# PiGPS Tracker Project

Projects website: https://bigbosstony.github.io/

## Proposal

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Proposal for the PiGPS Tracker Project

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### Executive Summary

As a student in the Computer Engineering Technology program, I will be integrating the knowledge and skills I have learned from our program into this Internet of Things themed capstone project. This proposal requests the approval to build the hardware portion that will connect to a database as well as to a mobile device application. The internet connected hardware will include a custom PCB with sensors and actuators for detecting the location by using a GPS module. The database will store the history of locations. The mobile device functionality will include a real time location tracking and will be further detailed in the mobile application proposal. I will be collaborating with the following company/department Humber Department of Public Safety. In the winter semester I have no plan to form a group with the following students, who are also building similar hardware this term and working on the mobile application with me. The hardware will be completed in CENG 317 Hardware Production Techniques independently and the application will be completed in CENG 319 Software Project. These will be integrated together in the subsequent term in CENG 355 Computer Systems Project as a member of a 2 or 3 student group.

### Background

The problem solved by project is to prevent car stolen. With this portable tracking device that you can easily install in your car, if your car was stolen, you can track your car using this tracker, and it will have a real time tracking system which you can access on your mobile app. This will help the police to catch the thief faster.

I have searched for prior art via Humber's IEEE subscription selecting "My Subscribed Content"[1] and have found and read [2] which provides insight into similar efforts.

The first article I found discusses how to set up your own database by using PHP & MySQL.(Veglis, Leclercq, Quema, & Stefani, 2005)

The second journal talks about GPS-Based Tracking Control for a Car-Like Wheeled Mobile.(Low & Wang, 2008)

The third article gives the information about how to merge GPS information to a real map.(Catalao, Nico, Hanssen, & Catita, 2011)

In the Computer Engineering Technology program we have learned about the following topics from the respective relevant courses:

- Java Docs from CENG 212 Programming Techniques In Java,
- Construction of circuits from CENG 215 Digital And Interfacing Systems,
- Rapid application development and Gantt charts from CENG 216 Intro to Software Engineering,
- Micro computing from CENG 252 Embedded Systems,
- SQL from CENG 254 Database With Java,

• Web access of databases from CENG 256 Internet Scripting; and,

• Wireless protocols such as 802.11 from TECH152 Telecom Networks.

This knowledge and skill set will enable me to build the subsystems and integrate them together as my capstone project.

**Methodology**

This proposal is assigned in the first week of class and is due at the beginning of class in the second week of the fall semester. My coursework will focus on the first two of the 3 phases of this project:

Phase 1 Hardware build.
Phase 2 System integration.
Phase 3 Demonstration to future employers.

Phase 1 Hardware build

The hardware build will be completed in the fall term. It will fit within the CENG Project maximum dimensions of 12 13/16" x 6" x 2 7/8" (32.5cm x 15.25cm x 7.25cm) which represents the space below the tray in the parts kit. The highest AC voltage that will be used is 16Vrms from a wall adaptor from which +/- 15V or as high as 45 VDC can be obtained. Maximum power consumption will be 20 Watts.

Phase 2 System integration

The system integration will be completed in the fall term.

Phase 3 Demonstration to future employers

This project will showcase the knowledge and skills that I have learned to potential employers.

The tables below provide rough effort and non-labour estimates respectively for each phase. A Gantt chart will be added by week 3 to provide more project schedule details and a more complete budget will be added by week 4. It is important to start tasks as soon as possible to be able to meet deadlines.

| **Labour Estimates** | **Hrs** | **Notes** |
|---|---|---|
| **Phase 1** | | |
| Writing proposal. | 9 | Tech identification quiz. |
| Creating project schedule. Initial project team meeting. | 9 | Proposal due. |
| Creating budget. Status Meeting. | 9 | Project Schedule due. |
| Acquiring components and writing progress report. | 9 | Budget due. |
| Mechanical assembly and writing progress report. Status Meeting. | 9 | Progress Report due (components acquired milestone). |
| PCB fabrication. | 9 | Progress Report due (Mechanical Assembly milestone). |
| Interface wiring, Placard design, Status Meeting. | 9 | PCB Due (power up milestone). |
| Preparing for demonstration. | 9 | Placard due. |
| Writing progress report and demonstrating project. | 9 | Progress Report due (Demonstrations at Open House Saturday, November 12th, 2016 from 10 a.m. - 2 p.m.). |
| Editing build video. | 9 | Peer grading of demonstrations due. |
| Incorporation of feedback from demonstration and writing progress report. Status Meeting. | 9 | 30 second build video due. |
| Practice presentations | 9 | Progress Report due. |
| 1st round of Presentations, Collaborators present. | 9 | Presentation PowerPoint file due. |
| 2nd round of Presentations | 9 | Build instructions up due. |
| Project videos, Status Meeting. | 9 | 30 second script due. |
| **Phase 1 Total** | **135** | |

