**Assignment1 – Knave + Teapot + Puzzle**

**Course Title:** Virtual Environments and Applications

**Course Code:** ENEL 602

**Lab Number:** 1

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**Part I - Movies and Demos**

**Exercise 1**

**Stereo Demo:**

The lenses flicker when the user looks away from the screen.

**Movie1:** The user is experiencing a stereo device mounted on his head, exploring some medical application that enables the user to rotate and move different angles. On the third experiment there is an interaction with a bubble, the user is making use of his hands and the stereo device.

**Movie2:** This video contains a 3d model of the thoracic cage of a human being and what appears to be blood dispersion.

**Movie3:** The haptic devices seem to be similar to what we are using in the lab, the user has to touch on a bubble, no noticeable difference from one user to the other performance can be seen.

**Movie4:** This is again a medical use where someone’s task is to drill a bone to locate medical bolts over a fractured bone, using haptic device, but no stereo glasses are observed.

**Movie5:** The video shows gesture use of a hand that is being recognized by a camera or something like that, then a red dot in the 3d model represents a pointer and the pivot point of the movement.

**Movie6:** We cannot define what the IO is, this movie only shows the model and the manipulation of the 3d model (output), but nothing else is shown.

**Movie7:** Contains a flow simulation of a fluid with different levels of details and perspective. It is the same model, just viewed from different angles and with a full body.

**Movie8:** Seems to be the same model as the previous one just with a different material and transparency that allows for a better analysis in 2d, then there are some changes amongst the type of visualization.

**Movie9:** There is here a haptic device that seems to be used with the purpose of detecting collisions with a rod or cable in the simulation, initially the user’s head is not seen, so it is impossible to determine if the user is wearing Head Mounted Display. The user seems to stop when the collision between the arc and the cable is sensed.

**Movie10:** Same experiment as before but now we have biosensors involved that recognize a pattern or cognitive workload on the user. This is only for recording as it is not clear what the influence of the environment is once is detected.

**Non-Stereo Demo:**

No stereo Glasses needed.

**KNAVETest:** The triangles are 2d, this causes the visualization of the triangles to be lost when they turn on the center axis, because they have no thickness and therefore it cannot be represented.

**Ball:** This is a 3d object that interacts with the mouse pointer, this scene makes the use of perspective and is easier to determine that the ball is closer or further away from us, also the deformation is easily perceived.

**Stereo Demo:**

Stereo Glasses needed.

**KNAVEStereoTest:** The stereo glasses made it much easier to detect the rotation of the triangles, the loss of shape perceived was much less.

**Ball:** The perception of the moveability of the ball is increased with the glasses.

**Teapot:** Teapot is more easily perceived since we can rotate the object and see what is behind and underneath the teapot, the stereo glasses give it an effect that allows the users to perceive the depth of the object.

**Touch Demo:**

No stereo Glasses needed.

**Touch Demo:** The haptic device allows perception around the cubes, allowing the user to also go behind the object and feel how the collision with the cube happens in the hand. We do not know if this is the accurate amount of force when two dices collide with each other, but it makes easier to interact with the object if we can feel the limits or the shapes of it.

**Unity Demos:** The demos interface with the Haptic device, the haptic device allows the user to follow the physical shape of the objects which is quite interesting. The environment also helps with the perception of the entire scene. Even though it is the same principle of work, the environment makes it better.

**StereoHaptic Demo:**

Stereo Glasses Needed.

**HapticDeviceTest:** The test has two cubes that we can interact with, grabbing one and colliding with each other or just bouncing them around in a 3D space. Something that was missing from the scene is that the collision between both cubes when one is being hold by the user is not felt through the haptic device.

**HapticKnaveTest:** The test has one cube that you can interface with, in the same manner as the other experiments you can use the haptic device to feel the shape, but oddly enough on the right of the cube and underneath the haptics seem not to work as with the rest of the cube.

