E2.10 – 3D Markerless Motion Capture System For Active Shooter Response Training


Bo Heyse


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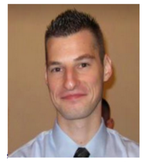

Matt Healea

Purpose

What?

Virtualize Texas State ALERRT Center's active shooter training scenarios

Why?

Allow smaller municipalities to have access to the training

How?

Build a wireless sensor-based system focused on collecting motion data at key points on a first responder

Background

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

Our system:

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

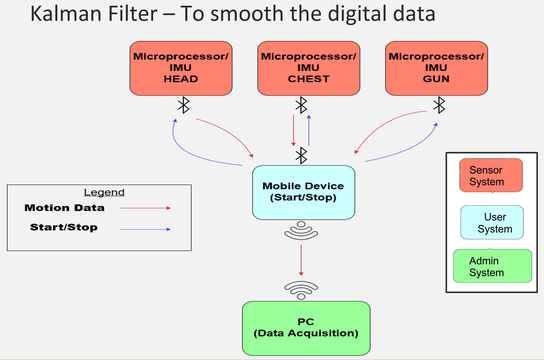
Approach

Hardware

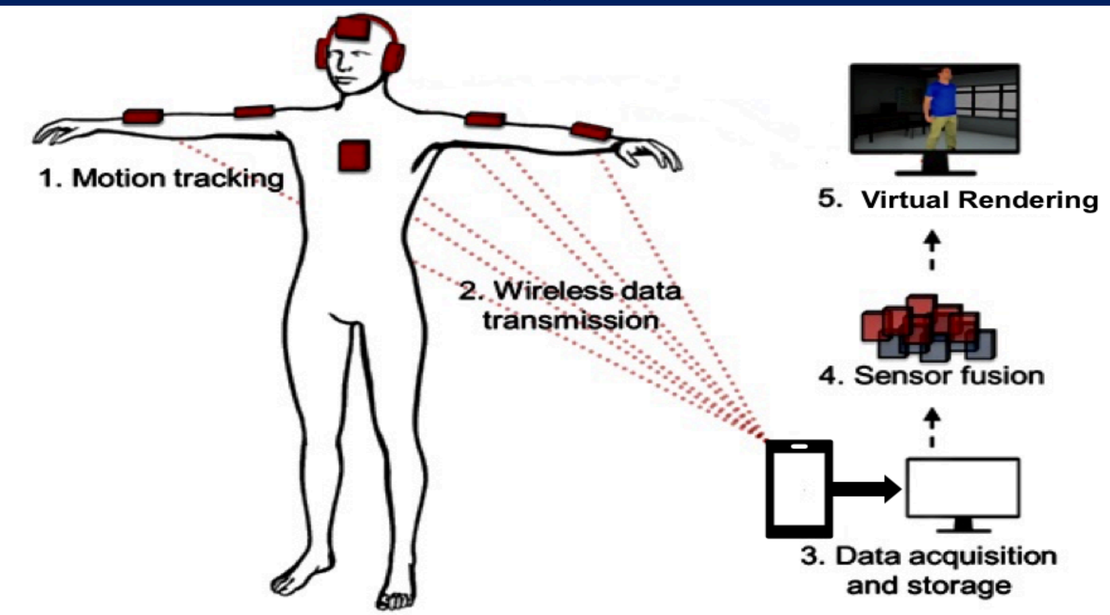
- Inertial Measurement Unit (IMU) – Collect analog data
- Microprocessor – Convert to digital and process data
- Micro SD – Locally store data
- Bluetooth Module – Create local area network among devices and transfer data upon completion of recording

