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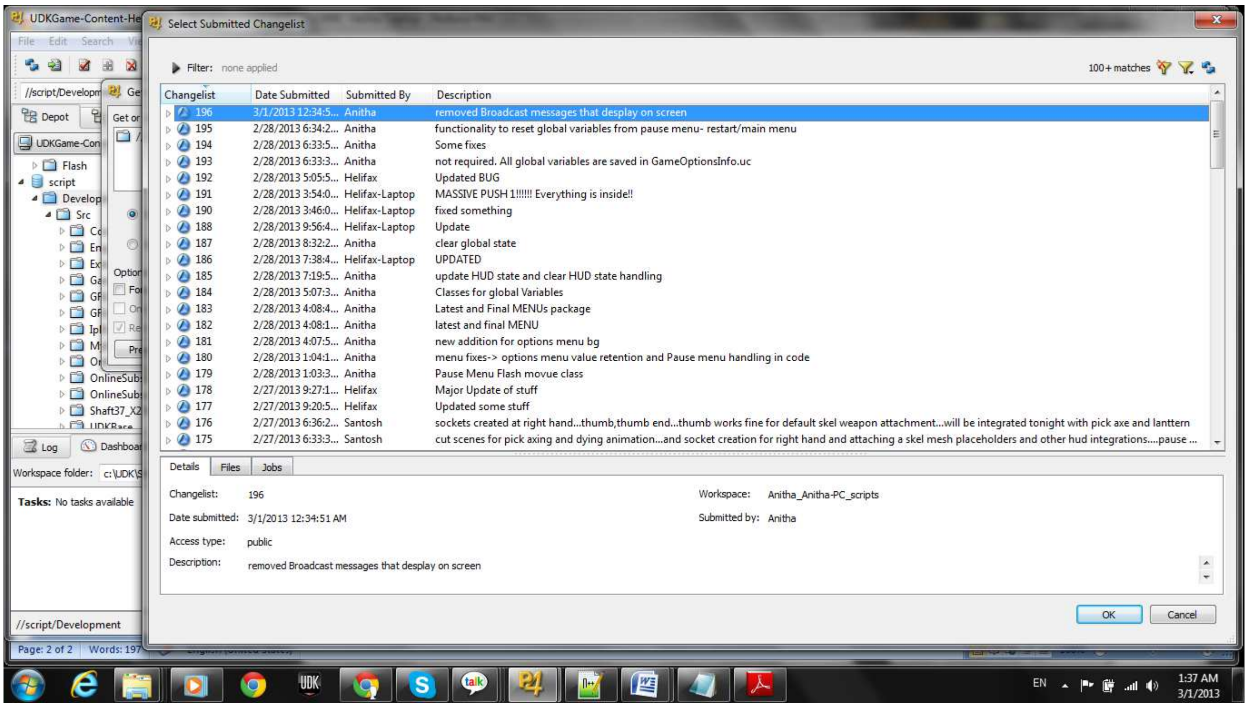
StudentID:	i7787535
Date:	01 March 2013
Programme:	MSC Computer Animation and Visual Effects
Unit:	Group Project
Title:	Shaft 37 – X25

Report about my roles in the development of Shaft 37-X25 game

During the length of this project I had multiple roles. One of the main roles was the **Technical Director** one. As I was the only one from the group familiar with Unreal Engine 3 and the tools my first responsibility was to explain the workflow, limitations of the engine to my fellow colleagues. For this I have created several documents that are attached in the **Support Documentation** folder on the DVD including a lot of technical details (like polygon count, material types etc) specific to the platform and the engine. The same folder also contains the initial game mechanics and game type that I created at the start of the project.

Another approach that I deemed very important was to setup a proper versioning system in order to be able to keep track of our assets, and since we had to deal with code to be able not to revert any unwanted changes, but also for the ease of sharing taking into consideration the big number of people in the group. For this I have used my personal computer from home, since UDK runs only on the MS-Windows operating system and created a quick tutorial on how to set it up that was shared across the group.



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Changelist	Date Submitted	Submitted By	Description
196	3/1/2013 12:34:5...	Anitha	removed Broadcast messages that desplay on screen
195	2/28/2013 6:34:2...	Anitha	functionality to reset global variables from pause menu- restart/main menu
194	2/28/2013 6:33:5...	Anitha	Some fixes
193	2/28/2013 6:33:3...	Anitha	not required. All global variables are saved in GameOptionsInfo.uc
192	2/28/2013 5:05:5...	Helifax	Updated BUG
191	2/28/2013 3:54:0...	Helifax-Laptop	MASSIVE PUSH 1!!!!!! Everything is inside!!
190	2/28/2013 3:46:0...	Helifax-Laptop	fixed something
188	2/28/2013 9:56:4...	Helifax-Laptop	Update
187	2/28/2013 8:32:2...	Anitha	clear global state
186	2/28/2013 7:38:4...	Helifax-Laptop	UPDATED
185	2/28/2013 7:19:5...	Anitha	update HUD state and clear HUD state handling
184	2/28/2013 5:07:3...	Anitha	Classes for global Variables
183	2/28/2013 4:08:4...	Anitha	Latest and Final MENUs package
182	2/28/2013 4:08:1...	Anitha	latest and final MENU
181	2/28/2013 4:07:5...	Anitha	new addition for options menu bg
180	2/28/2013 1:04:1...	Anitha	menu fixes-> options menu value retention and Pause menu handling in code
179	2/28/2013 1:03:3...	Anitha	Pause Menu Flash movue class
178	2/27/2013 9:27:1...	Helifax	Major Update of stuff
177	2/27/2013 9:20:5...	Helifax	Updated some stuff
176	2/27/2013 6:36:2...	Santosh	sockets created at right hand...thumb,thumb end...thumb works fine for default skel weapon attachment...will be integrated tonight with pick axe and lanttern
175	2/27/2013 6:33:3...	Santosh	cut scenes for pick axing and dying animation...and socket creation for right hand and attaching a skel mesh placeholders and other hud integrations....pause ...

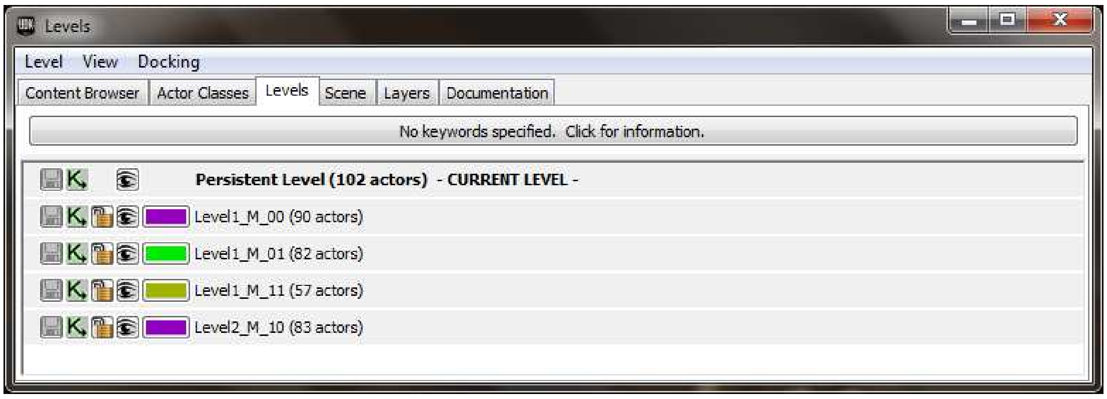
Changelist: 196
Date submitted: 3/1/2013 12:34:51 AM
Access type: public
Description: removed Broadcast messages that desplay on screen
Workspace: Anitha_Anitha-PC_scripts
Submitted by: Anitha

A screenshot of the Versioning systems and the revisions pushed so far

Since not all the people from the group were using Autodesk Maya, but others were using Autodesk Softimage and we also used UDK, I created a small video tutorial on how to set the same scale and grid in both Maya and Softimage in order to match the one in UDK for a fluent integration. The movie is included in the DVD but can also be found online at: http://www.youtube.com/watch?v=7kXg4H1TUMM

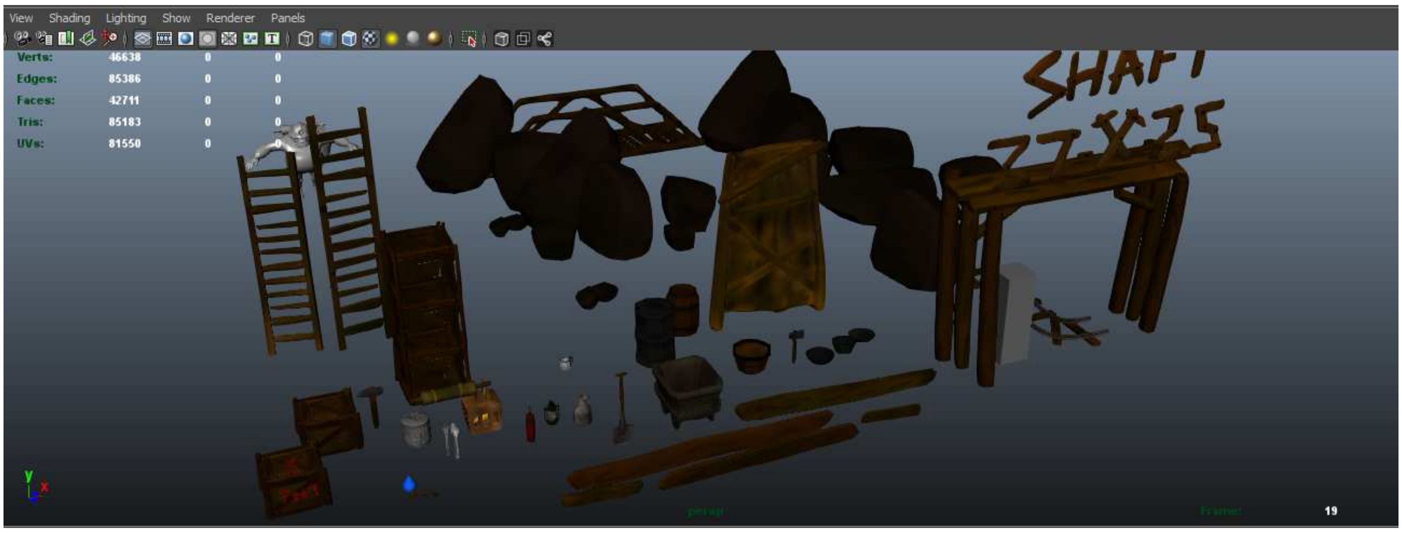
As a technical director for the length of this project I tried to respond to all the requests and answers and point all the colleagues in the right direction.