**HapticTeapotTest:** The device allows to follow the shape of the teapot, no further problems found.

**Unity Demo:**

**3Dstereo**: Scene allows to adjust the superposition of left and right image on the lenses which result in a more or less distorted 3d image.

**VisualPuzzle:** This scene allows the user to perceive the puzzle in 3d and just as the previous experiment, we have adjustments made in the panel. The representation of the puzzle and the environment surrounding the puzzle make it feel more immersive.

**HapticPuzzle:** The collision between two objects is not properly felt through the haptic devices when you attempt to crash two objects together, at low speed it works fine but when you make a quick movement the sensation disappears.

**HapticShapes:** The interesting part in this experiment was the texture of the wood, this experiment really throws your mind away when you touch the wood.

**Part II - Observation**

**Exercise 2 - KnaveTest:**

**Ctrl+mouse (Step 4):**

(X-axis, Z-axis) It allows to move the red dot but when the right click is used in conjunction with Crtl, the red dot jumps.

**Shift+mouse (Step 5):**

(X-axis, Y-axis) It no longer jumps when right click is used.

**Alt+mouse (Step 6):**

Rotation is allowed revealing that the dot is not actually a dot.

**Arrows (Step 7):**

Move the blue dot on the X-axis and Z-axis.

**Spacebar+mouse (Step 8):**

Allows the change of the perspective relative to the ground and triangles, 3d shapes are not affected.

**Exercise 3 - TeapotTest:**

**Spacebar+mouse (Step 5):**

Changes the alignment of the left and right images on the glasses.

**Left button of the mouse + movement (Step 6):**

Allows rotation.

**Right button of the mouse + movement (Step 7):**

Allows movement along the Z-axis.

**Exercise 4 - VisualPuzzle:**

**Left button of the mouse + drag the block around (Step 6):**

The objects move along when the mouse drags them out of the location they have, it seems a bit hard to pull them out at the beginning.

**Spacebar (Step 7):**

Resets all the movements of the pieces.

**PART III – Compiling and Running Codes**

**Exercise 5 - compile and build testKnave project:**

**File names in the directory testProject:**

* caveMain.cpp
* caveMain.h
* KNAVETest.sln
* KNAVETest.vcxproj
* KNAVETest.vcxproj.user

**File names in the directory Release:**

* testKNAVE.tlog (directory)
* caveMain.obj
* KNAVETest.log
* KNAVETest.pdb
* KNAVETest.vcxproj.FileListAbsolute.txt
* testKnave.exe
* testKNAVE.exe.recipe
* testKnave.ilk
* vc142.pdb

**Exercise 6 - compile and build testTeapot project:**

**File names in the directory testTeapot:**

* main.cpp
* teapot.h
* teapotLab.vcxproj
* teapotLab.vcxproj.user
* TeapotTest.sln
* Timer.cxx
* Timer.h

**File names in the directory Release:**

* testTeapot.tlog (directory)
* main.obj
* teapotLab.log
* teapotLab.vcxproj.FileListAbsolute.txt
* testTeapot.exe
* testTeapot.exe.recipe
* testTeapot.iobj
* testTeapot.ipdb
* testTeapot.pdb
* Timer.obj
* vc142.pdb

**Exercise 7 - compile and build testPuzzle project:**

**File names in the directory Build:**

* MonoBleedingEdge (directory)
* testPuzzle\_Data (directroy)
* testPuzzle.exe
* UnityCrashHandler64.exe
* UnityPlayer.dll

**File names in the directory UnityPuzzle:**

* .vscode (directory)
* Assets (directory)
* Build (directory)
* Library (directory)
* Logs (directory)
* Obj (directory)
* Packages (directory)
* ProjectSettings (directory)
* .vsconfig
* Assembly-CSharp.csproj
* Assembly-CSharp-Editor.csproj
* Assembly-CSharp-firstpass.csproj
* UnityProject.sln