UMD backup

**2.0 Introductory Kit**

2.1 System Overview

This is a system basically based on sensor data collections and analyzations. Sensors and Microcontroller/Arduino are attached with the system. When sensor is activated, the information of current speed, loss, and acceleration of the target with the sensor will be collected. The Microcontroller/Arduino gives information of current coordinates of the target in the format of latitude with attitude. All that information collected by hardware will be sent to Lora Gateway for further processing (decoding, encryption and decryption). The processed data will be sent from LoRa Gateway to Raspberry Pi in the format of csv files. Python codes implemented in Raspberry Pi takes csv files as input and analyze input data, including synchronous data visualization, status graphing as matrix, and mapping current coordinates. The csv files will be sent to Azure IoT Hub by Raspberry Pi. Azure IoT Hub take those input files and stored into SQL Database, also Power BI as a front-end shows the input and options that users can perform with the system.

2.2 Getting started

The system will be activated when the sensors are properly attached on the target and user’s computer is connected with the internet. User interface of the application shows the real-time related information of the target when the application is opened.

3.3 Generate or collect data

The raw data will be collected from LoRa Gateway in the format of csv files. Raspberry Pi takes them for further processing, includes analyzing and graphing. Python codes written in the system takes the csv files as input and generate output depending on the type of information that the csv file has.

For the keys of 3 Axis and lable name, the output is in the following two formats:

1. Showing the real-time speed, loss, and acceleration:

A screenshot of a cell phone

Description automatically generated

A screenshot of a cell phone

Description automatically generated2. Graphing as a matrix and calculation listed as a table:

For the keys of latitude and attitude, the location will be marked as dots on the map:

A close up of a map

Description automatically generated

(The precision range of map will be adjusted as the range of keys given.)

3.4 Collected data reached Azure IoT

The csv file will be sent to Azure IoT by Raspberry Pi after finishing steps in 3.3. Python code written in Raspberry Pi sent the csv file to the corresponding table created in SQL Database and insert data in csv file into the table.

Sample code:

A screenshot of a cell phone

Description automatically generated