I was also the **Level Designer and Programmer**, during the project. As a Level Programmer, based on research I came to the conclusion that the iOS platform is not performant enough to be able to run big maps with a lot of polygons. Therefore I searched for alternative methods and tested and integrated a multiple levels that are loaded on demand, or **streamed levels**. This was done in UDK both through the user Interface and the **Kismet** visual scripting language.



Persistent Level (102 actors) - CURRENT LEVEL -
Level1_M_00 (90 actors)
Level1_M_01 (82 actors)
Level1_M_11 (57 actors)
Level2_M_10 (83 actors)

As a Level Designer I received a sum of assets that will be used to populate the environment. A screenshot with all the assets can be found below:



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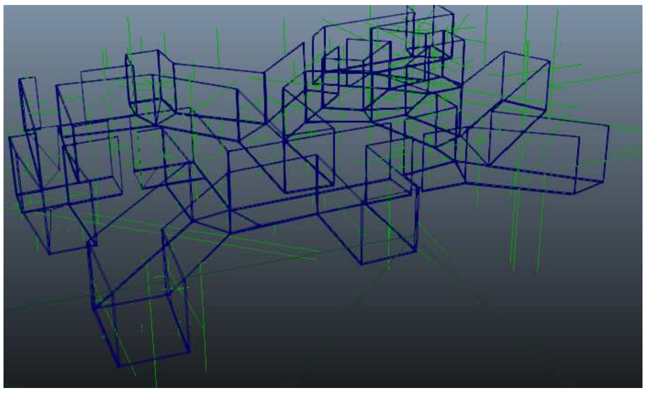
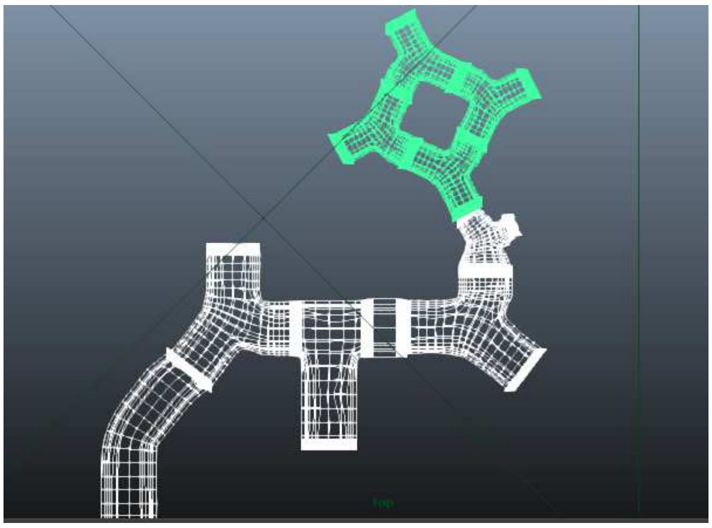
Tris:    85183   0   0
UVs:     81550   0   0
```

The final version of all the assets given to me by the modelers

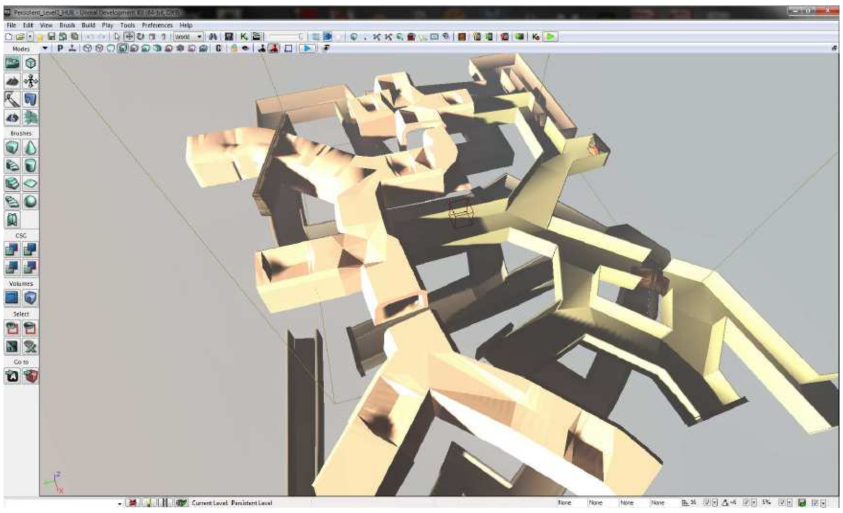
Since I wasn't given any actual environment models I had to try and envision the "world" where our game would take place. We had a top-view level design of the mine tunnels and based on that I tried to create the mine both with modular assets and unique and distinct ones. The first one I disked since it looked to repetitive and in the end I chose to create all the galleries from scratch.



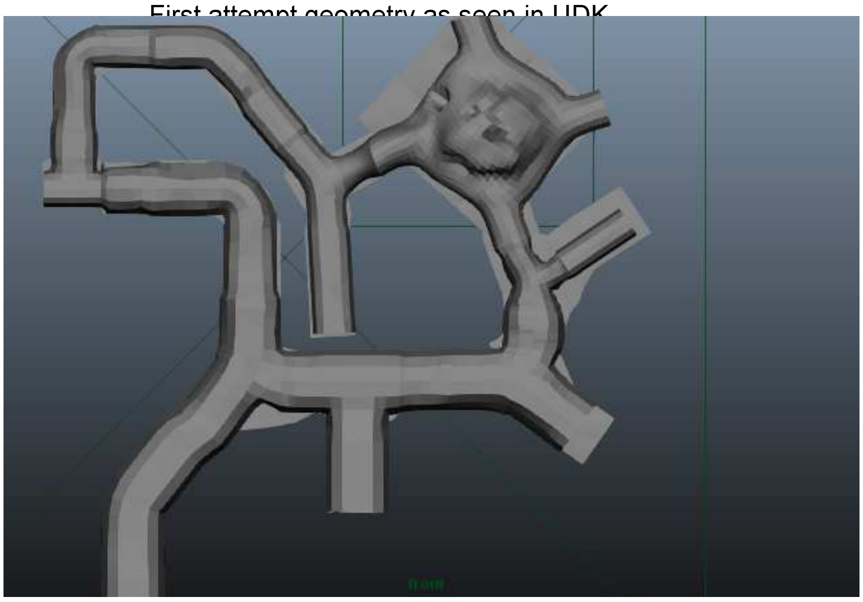
First attempt for world geometry.



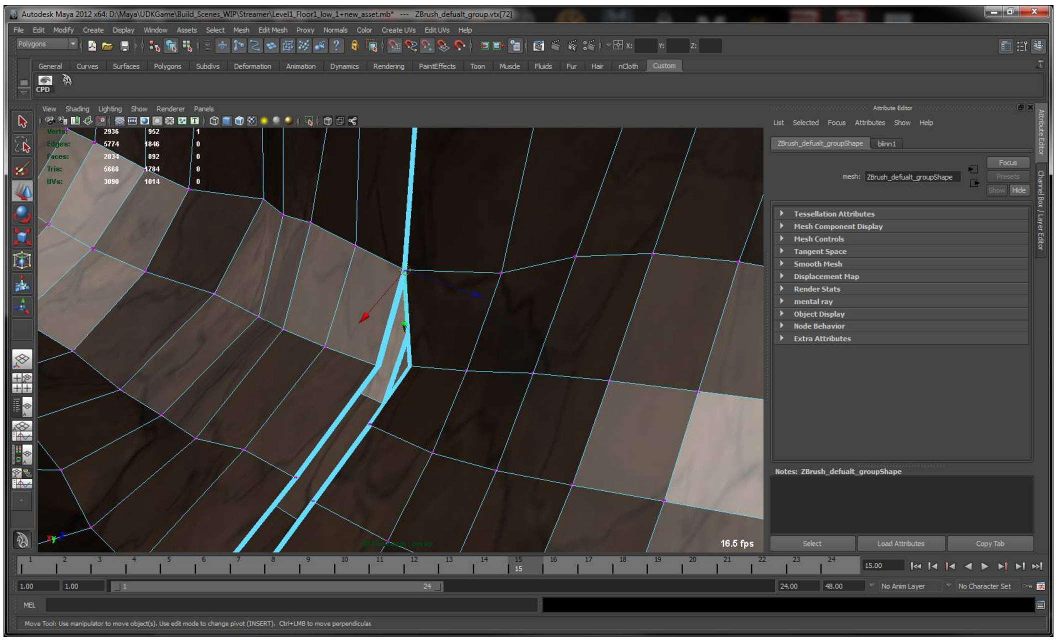
Second attempt for world geometry.



