ECE 4600 Capstone Design Project

Title: Air Mouse

Team Size – 6 students

Brief Description of the project:

1. Scope:
   This project will require a Bluetooth based microcontroller set on a glove unit that will allow a user to wear the glove and provide input for mouse movement based on hand gestures and orientations. Three axis accelerometers/gyroscopes present on the glove will detect and collect the data. The glove will then process the data and send it to the computer wirelessly via Bluetooth. The glove should be capable of connecting with any computer device with Bluetooth technology.

2. Preamble:
   The idea behind the project is to make a user friendly glove that allows the user to control a mouse pointer wirelessly in air. Optical/laser wireless mice are readily available in the market today but they still require a flat surface to operate on. We plan on incorporating hand gestures that are intuitive and/or easily remembered by the user to aid in operating computers and such devices allowing the user greater freedom.

3. The design content of the project will include:
   Board name – Adafruit Feather nRF52 Bluefruit LE Development Board containing the Nordic Semiconductor nRF52832 SoC which uses an ARM Cortex M4F microprocessor

   At least one of the following (and/or alternatives):
   - Analog Devices ADXL335/ADXL345(SPI/I2C) - Triple-axis accelerometer
   - Bosch Sensortec BNO055 - Intelligent 9-Axis Absolute Orientation Sensor
   - InvenSense MPU-6050 - 6 DOF Gyro, Accelerometer IMU
   - NXP MMA8451 - Triple-Axis Accelerometer
   - ST LSM9DS0 - 9-DOF Accelerometer/Gyroscope/Magnetometer

   Interfacing method/programming language – C++ programming using the Arduino IDE, with additional languages such as MATLAB/Python for simulations as necessary.

   Implementation, validation and testing:
   - Decide what sensors/buttons to use
   - Write code to read sensor data
   - Figure out how to convert sensor data to clicks and mouse movement
   - Write code to send mouse clicks and movement via Bluetooth to computer
   - Calibration to user needs, and add extra stuff if time permits
   - Wire everything nicely onto a glove

4. Design Challenge: The initial concept of an inertial mouse system is detailed in Patent US4787051. This design and implementation of a finger/glove mouse have been explored by other university teams using RF as their wireless communication protocol. We plan to simplify and improve the quality of the design by making use of Bluetooth that reduces the need of a base station, thereby, reducing hardware and improve the speed as well as accuracy of the device.