

## Haptics Final-Project Second-Checkpoint Progress Memo

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*Subject: Haptics Final-Project Second-Checkpoint Progress*

*Attachments: 0*

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### **Introduction:**

For our final project we are implementing a program that allows the user to pick a virtual lock. This project was selected because of its nearly complete dependence on haptics, or the sense of touch. (One can sometimes visually perceive the pin positions, which might help.) It is also hoped that the program feels real for inserting a virtual key into the lock.

### **Methods and Procedures:**

Since lock picking is a haptic activity that requires both hands, it is necessary to use two haptic devices: one for the wrench using one degree of freedom, and another for the pick using at least three degrees of freedom, (more specifically, three DOFs to position the pick in space and one DOF to vertically position the pins). The following checkpoints have been proposed that are expected to result in timely completion of the project by the time the class presents its ideas:

10 March 2011:

- ✓ Render haptic paddle interface
- ✓ Program vibration for tripping each pin
- ✓ Program 5 pin stopping points
- ✓ Program resistive force to simulate spring loaded lock

29 March 2011:

- ✓ Create cylinder lock model with five spring loaded pins
  - Render lock and wrench graphics
  - Use collision detection for interactions

12 April 2011

- Program dynamics of internal parts including pin and pick frictions

- Render forces
- Mimic real world vibrations to make the simulation more realistic (as time permits)

### **Results:**

As can be seen by the checkmarks shown next to each bullet above, the 2<sup>nd</sup> set of checkpoints were not accomplished to our satisfaction, by 29 March. We were able to make a model of all the lock components (the cylinder, chamber, and upper and lower pins) as well as a matching key using SolidWorks. We also found and used software to convert the SolidWorks files into those recognized and supported by Chai3D. But although the program has no problem loading the files, we were unable to render the graphics for the lock and key. And, without graphics, we did not attempt to use collision detection on the objects.

### **Discussion:**

While it appears we are far behind schedule, we still believe that the next checkpoint goals (at least those that are essential, and not optional, to the virtual environment) will still be met. When planning the checkpoint schedule we did not realize that Chai3D provides the dynamics (including friction) for objects created in it. So, as soon as we have the graphics rendered we will also have all necessary 3<sup>rd</sup> set of checkpoints met (i.e., all bullets except the final, and optional, bullet).

### **Conclusions:**

The goal we have had in mind is simply to mimic the lock-picking process and not necessary to improve upon the procedure. Important cues have been added that we believe are necessary to the lock-picking process, but until the entire environment is created we cannot determine whether these cues will be sufficient to pick the virtual lock. Once the model is fully created we may still consider implementing the final bullet, or think of other improvements, which we expect we will have plenty of time for.