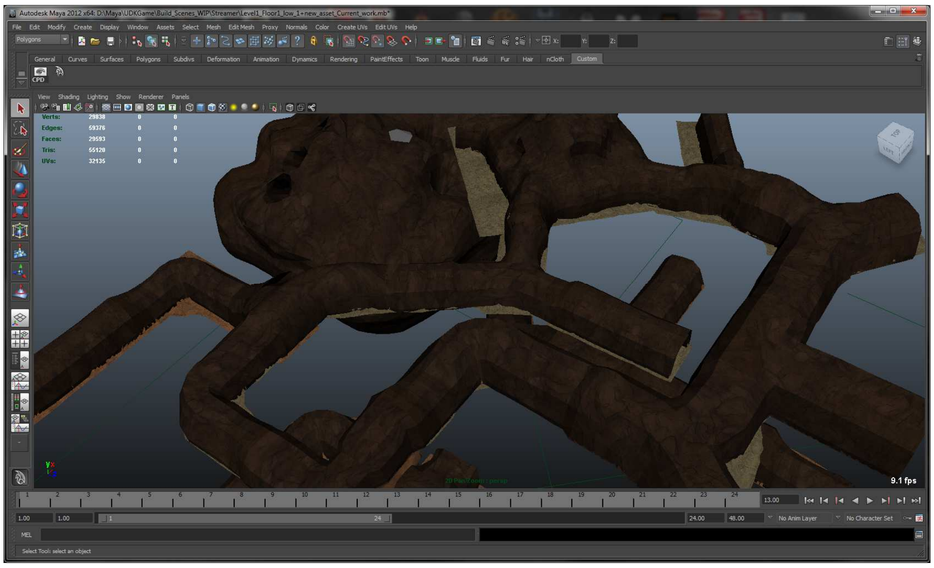
First attempt geometry as seen in UDK



Final attempt for world geometry.



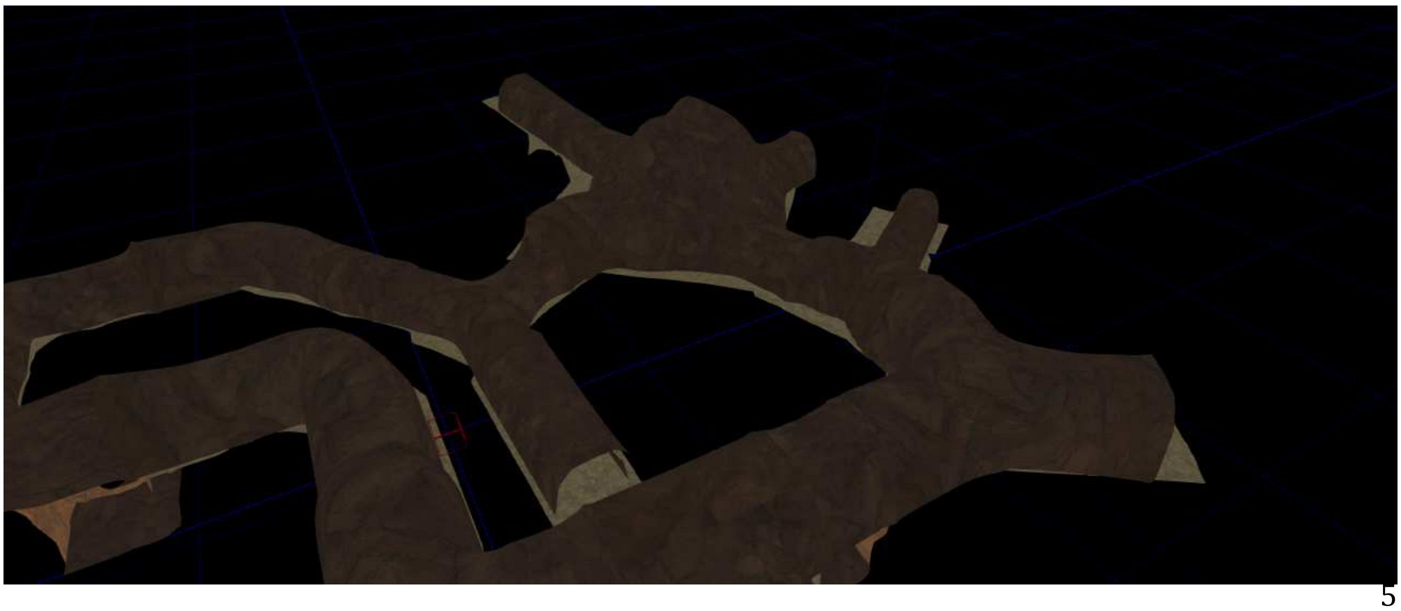
Manually stitching the different meshes together with vertex snap in order to avoid clipping.

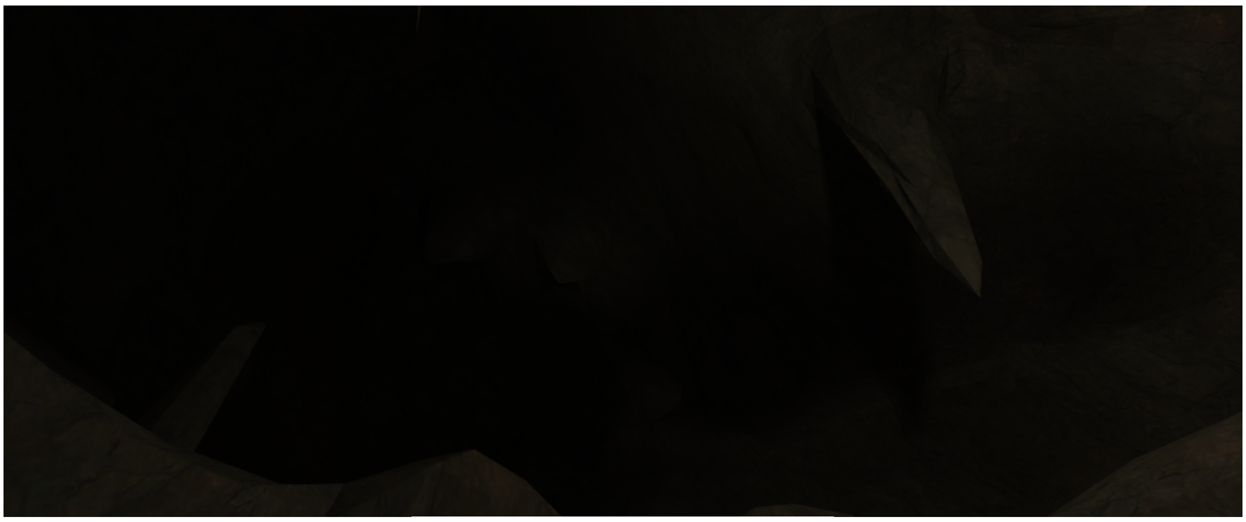


Final geometry overview of the upper level.

Central room as seen in UDK without any lighting.

Mine tunnels as seen in UDK without any lighting.

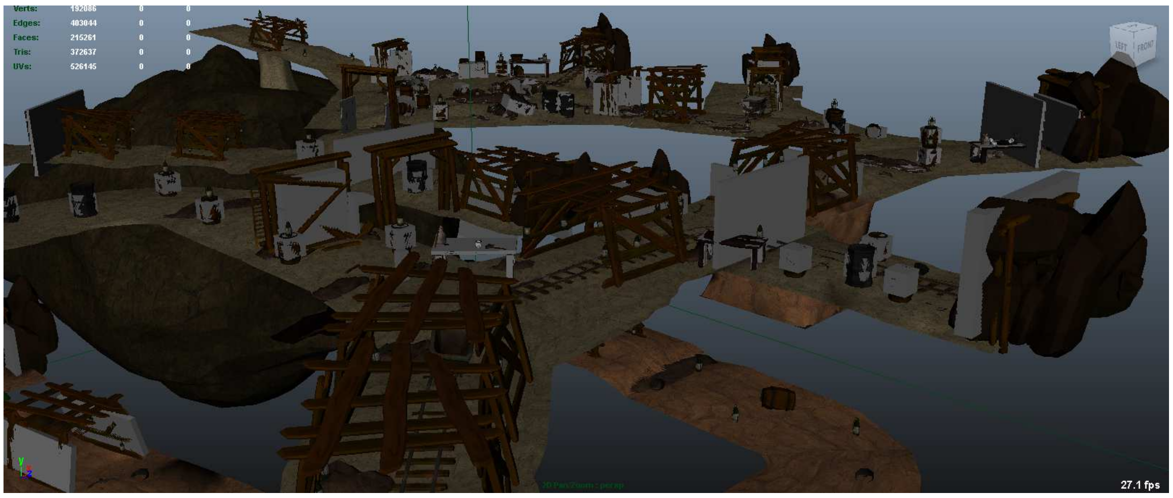



Lower level cavern as seen in UDK.

Lower level tunnels as seen in UDK.

The textured that I used for the environment are not my own creation and even if I did modify them, they were created by Pete Bottomley (August, 2012) and posted on his blog.

The world was crafted in Autodesk Maya. Than different objects merged together (to limit the number of the draw calls and nor killing the iPhone), created new UV layouts for these merged meshes to be used in UDK, collision volumes and as a last step exported and imported in UDK into new assets and packages. The last stage was to tweak each material for each mesh to work on mobile and test them.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Faces:   215261   0   0
Tris:    372637   0   0
UVs:     526145   0   0
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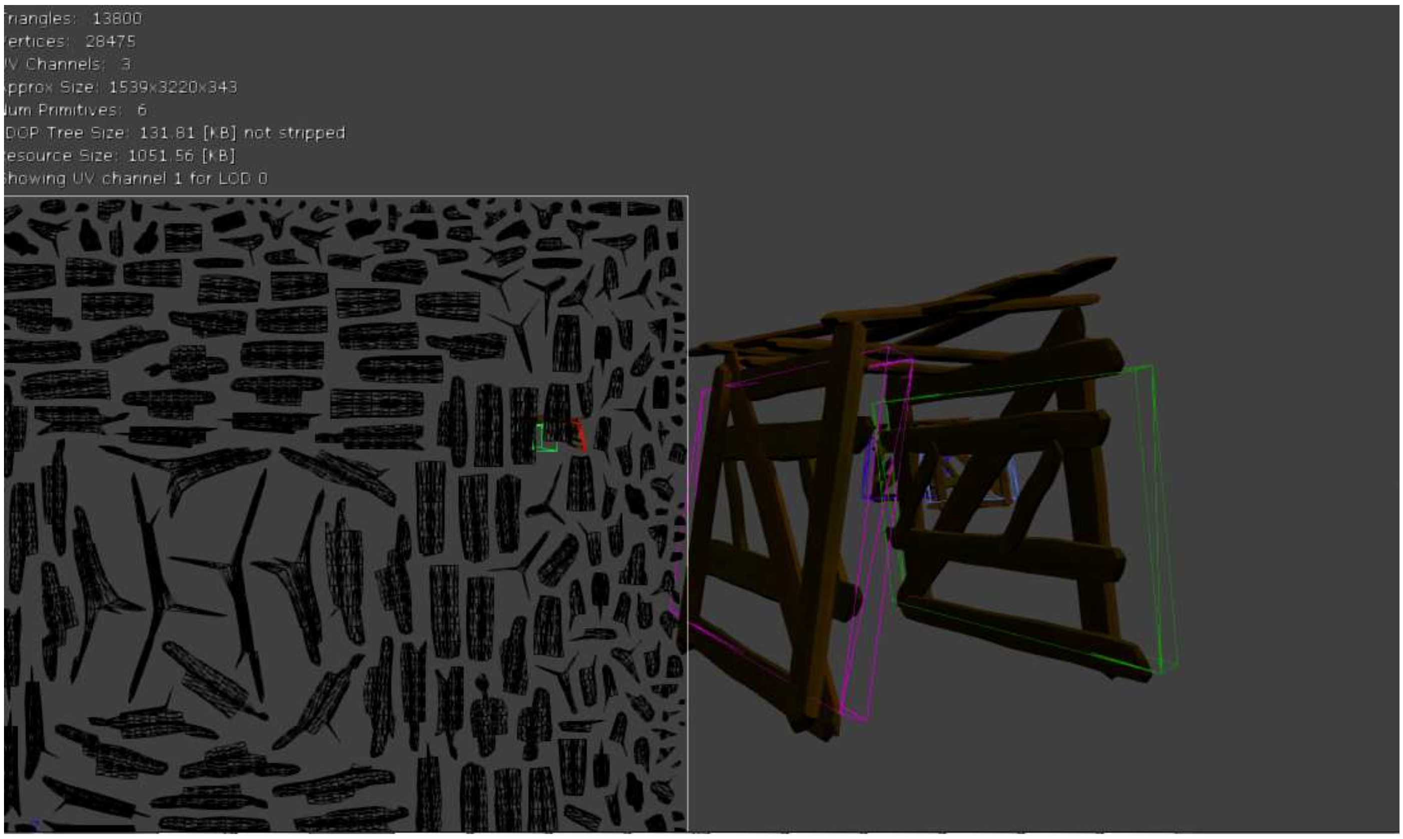
The final environment geometry as seen in Maya, before export.

A full movie navigating through the whole game can be found in the **Movies** folder.

