**Project Title:** Arduino-based Electrotactile Simulation System for Virtual Sensory Contact

**Student:** Javan Willock

**Supervisor:** Professor Francisco Sepulveda

**Abstract**

Intro

This project displays an approach for enabling people to achieve obstacle detection in a virtual environment with the aid of electrodes, electro-tactile stimulation and a data glove. The system works by calculating the position of your fingers using optical fibres, python programming finds the position of your fingers, assigning them values. If the correct value is confirmed then a signal is delivered to the Arduino via serial USB, to indicate to the system that a pulse be sent to the electrodes.

Goals

To recreate the sense of contact made with touching an obstacle in the 3D environment, the user will experience localised stimulation on the tips of their fingers if their hand is ‘grabbing’ the object. The intensity of stimulation felt by each finger does not vary or indicate the level of force applied to the virtual object and will remain consistent. Distance to the object in relation to the hand will also not be a factor in the ability to interact with the object.

Successful implementation of this project will allow the ability to perceive the environment and the object in real-time effectively and enable the user to experience their environment without use of the eyes or other aids. Given time this could allow for object localisation, obstacle avoidance and object identification without using the eyes.

Virtual environments are currently highly incompatible to people with visual impairment as most of the experiences given are visual. There is potential to provide a useful and safe environment for learning. Primary use of such an application could be used instead in locations where remote sensitivity to objects is needed. Or gaming, where electrotactile stimulation provides an increased user immersion experience.

By using the virtual environment as a test case scenario, we can derive results that can potentially benefit many people and be used in innovative ways.

Method and Tools

The primary tools setup used for this project will consist of one electrode placed on each fingertip, with a waveform generator delivering stimulation within specified parameters, a PCB to convert the waveform signal to current and Vizard5 virtual reality software to program the glove and object interface.

Current state & Next Steps

At the current state the user can interact with the virtual object, but there is no tactile sensation feedback system in place to begin test trials. The goal from here is to get some feedback through the electrodes and to link it with the glove functionality, so that live performance data can be recorded.