Software

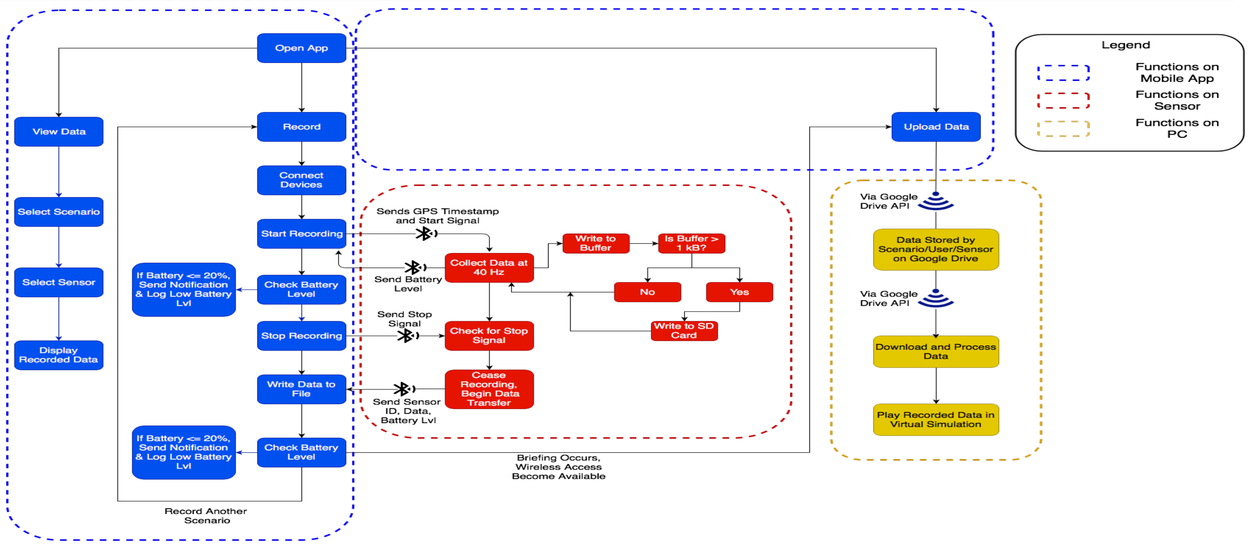
- Process digital data
- Visualization model
- Advanced Heading and Reference System (AHRS), Kalman Filter – To smooth the digital data



The System



Detailed Functionality



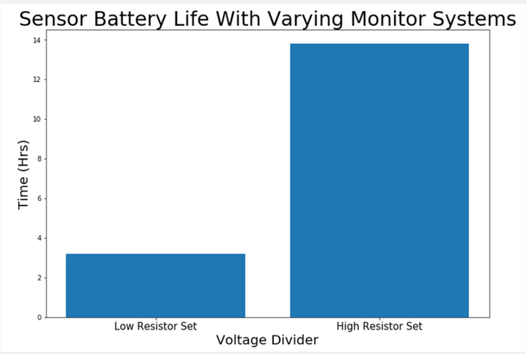
Project Goals

- Record motion and orientation of the **body**, **gun**, and **head** of the responder
- Non-intrusive design/integration with ALERRT Center equipment
- 2-hour battery life – minimum
- Scalable design
- Simple and intuitive user interface
- Virtualize the motion of the body, head, and gun

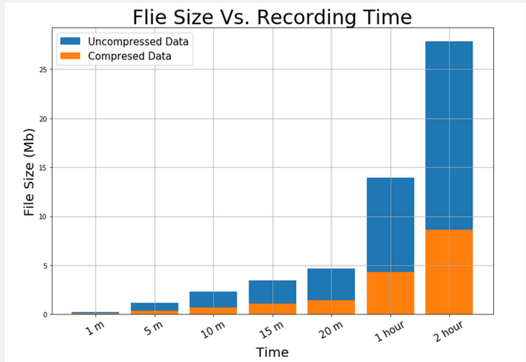
Sponsored by the Texas State University ALERRT Center

Results

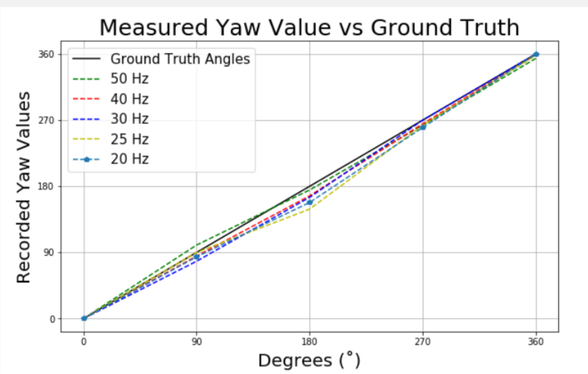
Battery Life – 13.82 Hours



Storage Capacity – 8.64 MB



Ideal Sample Rate – 40 Hz



A 40 Hz Sampling Rate Minimizes Angular Deviation

Acknowledgements

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