The next step was creating the lights in our environment. Unfortunately the iOS platform does not support dynamic lights and since it uses only static lightning, the shading information must be written to a map called a *lightmap*. For this alone a new set of UVS was needed that looks different than the UVs used for texturing based on the shape of the object.



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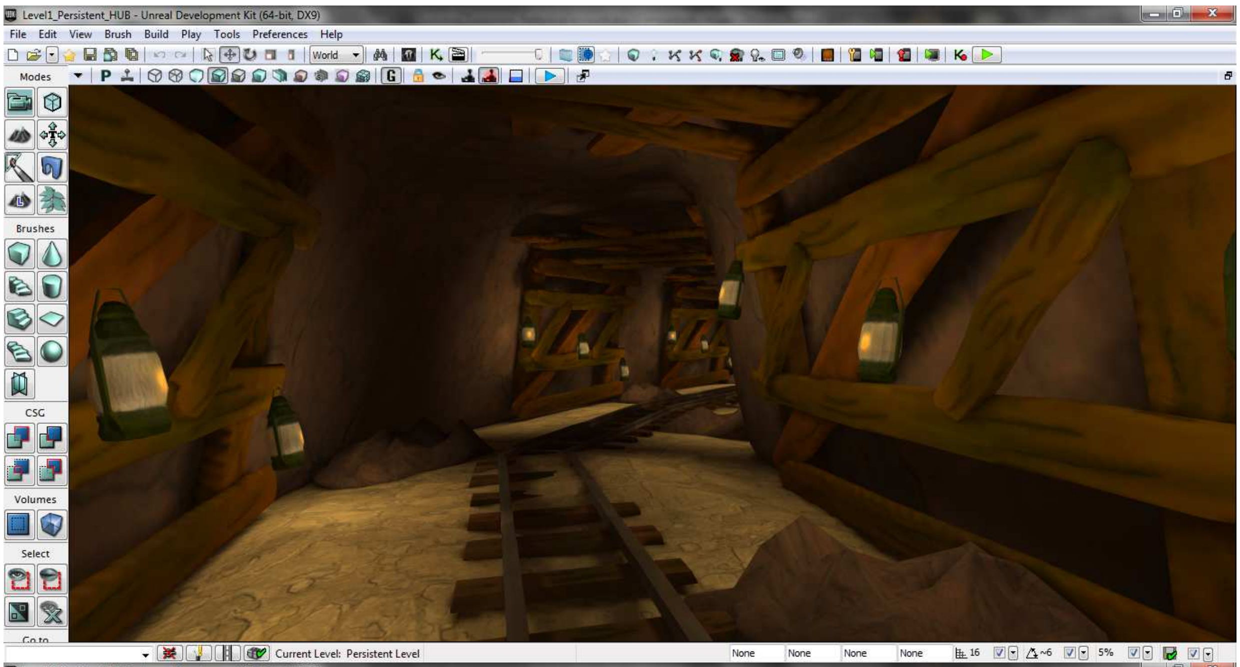
Lightmaps and collision volumes as seen in UDK for imported geometry.

In UDK all the lights needed to be manually placed and tweaked. Originally the idea was to use one dynamic flashlight to lit the environment. However due to the fact that nu dynamic light support exists in the mobile version of UDK I employed an old trick used in computer games a long time ago: mesh swapping. I would create one mesh with the light information mapped to it and one pitch black. Then through an event I would swap them, revealing the lit environment. A movie from when I was prototyping can be found in the **Movies** folder on the DVD.

After the whole environment was lit in UDK and a lot of effort was put into providing a mine look and a blend between lights and shadows, with some areas lit while other more in obscurity the hardest part came: **populating the environment** as no one wants big empty spaces.

A lot of effort was put into creating new assets based on the few that I received and to make the environment as rich as possible and "alive" without making it too hard to navigate. Each corridor, cavern and room was carefully thought about and created. The overall feel that I wanted to transmit was that of a maze while in the same time still making one corridor or room distinct.

