Haptics Final-Project Third-Checkpoint Progress Memo

To: William Provancher
From: Karl Arthur, Courtney Parsons
Date: 14 April 2011
Subject: Haptics Final-Project Third-Checkpoint Progress
Attachments: 0

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. (The word 'nearly' was used because one can sometimes visually perceive the pin positions, which may help in the picking process.) It is also hoped that the program feels real for inserting a virtual key into the virtual 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 graphics
- Render 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, most of the 2nd set of checkpoints have finally been completed (we have a simple way of implementing the wrench, but would like to build a model of the wrench and pick in SolidWorks to make a nicer model). The 3rd set of checkpoints has not been accomplished to our satisfaction, by 12 April. We were able to upload our model of all the lock components (the cylinder, chamber, and upper and lower pins) as well as a matching key, have determined initial positions for each component, and implemented Chai3D's collision detection on these objects. But, the model behaves in unpredictable ways (with the pieces flying randomly around the environment). We are planning to continue to use Chai3D's ODE collision detection, but instead limit the collision detection to interactions with the pick only, and calculate the lock state manually.

Discussion:

We are a little behind schedule, but still believe that the project will be completed on time. When planning the checkpoint schedule we were planning to be practically done by this 3rd checkpoint and so we still have some time to implement and test the lock-picking features.

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, but at this point we expect we will not have time to do.