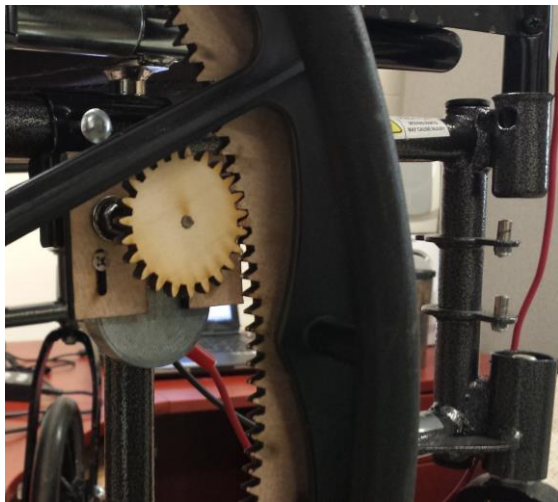


mounts, the system can be more easily attached to any standard wheelchair.

In order to control the motors a USB powered control circuit is used to utilize the back EMF which can allow for smooth rotation of the wheels, stuttering or braking of the wheelchair wheels. With a unique set of commands which are generated from the synthesized virtual environment interactions different feelings of feedback are experienced by the user.



(a)



(b)

Figure 2: VRNChair Haptic Feedback System

3 Results

A prototype haptic wheelchair was built to demonstrate the output and real world feedback from the virtual reality game and physics engine. Information about three different surfaces and surface textures were recorded. A smooth surface which had a low amount of surface friction, a grassy terrain which provided moderate resistance to movement, and a pebble terrain which provided moderate resistance and a physical jitter to user movement. With the recorded information, similar environments were built into the

virtual reality game. When the user, sitting in the wheelchair moved over the surface in the virtual environment, the passive motor haptic drive was commanded to apply resistance to movement, stuttering, or apply both in varying degrees of force. The immersion level with the virtual environment greatly increased as a result of this.

4 Future Work

Currently, the haptic wheelchair provides only braking properties to real world movement. Using a large capacitor array, real world movement on the wheel can be used to charge the capacitors to provide later forward acceleration of the motors which allows for the addition of negative forces to the system, such as experiencing inclines, or moving on an icy surface.

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