The last part was to script the lights as intended to reveal the lit geometry only at a certain point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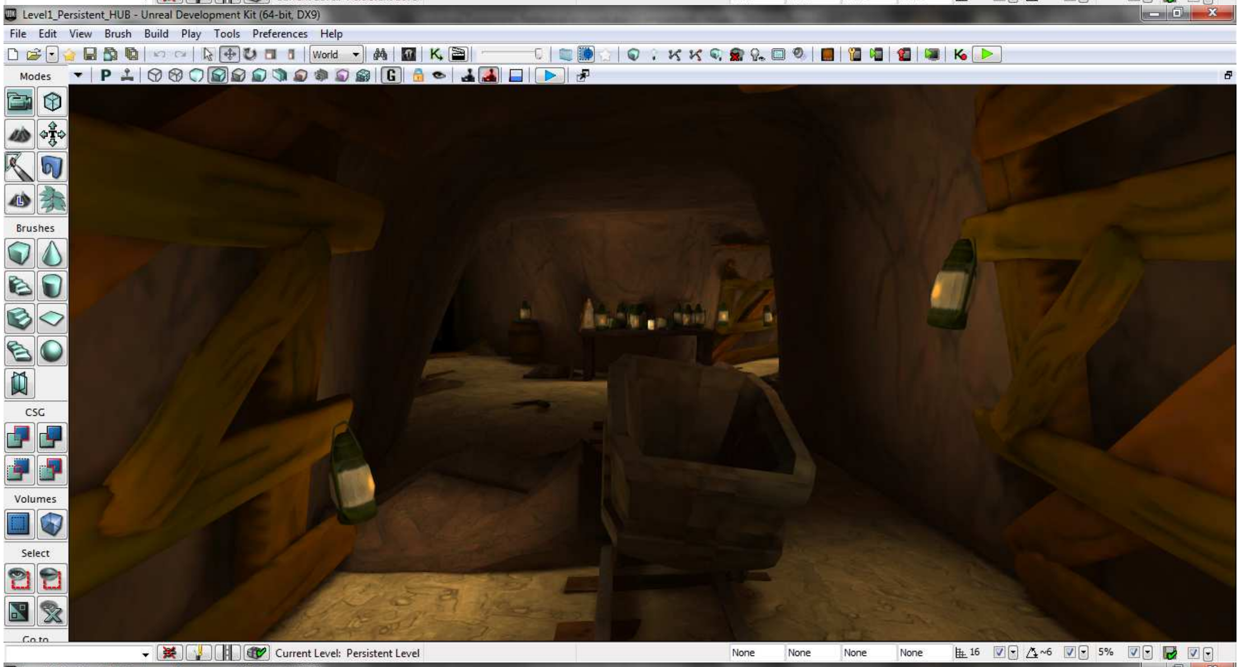
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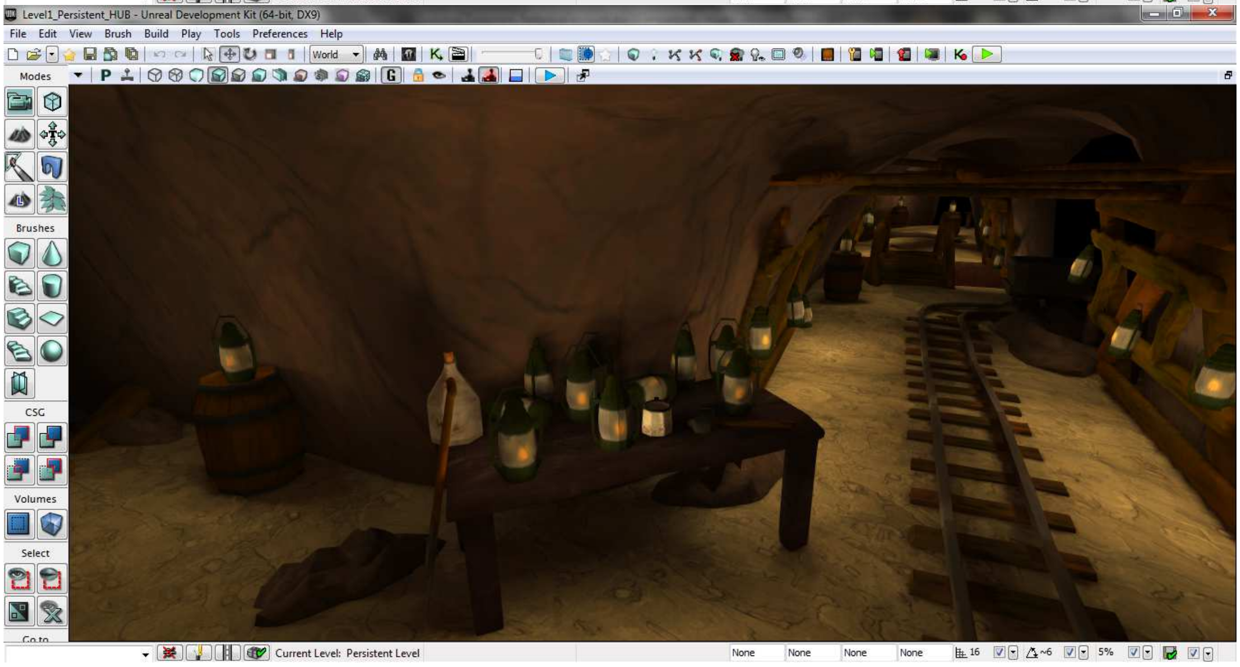
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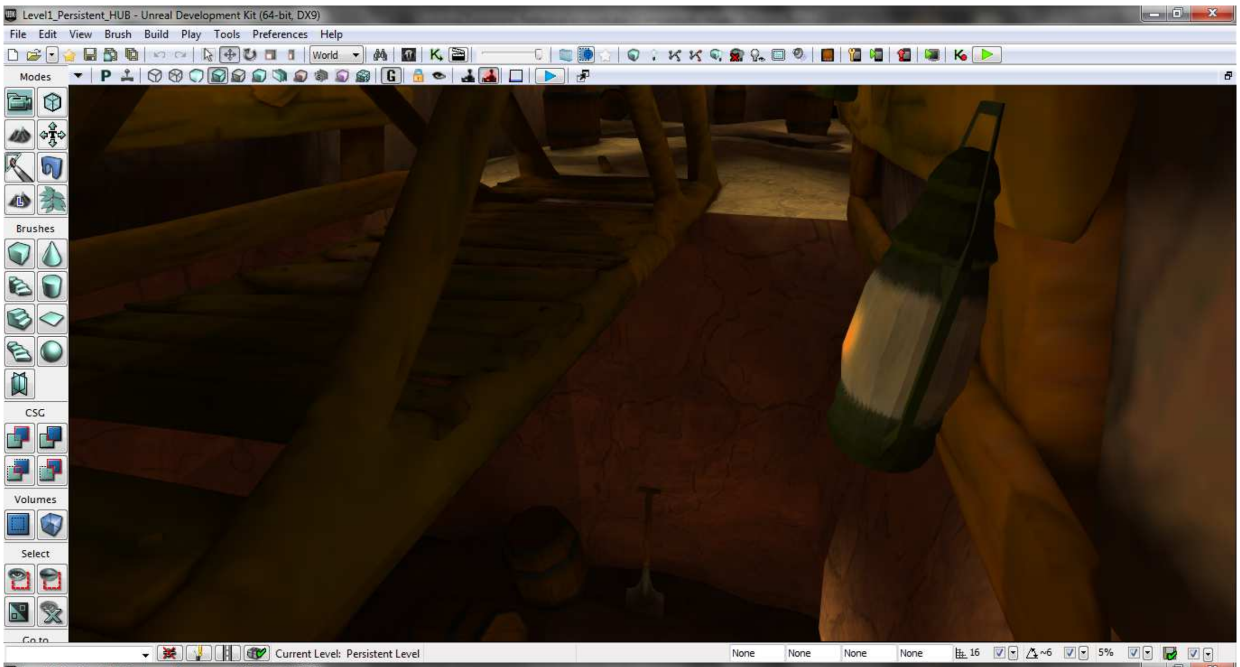
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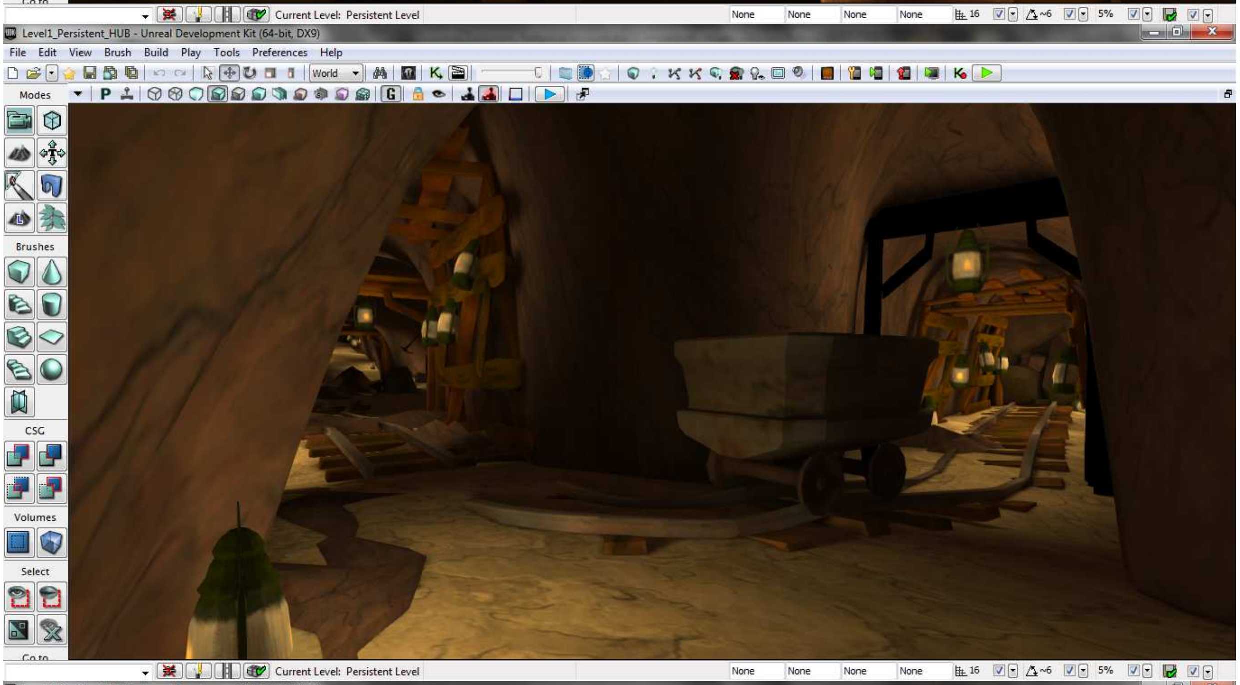
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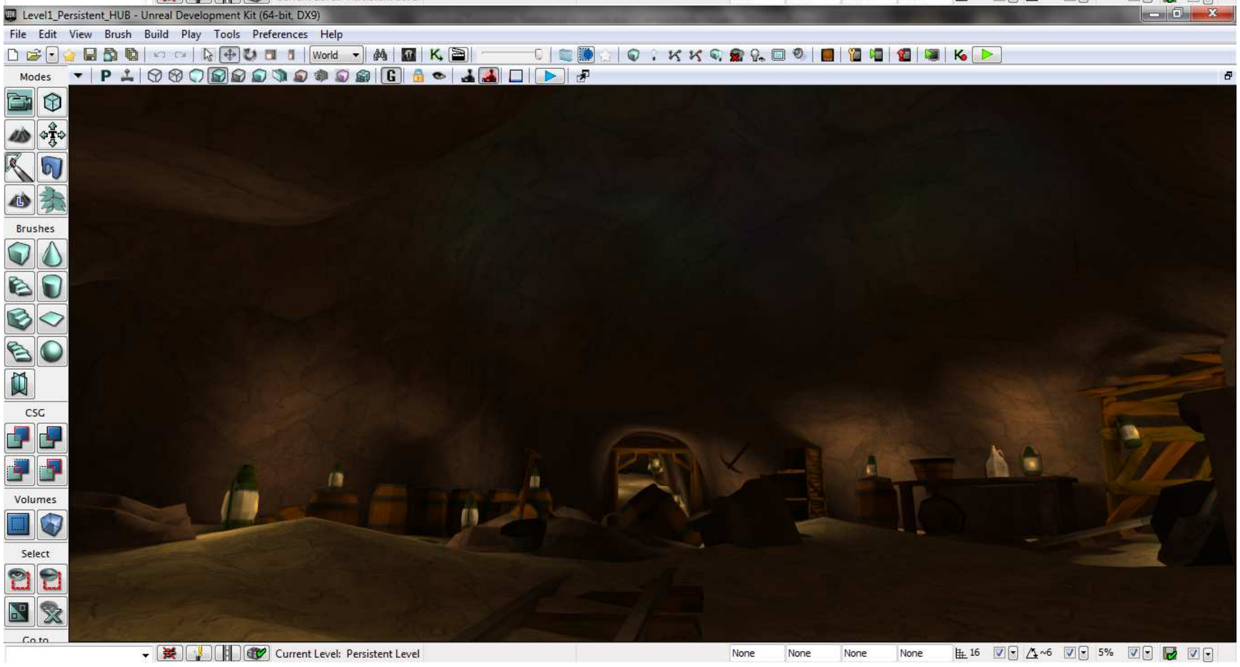
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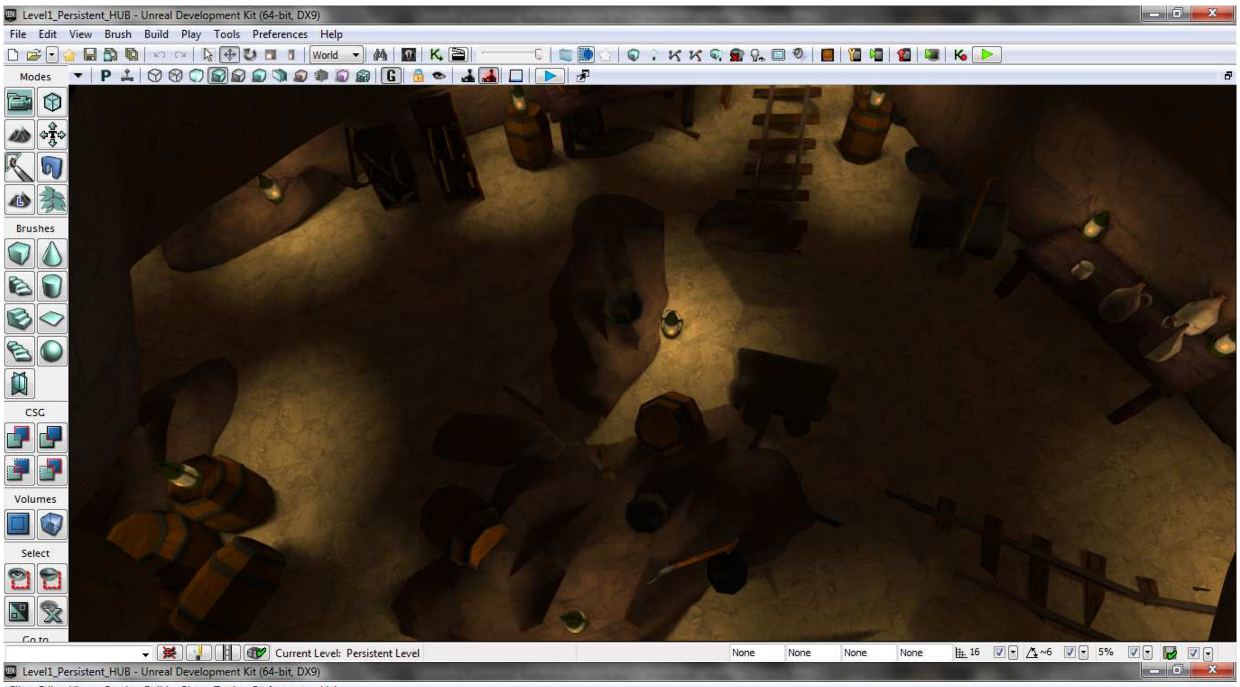
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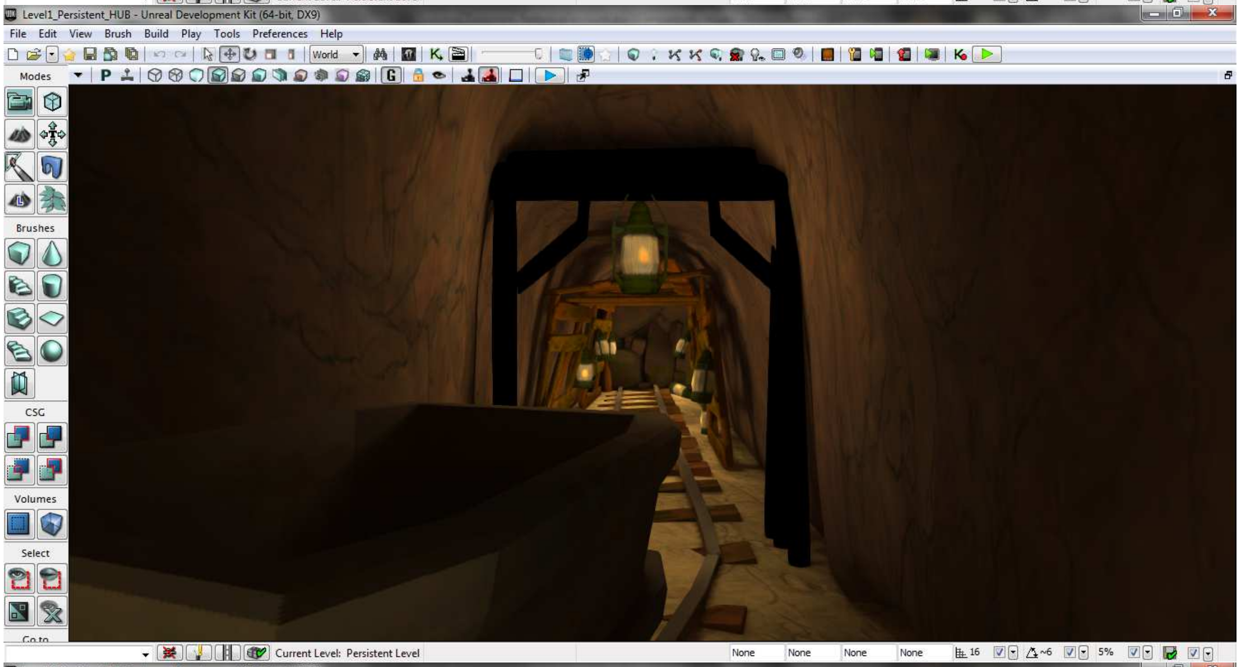
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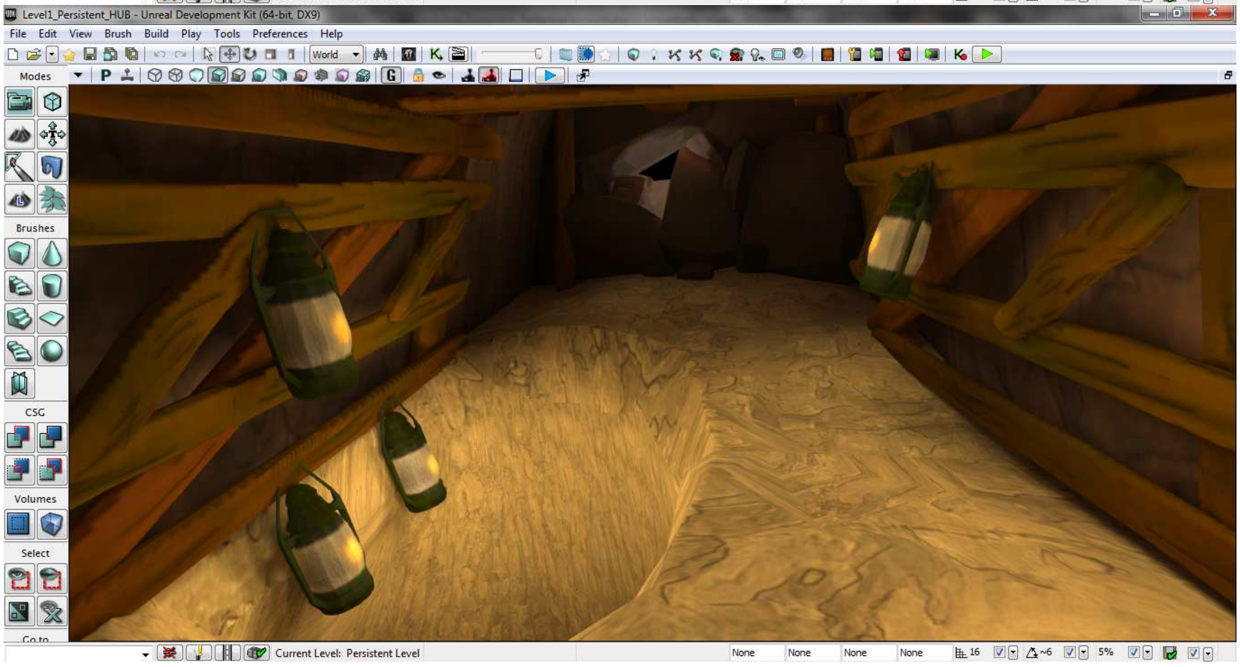
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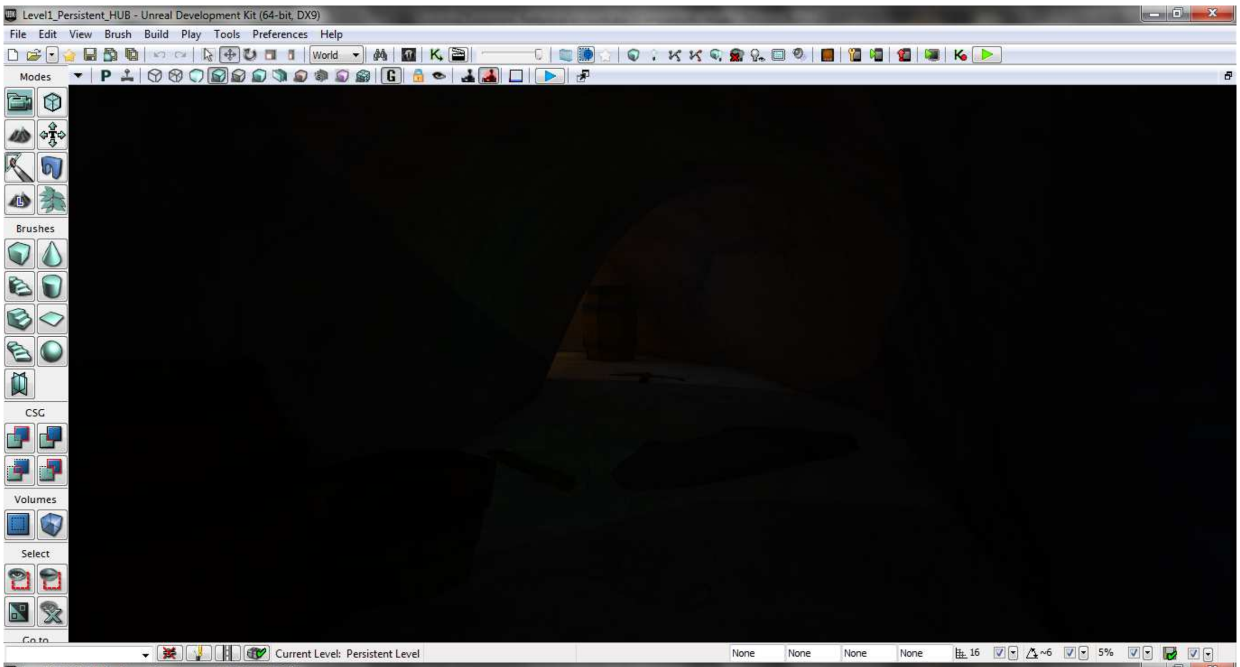
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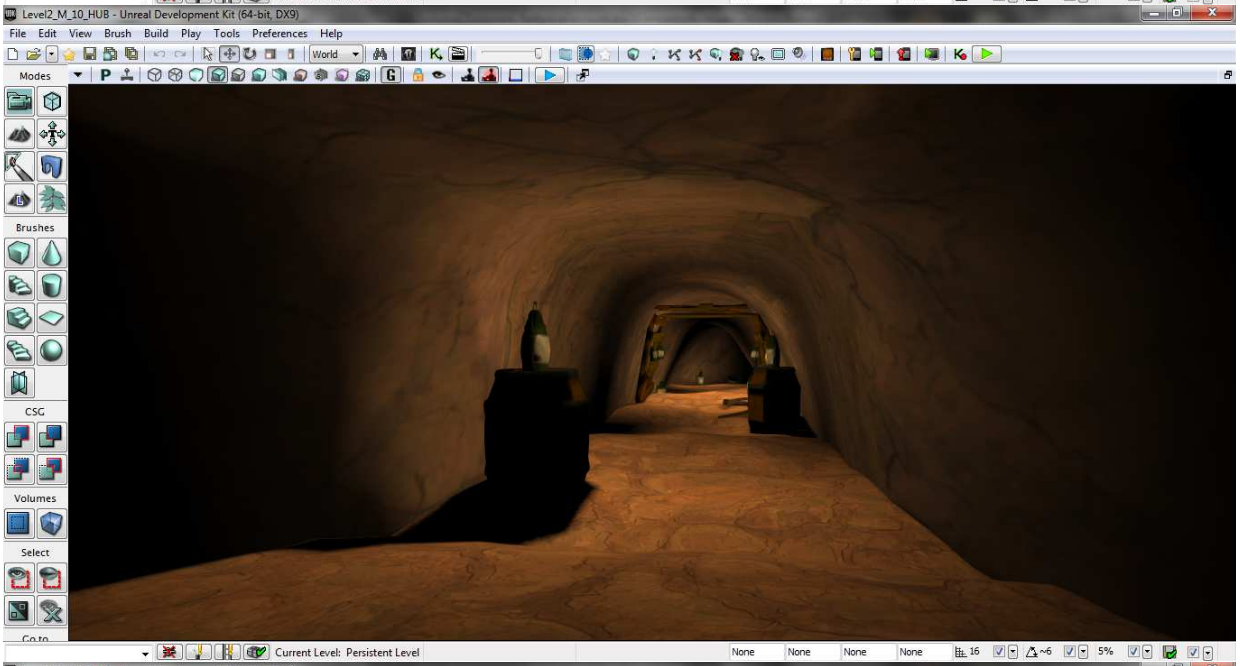
Level2_M_10_HUB - Unreal Development Kit (64-bit, DX9)

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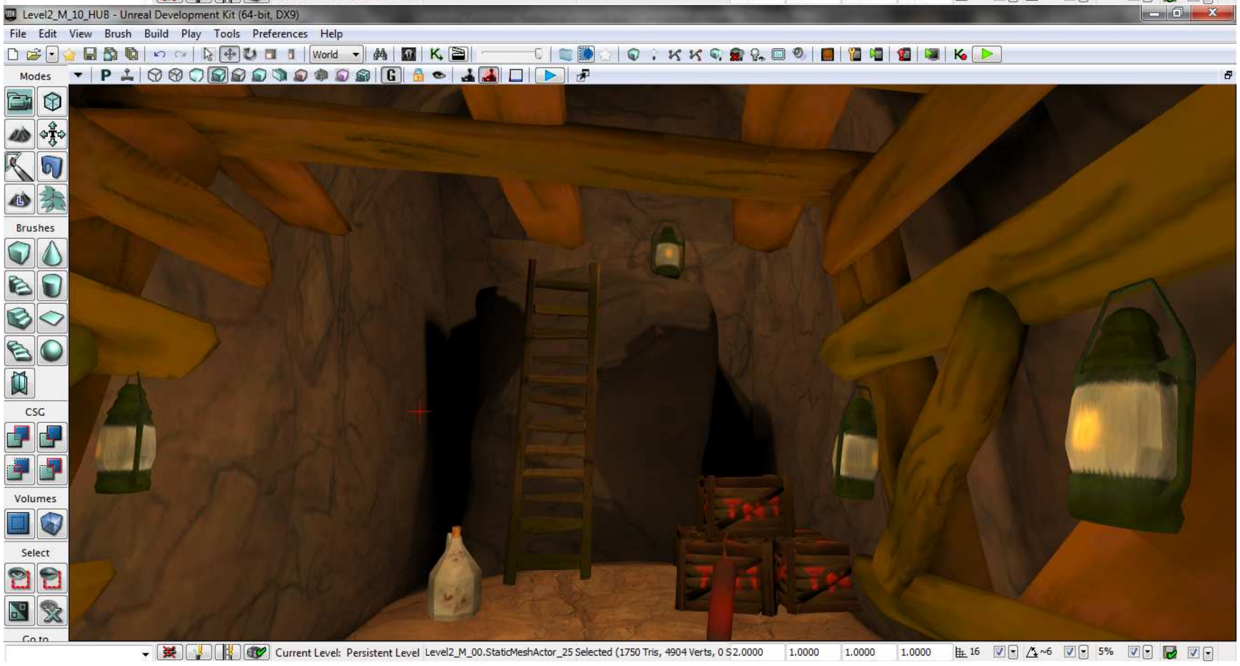
Level2_M_10_HUB - Unreal Development Kit (64-bit, DX9)

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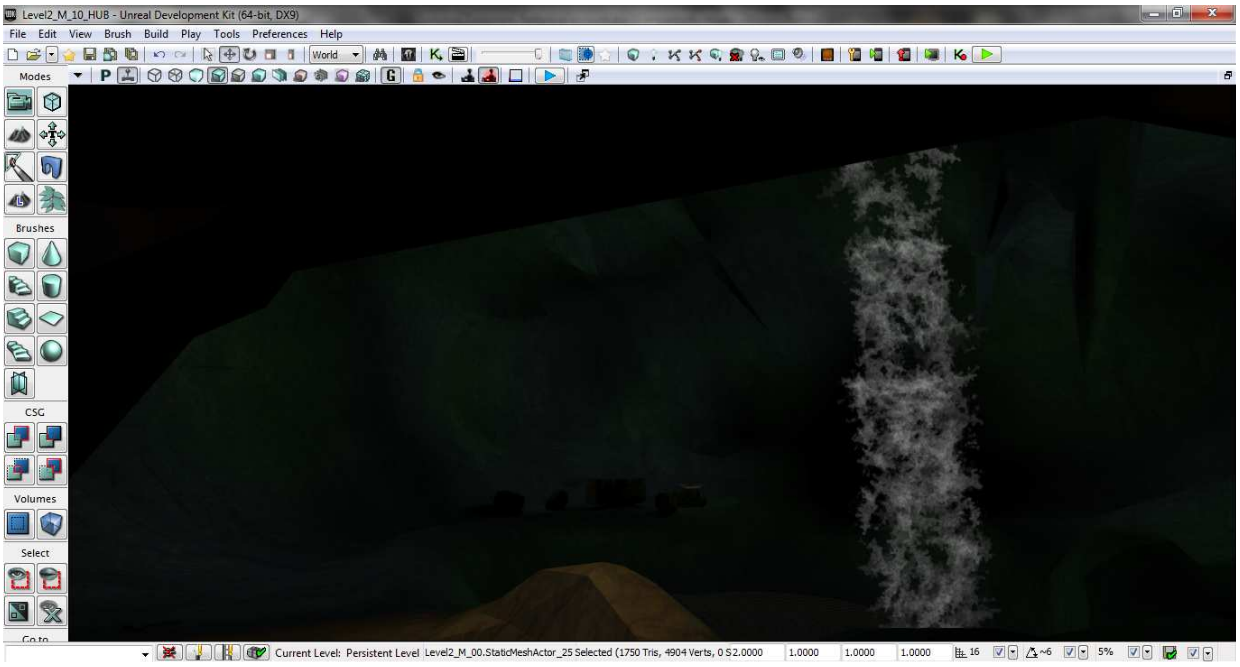
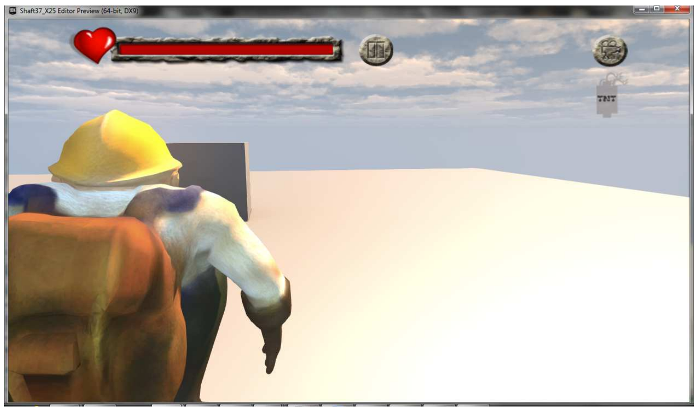
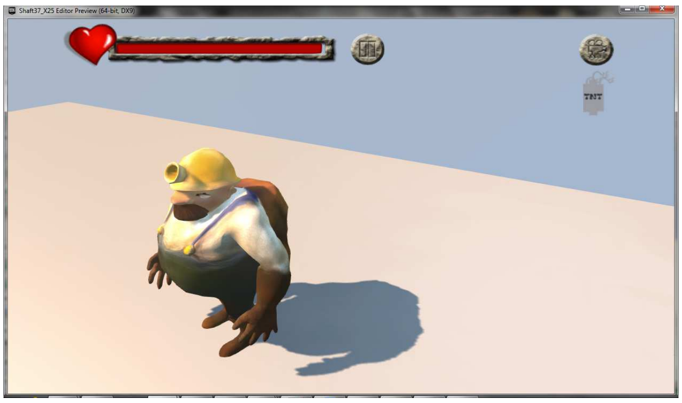

Screenshots from the game as seen in UDK with light calculated.

A movie showing the full environment can be found in the **Movies** folder.