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|---|---|---|
| **Phase 2** | | |
| Meet with collaborators | 9 | Status Meeting |
| Initial integration. | 9 | Progress Report |
| Meet with collaborators | 9 | Status Meeting |
| Testing. | 9 | Progress Report |
| Meet with collaborators | 9 | Status Meeting |
| Meet with collaborators | 9 | Status Meeting |
| Incorporation of feedback. | 9 | Progress Report |
| Meet with collaborators | 9 | Status Meeting |
| Testing. | 9 | Progress Report |
| Meet with collaborators | 9 | Status Meeting |
| Prepare for demonstration. | 9 | Progress Report |
| Complete presentation. | 9 | Demonstration at Open House Saturday, April 8th, 2017 10 a.m. to 2 p.m. |
| Complete final report. 1st round of Presentations. | 9 | Presentation PowerPoint file due. |
| Write video script. 2nd round of Presentations, delivery of project. | 9 | Final written report including final budget and record of expenditures, covering both this semester and the previous semester. |
| Project videos. | 9 | Video script due |
| **Phase 2 Total** | **135** | |
| **Phase 3** | | |
| Interviews | TBD | |
| **Phase 3 Total** | **TBD** | |
| **Material Estimates** | **Cost** | **Notes** |
| **Phase 1** | | |
| RaspBerry Pi 3 Starter Kit | $89.99 | https://www.amazon.com/Vilros-Raspberry-Ultimate-Starter-Kit-Clear/dp/B01CYWE20U |
| Pi Camera Module with Case | $38.79 | https://www.amazon.com/Raspberry-Pi-Camera-Module-Megapixel/dp/B01ER2SKFS/ref=sr_1_2?s=pc&ie=UTF8&q2&keywords=raspberry+pi+camera |
| Piezo Buzzer Element (Vibration Sensor) | $5.19 | Canada Robotix |
| LED | $0.50 | Canada Robotix |
| USB GPS Dongle. | $50 | Amazon |
| **Phase 1 Total** | **>$200.00** | |
| **Phase 2** | | |
| Materials to improve functionality, fit, and finish of project. | | |
| **Phase 2 Total** | **TBD** | |
| **Phase 3** | | |
| Off campus colocation | <$100.00 | An example: [4]. |
| Shipping | TBD | |
| Tax | TBD | |
| Duty | TBD | |
| **Phase 3 Total** | **TBD** | |

**Concluding remarks**

This proposal presents a plan for providing an IoT solution for Parking Lot. This is an opportunity to integrate the knowledge and skills developed in our program to create a collaborative IoT capstone project demonstrating my ability to learn how to support projects such as the initiative described by [3]. I request approval of this project.

**References (Generated in pdf)**

# Abstract

## Table of Contents



# 1. Introductionn

# 2. Software Requirements Specifications (SRS)

## 2.1 Product Description

### 2.1.1 Goal

This project will combine Raspberry Pi and a GPS module together to make a portable GPS tracking device. As the device is running, the gps module will keep updating the current location to the server, and users can access those data by their smartphone.

### 2.1.2 Targeted Users

This real time tracking devce is for vehicles track down, for people who go out for hiking or biking, for kids and elderly.

### 2.1.3 Overview Of Product

PiGPS Tracker includes a Raspberry 2 Model B, a GPS module, battery power supply(Or rechargable battery pack), GPS Antenna(if needed), USB to TTL Adapter.

## 2.2 System Perspective

### 2.2.1 Product Perspective

The product will be written by Python on the Raspberry Pi side, for the mobile application, It will support android and ios platform.

### 2.2.2 Product Functionality

Tha main functionality of my product is to provide user the location of the device for user to track it. It will help them to find their stolen car, or the people who needed help.

### 2.2.3 Requirements

Internet connection is needed to upload location information to the database. If you take it with you a battery supply will be required, or if you placed it in the car, power supply will be needed. To achieve the best performace of the product, a GPS antenneis recommended to recieve a stable and strong signal of the GPS.

## 2.3 Overall Description

### 2.3.1 System Interface

System Interface for my project includes GPS module, database server, and mobile application. When the system is power up, a python software should autamatically run as dufault, it will collect all the gps data and send it to the server if there is a internet connection. User can track down the real time location update by using the application on thier cellphone. User can also manege all the data from the server, they can decided to keep it or delete it.

### 2.3.2 Database

PiGPS Tracker uses Google's Firebase Database, which easily for android application development. One device can only connect to one root user who has all the authorization to the data. Root user can see all the data and decide to keep it or not. Other users will need autherization from the root user to access the data and can only see it from the last 24 hours. User will see a real map on their app which powered by Google Maps.

### 2.3.3 Hardware

The main process of this project is collect data by using the GPS module and then raspberry pi micro-computer will upload it to the server, most of the data is the longitude and latitude.

### 2.3.4 Software

User needs a account to connect to the tracker. The first User conect to the device will be the root user, and one device can only have one root user, but user can have multiple devices. Once the data is uploaded, user will see the tracker on thier map application. User (root) can manage all the data on the server, they will have a email address as the login name, a password more than 6 digit, they can also change it after the registration.

### 2.3.5 Web

My website will have the same functionality of the application.

Catalao, J., Nico, G., Hanssen, R., & Catita, C. (2011). Merging gps and atmospherically corrected insar data to map 3-d terrain displacement velocity. IEEE Transactions on Geoscience and Remote Sensing, 49(6), 2354–2360. https://doi.org/10.1109/TGRS.2010.2091963

Low, C. B., & Wang, D. (2008). GPS-based tracking control for a car-like wheeled mobile robot with skidding and slipping. IEEE/ASME Transactions on Mechatronics, 13(4), 480–484. https://doi.org/10.1109/TMECH.2008.2000827

Veglis, A., Leclercq, M., Quema, V., & Stefani, J. B. (2005). PHP and sql made simple. IEEE Distributed Systems Online, 6(8). https://doi.org/10.1109/MDSO.2005.42