**Purpose**

Our project is a wireless sensor and communication system to record a responder’s three-dimensional motion relative to time. The data will be used to:

- Create 2D Mapping System
- Enhance Training
- In the future, power an augmented reality simulation

**Background**

The current industry standard for motion capture is a marker system that requires a 360 degree field of view along with several high resolution cameras and the wearer to be covered in restrictive marker equipment.

Our system:

- Is minimally invasive and does not require excessive equipment
- Operates in many environments
- Low cost which will greatly enhance the availability of training for municipalities

**Approach**

**Hardware**

- Inertial Measurement Unit (IMU) – Collect analog data
- Microprocessor – Convert to digital and process data
- Micro SD – Locally store data
- Bluetooth module – create local area network among devices and transfer data upon completion of simulation

**Software**

- Process digital data
- Visualization model
- Advanced Heading and Reference System (AHRS), Kalman Filter – To smooth the digital data

**Project Goals**

- Record motion and trajectory of the **body**, **gun**, and **head** of the wearer
- Non-intrusive design / integration with ALERRT Center equipment
- 2 hour battery life - minimum
- Simple and intuitive user interface
- Location mapping software

**Use Cases**

- Capture movement data from multiple training simulations over several hours

**Hardware**

- LiPo Battery
- Power Switch
- Microcontroller
- MicroSD
- Wireless Transmitter (HC-05)
- Wireless Receiver (HC-05)
- PC/Laptop
- User Interface

**Software**

- System Calibration
- User Interface
- Data Capture
- System Calibration Reporting

**Control System**

**System Command Center**

- System Power On
- Connection
- Calibration
- Capture
- Stop

- Standby
- Standby
- Steady State
- Recording
- Data Capture

- On/Off
- Steady State
- Recording
- Data Capture
- System Calibration Reporting

**Progress**

Completed:

- Filtering and calibration applied to sensor
- Integration of wireless capability (single unit)
- Visualization of sensor output data

Next Semester:

- Buildout user interface
- Automate data downloading
- Build prototype system (integrate multiple units)
- Fabricate enclosure
- Integrated testing

**Stretch Goals:**

- Virtualization using Unity
- Develop basic augmented reality experience

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