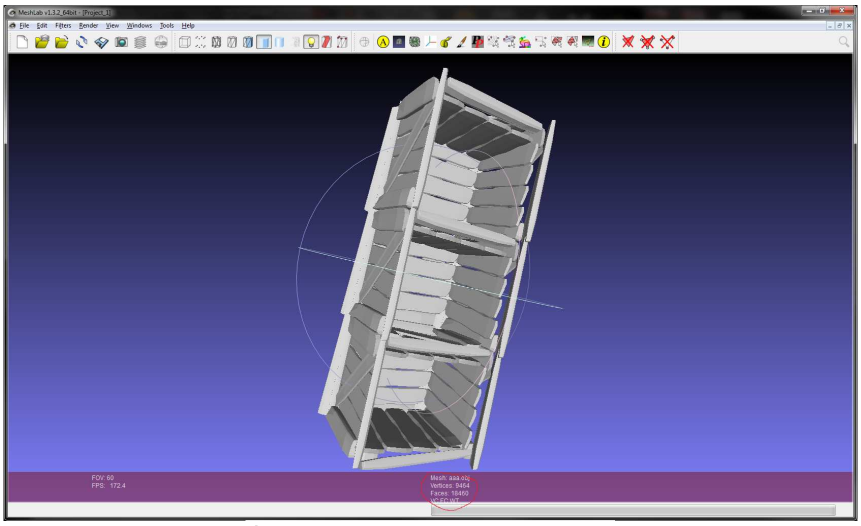
A world without a camera and viewpoint would make no sense. The approach we decided upon was to create an over-the-shoulder camera. To this I had the idea to also create an orbit camera around the character so he can also look around. The camera features a fully working trace detection system, which means it will never move inside the world geometry, instead it will try to stay as close to the player as the space allows it. The worst case scenario is when the space is as limited as only the player can fit. In this case the camera moves close to the origin of the player.

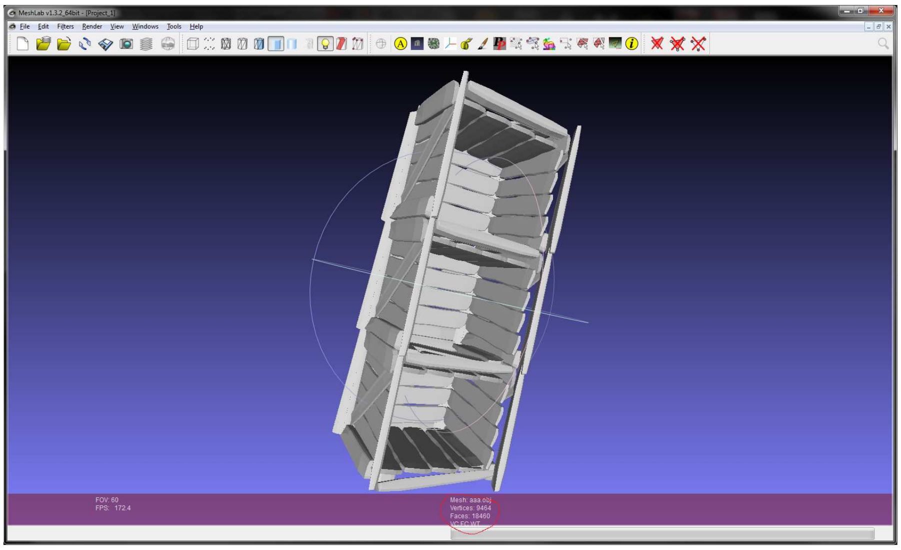

Over the shoulder camera.


Orbit camera.

A movie showing this can be found in the **Movies** folder.

Since modeling to an exact amount of polygons is very difficult only later to find out that you have to much, and since Autodesk Maya's ability to reduce the polygons also destroys the UV layout, after some research I came across a wonderful tool named **MeshLab (http://meshlab.sourceforge.net/)** It's unique ability among a lot of other things, is to reduce the polygon count to any set value, without destroying the mesh boundaries or the UV information. The result is a mesh that fits in the same world space, has the same texture mapped almost perfectly but with a lot less polygon count.


Original Mesh – 9464 triangles.

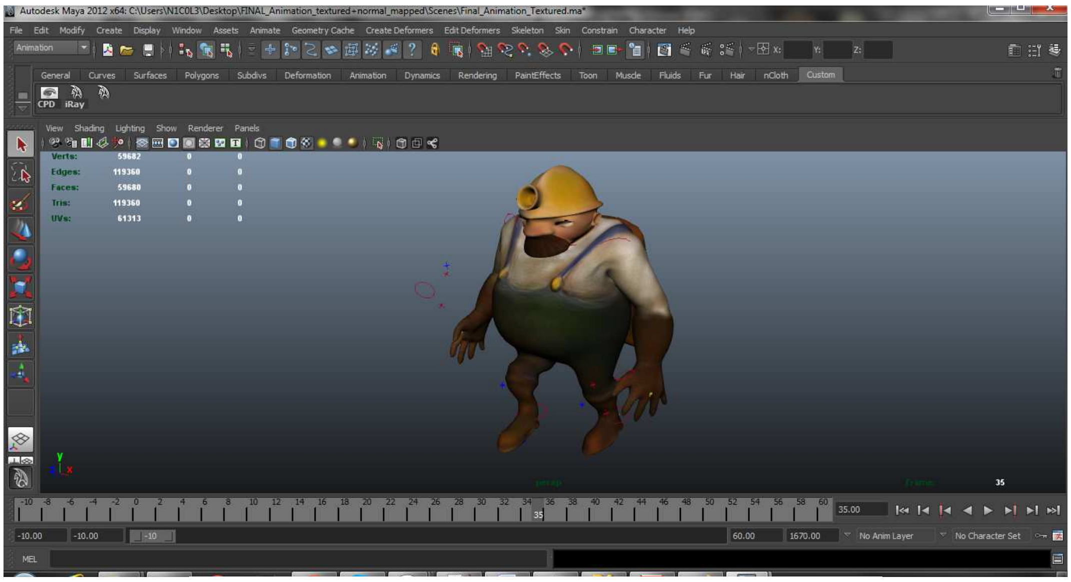

Simpliefied mesh 1000 triangles.

Another very important role that I had was to import into UDK the character with a full animation set, creating the animation tree based on the user input. The method of doing this is not so straightforward.
