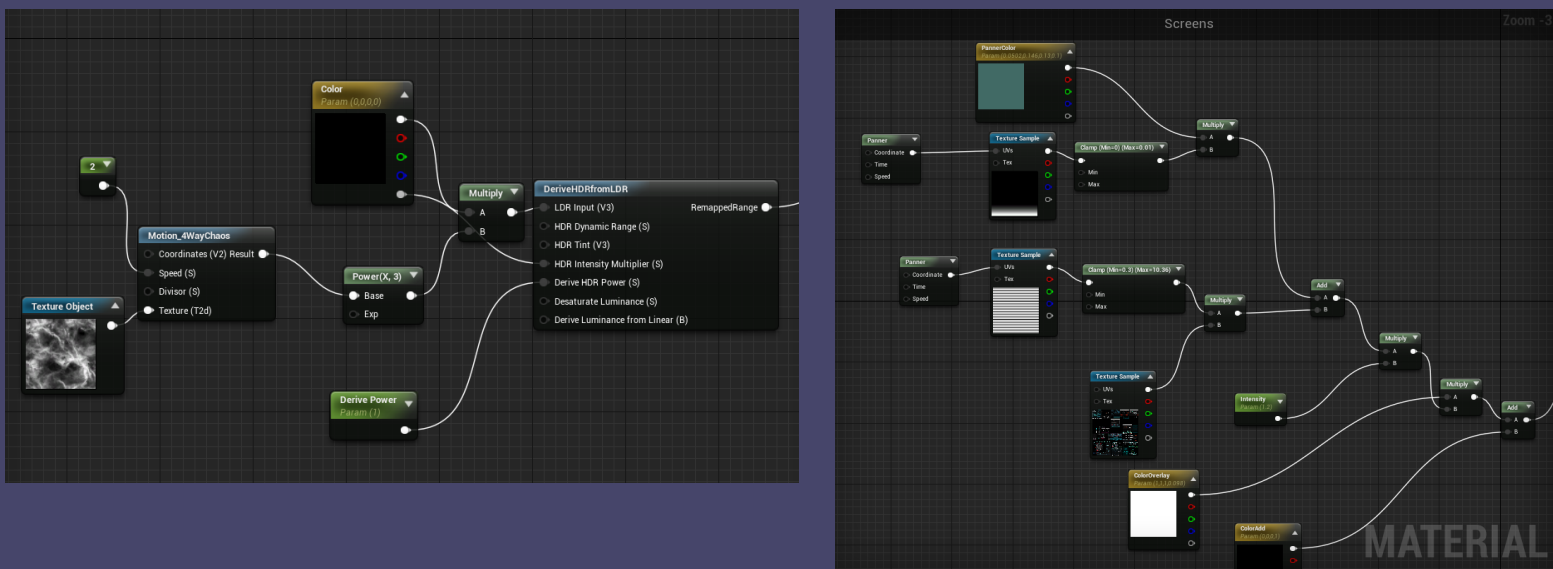
LIGHTING

For the overall lighting solution, my aim was to highlight the player's attention to the fusion core as the focal point of the scene as well as make use of dynamic lighting to create an interesting scene in the fusion core.

Along the hallway the lights converge from red to blue, guiding the players attention to the focal object, by playing with the contrasting colours. The halogen lights along the walls and ceiling act as subtle lines pointing to the core. I added few low-intensity fill lights where I felt they were needed for a more realistic feel.

For the generator core I added a very bright blue point light in the centre and used rotating dynamic lights pointing to it to cast interesting shadows in the walls and further call the players attention.

I modified the lightning effect blueprint from Unreal's Alan Willard to create the electric bolts emitting from the energy core, and create unexpected dynamic lighting variation in the centre of the scene.

For the computer consoles I used a blue spotlight to rim light it and fake light coming from the screens, and used a similar effect for the lights at the side of the entrance door.

For an added use of dynamic lights, I wanted the player to be able to walk to the fusion core, and the created an animation that extended a bridge and lit up each of its lights one by one. This was triggered by the player approaching the edge of the platform.

