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# Project Outline – Augmented Reality Training Tool

## *Project Overview*

The purpose of this project is to develop an augmented reality tool that aims at training the labor force to be familiar with a mechanical device (an air impact wrench will be used for the first prototype) without suffering from repetitive strain injury (RSI). This mechanical device may lead to RSI due to the frequent shock and vibrations that the device produces, especially if this device is used on a regular basis. We plan to use augmented reality (AR) technologies to train the labor force to use the device; this way, there is no contact involved and the training may be more efficient and effective. A 3D model of this tool can be emulated using a pair of AR glasses. This model can be controlled by general HCI devices (keyboard and mouse), which are connected to the AR glasses to implement functions in the virtual environment which emulates that of the real world. Conclusively, the purpose of this AR tool is to reduce RSI by emulating the target device when training the labor force.

Device Specs (Campbell Hausfeld TL050201AV):

- Torque: 250 ft. lbs.
- Revolutions / Minute: 10000 RPM
- Style: Pneumatic
- Air Flow: Requires 6.2 CFM @ 90 PSI
- Component: Metal
- Included: Impact Wrench,
  Flip Socket (13/16" & 3/4")
  3" Extension
  1/4" NPT Air Inlet
  Case
- Model: TL050201AV
- Length: 8 3/10" (21.08 cm)
- Width: 3" (7.62 cm)

## *Hardware Tools*

1. PC.
2. Moverio BT-200.

## *Software Tools*

3. Unity.
4. 3D model maker (Maya, Blender, and Cheetah 3D).

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## *Major Tasks*

1. Build the 3D models of the target device, Campbell Hausfeld TL050201AV, in a mainstream 3D model maker, which can be imported into Unity.
2. Design the control logic of the model of the mechanical device in the virtual environment. More specifically, we need to determine which module in HCI devices control the implementation of certain functions and 360 degree view of the 3D model.
    a. Control module in HCI devices: Such as a button in a keyboard;
    b. Functions of the 3D model: such as the rotation of the drill, the pressing of a switch, and etc.
    c. Viewing angle: the different angles for the users to observe the 3D model in the virtual environment.
3. Implement the visual and auditory feedback of the 3D model.
    a. Visual feedbacks: rotation, movement, button pressing in the 3-D environment
    b. Auditory feedback: sounds corresponding to each action in the 3-D environment
4. Transplant the above-mentioned AR tool, which is built in PC, into Moverio BT-200.
5. Recursive testing
    a. Modification of design
    b. Modification of implementation.

**Further steps will be added if any additional functions are required.*

## *Division of Task*

Due to the fact that these tasks cannot be done in parallel (for example, before programming the control logic of the 3D model in Unity, the model should have been built with a 3D model maker), we will work together to take part in each task, which allows us to gain experience and knowledge on all aspects of the project.

1. Guofan and Richard are separately responsible for building different parts of the 3D model in Unity.
2. Guofan and Richard will discuss the design of the control logic and come up with an optimal plan together.
3. Guofan and Richard are separately responsible for coding different parts of the control logic in C# within Unity, as well as different parts of the visual and auditory feedback.
4. Guofan is responsible for this, and Richard will examine the effectiveness.
5. Guofan and Richard will test the AR training tool together, as well as optimize the original design and implementation.

**More details will be added as the project proceeds.*

**Further steps will be added if any additional functions are required.*

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## *Scheduling*

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|---|---|
| Meetings among Prof. Cooperstock, Guofan and Richard: | At least one time / two weeks |
| Meetings between Richard and Guofan: | At least three times / week |