It requires:

- Creating the animation in the exact center of the world. The root joint should always be at (0,0,0). Any offset added in the animation will also be present in the game.
- Baking into each skeleton joint and skeletal mesh all the keyframes.
- Export it using the FBX format.
- Import it into UDK
- Creating the animation set, by redoing all the above for each animation.
- Creating the animation tree in order to script how and where each animation should play (walking, running, idle states)
- Adding the character as the player through coding.

Initially a motion capture retarget was thought for the character but the team failed to give any usable results so the key-framing method was selected.

The biggest problem that I had to solve during this project, that could basically jeopardize it was importing in the game engine a character with full animation set and textured. Instead of receiving an asset composed of a complete textured character + key frame animations I received 2 distinct assets: In one the character was textured but not animated, in the other the character was animated but had no textures, not even an UV layout.
After a lot of research I found out a very good tutorial on how to achieve this without the need of rebinding the correct mesh to the skeleton again. It can be found at: http://vimeo.com/31780382



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Tris:     119360    0    0
UVs:       61313    0    0
```
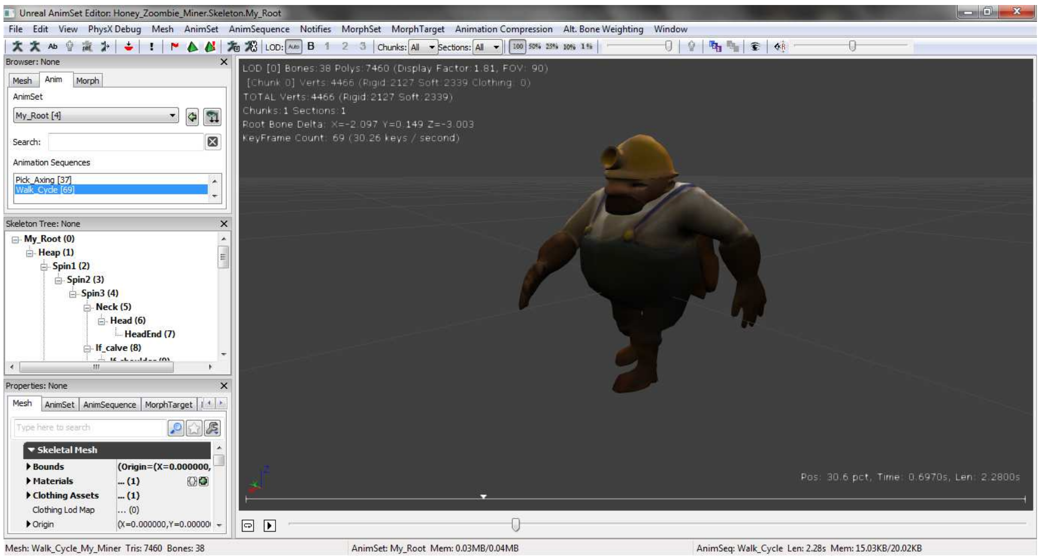