I made use of Unreal's Exponential height fog, and a custom volumetric material and particle system to add Volumetric smoke to the fans on the walls, using spotlights casting from them to add to the effect. Lastly, over the pipes, I added smoke particles based on Epic game's infiltrator scene to further add to the foggy, machine room vibe.
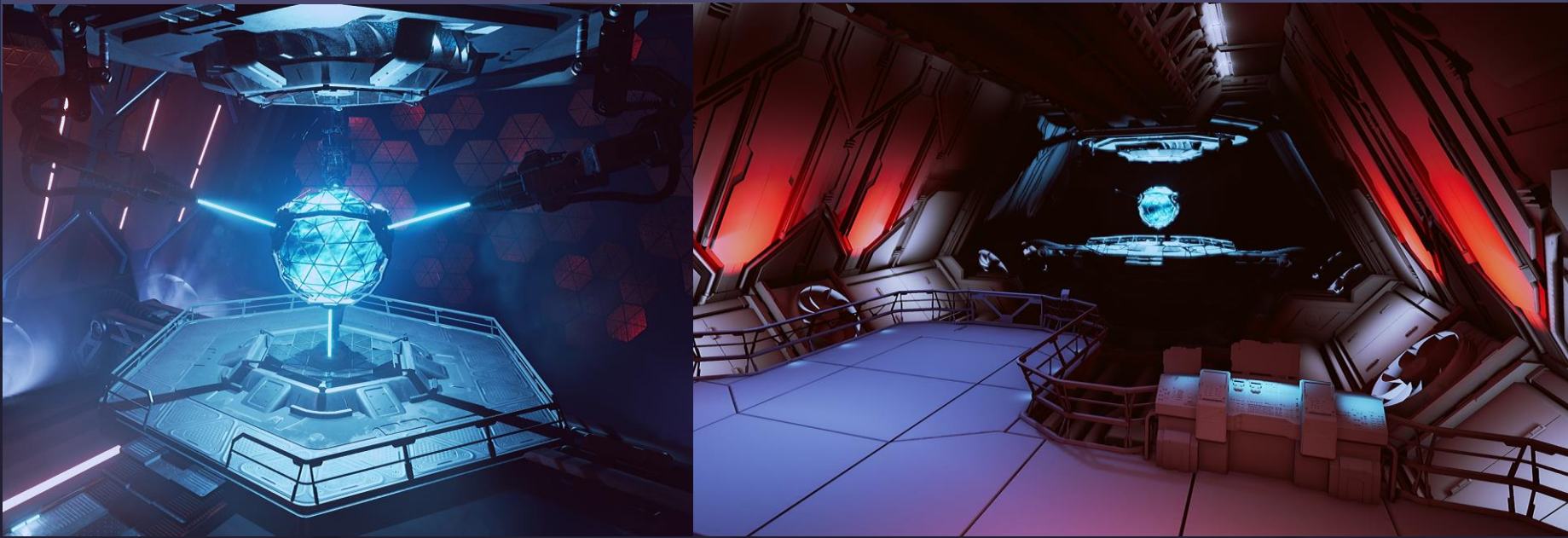
POST-PROCESS

The final touch up consisted of adjustments to the temperature, tint, contrast, adding a LUT, adjusting the bloom, using a screen dirt mask, and tweaking the exposure (for a heavily stylized look). An essential tweak was to disable unreal's auto exposure and disable motion blur and chromatic aberration. Lastly I applied a sharpening filter to the post process volume.

END RESULT AND SELF CRITIQUE

This was the first scene I made using unreal engine, and the first time I went through many of the processes of creating game assets from start to finish, not to mention to fully light a scene. Overall, I think I achieved a result similar to what I initially intended, very similar to my initial concepts, and with a strong emphasis on dynamic lighting and moving elements. The scene evokes a tense feeling of being in a room with a massively powerful object radiating energy.

I learned immensely from all my mistakes and greatly improved my workflow from every lesson learned. In the end I wish I had created better material node setups in unreal and further improved the individual materials in each asset, instead of focusing my time in modelling.