Generating Enhanced Augmented Reality Surveillance (G.E.A.R.S.): Requirements Plan

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Client: Sentry View Systems

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1. Overview

1.1 Purpose
The purpose of this project is to design and implement a wearable system that combines COTS AR and millimeter wave sensors. This system will provide the wearer with an 3D model that displays persons moving through it that are detected by the sensors. The intent behind development of this system is to provide security personnel with the ability to easily visualize a person's position relative to its surroundings.

1.2 Definitions
- **COTS** - Commercial off the Shelf
- **AR**- Artificial Reality
- **mmWave** - millimeter wave sensor (provided by Texas Instruments)
- **Vital Signs** - heart rate and breath rate
- **HUD** - Heads-Up-Display

1.3 Stakeholders
The stakeholders for this development project are Sentry View Systems and the Senior Design group currently working on this project.

2. Requirements

2.1 Interface Requirements

2.1.1:
Description: The system shall interface with an Texas Instrument mmWave sensor to track objects moving through an environment.
Rationale: The Magic Leap device will need to have movement detection data sent to it so that the 3D model can be updated.

2.1.2:

> **Description:** The system shall utilize the Magic Leap One's Mission Control device to allow the user to select an object which will prompt the visual system to display additional data relevant to the object.
> **Rationale:** Utilizing the Mission Control device will be the most intuitive method for object selection.

2.2 Visual Requirements

2.2.1:

> **Description:** The system shall display a 3D model of a pre-generated room in AR.
> **Rationale:** A model in 3D space in AR will allow the user to walk around the model to view the space from a full 360 degree angle.

2.2.2:

> **Description:** The system shall display objects detected by the mmWave sensor inside of the 3D model so that the position and movement of the objects are actively tracked and relayed to the model.
> **Rationale:** Detected objects will need to be instantiated into the 3D model for the user to visualize the object's location in the room.

2.2.3:

> **Description:** When an object is selected, the system shall display a box conveying the object's breathing rate and heart rate.
> **Rationale:** Displaying the information perpetually would overload the user with information.

2.2.4:

> **Description:** When an object is selected, the system shall display a trail behind the object to display it's recent path.
> **Rationale:** Displaying the information perpetually would overload the user with information. Only showing the most recent path will keep the 3D model from being filled with a long and obtrusive trail.

3. Constraints

3.1 Device

3.1.1:

        The Magic Leap One device is unable to filter out windows or glass. Therefore a room with glass windows (ex. Panther Dining Hall on FIT campus) cannot be mapped properly by the Magic Leap One device.

3.1.2:

        In order for the mmWave sensor to read an object's heart rate and breathing rate, the object must be sitting stationary in front of the sensor between 0.5-1.0 meter from the sensor. The object must also hold still for 10-15 seconds for accurate readings.