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

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Faculty Sponsor: Dr. Thomas Eskridge

Client: Sentry View Systems

Team Members:

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Client:

Sentry View Systems

1. Brad Costa <bcosta@sentryviewsystems.com>
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Meetings:

Initial Meeting with SentryView: January 18th, 2019

Requirements Review with SentryView: February 1st, 2019

Goal:

The goal of this project is to develop and implement a prototype of a system that combines COTS augmented reality and millimeter wave sensors to provide the user with an 3D model containing persons detected by within the sensors. The prototype will utilize the Magic Leap One headset to augment reality and the Magic Leap One's Mission Control as a user interface. One of the goals of our project to successfully interface millimeter wave (mmWave) sensors with the Magic Leap One device in order to display a visual representation of a room that tracks persons detected by the mmWave sensors and displaying their location in real time within the 3D model. We hope that this product will be utilized by security personnel and improved in the future to include information about the objects.

Approach:

The focus of our project is going to be the integration of our system with the Magic Leap One software. Our system will need to interface with a Texas Instrument Automotive millimeter wave (mmWave) sensor to analyze the data to determine meaningful information which will be displayed on the Magic Leap One headset. Every object that is sensed by the mmWave sensors will be stored as its own entity tracking vector information such as trajectory and velocity.

For the 3D model that will be displayed through augmented reality, we will be utilizing the real-time creation engine Unity. We are currently looking into utilizing a 3D model of Florida Institute of Technology's campus that is currently being developed. Otherwise, we will

design and build a model based off of a room or building on campus. Persons that have been detected by the mmWave sensor will be displayed in real-time moving through the 3D model.

The Magic Leap One's Mission Control will be the user interface device with our augmented reality (AR) system. The Mission Control will allow the user to power the system on and off as well as dismiss alerts. Pending future testing, an external battery may be utilized to allow the system to remain powered during extended use.

Novel Features / Functionalities:

One of the requirements that have been stated by the client to be "desired but not required" is to display an outline of the entities that are tracked by the sensor. By displaying the gait of a human walking or the four legs of a dog passing by, the outline will help to improve the user's ability to differentiate entities from one another.

Technical Challenges:

We will be working with the Magic Leap SDK which provides a powerful toolkit for spatial computing. However, none of the team members for this project have any experience with spatial computing. Magic Leap does provide a plethora of tutorials and API reference documentation that our team will be studying.

The hardware aspect of our project such as working with the millimeter wave sensors will difficult to work with because, as CS and SE students, we don't interact with the hardware as much as we do with software. Determining the optimum utilization of the sensors will require extensive testing and research.

Our client has expressed a desire for our team to develop using the Scrum software development life cycle. Although our team understands Scrum in theory, we are inexperienced with the practical application of the SDLC. We have discussed our inexperience utilizing Scrum with our client and thankfully they have offered to provide us with an introductory course on its use. However, it will take time to adjust to Scrum to utilize it efficiently.

Milestone 1:

1. Meet with SentryView Systems to determine requirements and scope of the project.
2. Research the Magic Leap One SDK
3. Research Texas Instruments Automotive mmWave Sensor SDK
4. Research Unity SDK
5. Draft Requirements Document

6. Draft Test Plan
7. Draft Design Document

Milestone 2:

1. Determine how to detect movements using the TI Automotive mmWave Sensors
2. Create a 3D model of a room in Unity
3. Show an object moving through the model, assuming perfect data with the sensors.

Milestone 3:

1. Demo: Interface the data retrieved from the mmWave sensor to the system showing an object detected by the sensor, actively moving through the model.
2. Develop a model that tracks the gait of a object as it moves

Task Matrix:

Task	Cameron	Zheneé	Coleman	Matthew
Compare and select Technical Tools	Automotive mmWave Sensor - Code Composer Studio	Magic Leap One - Unity	Magic Leap One - Unity	Automotive mmWave Sensor - Code Composer Studio
Discuss Requirements with the client	25%	25%	25%	25%
Design Document	25%	25%	25%	25%
Requirement Document Design Document	25%	25%	25%	25%
Test Plan	25%	25%	25%	25%