The character with texture and animation as seen in Maya.



```
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 [Chunk 0] Verts:4466 (Rigid:2127 Soft:2339 Clothing: 0)
TOTAL Verts:4466 (Rigid:2127 Soft:2339)
Chunks:1 Sections:1
Root Bone Delta: X=-2.097 Y=0.149 Z=-3.003
KeyFrame Count: 69 (30.26 keys / second)
```

```
Pos: 30.6 pct, Time: 0.6970s, Len: 2.2800s
Mesh: Walk_Cycle_My_Miner  Tris: 7460  Bones: 38    AnimSet: My_Root  Mem: 0.03MB/0.04MB    AnimSeq: Walk_Cycle  Len: 2.28s  Mem: 15.03KB/20.02KB
```

The character as seen in UDK after import.

As a last touch I added the cave soundtrack that can be heard through the entire game. It was created by JohnRoss Sanden and is available on YouTube at: http://www.youtube.com/watch?v=PsXxQZrl_qM

Since this was a very technical project, my other roles where in **testing, fixing bugs, integration(scripting, coding), maintaining** the overall health of the product and finally **creating the builds** (both the iOS and PC versions) of the game that can be found on the group submission DVD.

Overall, I think the result of the project which is the game has his strong points and weak points but I would consider it a success. With more time invested in, it could be tweaked and made seemless.

References:

3D Buzz . Available at: http://www.3dbuzz.com/ [Last Accessed 28.02.2013]
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J.P.Doran, C.Gatzidis, 2012. *UDK iOS Game Development*. Packt Publishing.
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UDK Documentation. Available at: http://www.unrealengine.com/en/udk/documentation [Last Accessed 28.02.2013]
Unreal Devemopment Kit3 – iOS Mobile Game Production Tutorial. Available at: http://eat3d.com/udk_mobile [Last Accessed 28.02.2013]