

Sign Tracking Device

Client: Flagger Pros USA

Advisor: Dr. Nathan Neihart

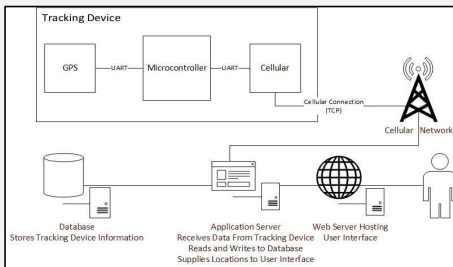
Team Name: DEC1620

Team Members: David Carlson, Tyler Dahle, David Dalo, Alex Sundholm, Brandon Trent, Tristan Walters

Introduction

This project is about developing a tracking device that can be inconspicuously attached to a traffic sign and can communicate information about its location with a server over a long range network. This project also requires the development of a mobile friendly web application that can communicate with the server to pinpoint where each tracking device is located. The purpose of this project is to allow our client to be able to find lost or stolen signs to help reduce the cost of replacing them.

Design Approach

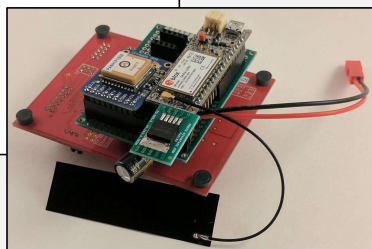
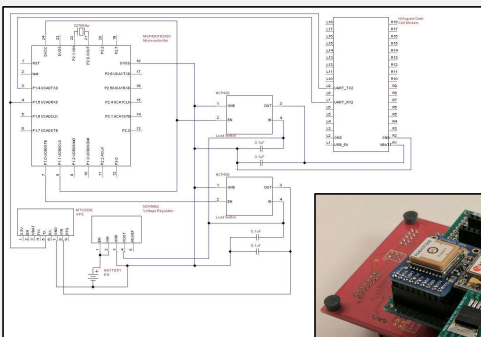


- The Device
 - Gathers location information from the GPS
 - Relays the GPS information to the server via cellular network

- The Database
 - Server receives GPS location information and then stores it in database
- The Web Application
 - Pulls information from database and displays the information in a user friendly fashion

Hardware Overview

The hardware we designed has 3 major parts; a low power microcontroller (MCU), a cellular modem, and a GPS chip. The MCU toggles power for the GPS and modem on and off during each run cycle. First the GPS finds our location, and then the modem reports the modem-specific ID and coordinates. Once both have done their jobs, power is cut and the MCU turns off all clocks except the real time clock that is used to wake up the device two days later. We chose to update periodically because the customer's main concern was having a battery life of at least nine months. The device is designed to be thin and should fit between the layers of a flexible road sign. However, our prototype has not yet been shrunk down to achieve this.



Design Requirements

- Web Application
 - Non-Functional Requirements
 - The application must be mobile friendly.
 - The applications shall always run using a secure connection.
 - The application will use Bootstrap and CSS to allow the application to smoothly transition between devices.
 - Functional Requirements
 - While the user is not logged in, the application will display a login prompt.
 - The application must allow only one user to be logged in per device.
- The Device
 - Non-Functional Requirements
 - The device shall use TCP to communicate reliably with the servers.
 - The battery must be able to withstand usage of up to 9 months.
 - The location Reported shall be accurate within 5 meters.
 - Functional Requirements
 - The device shall draw less than 15 μ A when in sleep mode.
 - The device will report its location at least 3 times a week to the server.
 - The device shall switch to sleep mode and power down all peripherals after successfully transmitting its location.

Intended Users and Uses

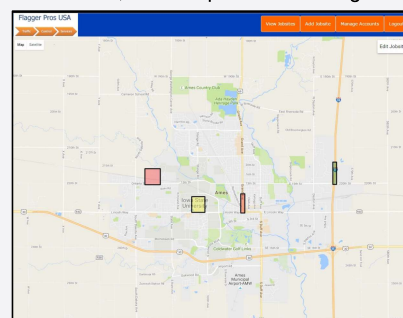
Authorized employees of Flagger Pros USA are our intended users. We intended them to use the device as an attachment to their signs and the web application to see where each of their signs are located.

Testing

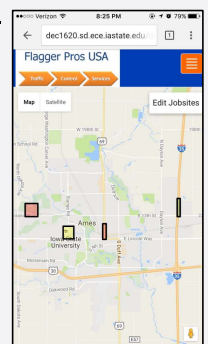
- Web Application
 - Test as you go
 - User testing
- The Device
 - Individual development of each component
 - MCU Power Control
 - Cellular Modem
 - GPS
 - Integration of separate parts

User Interface

The goal for the web application was to create an application that would look as good on a mobile device as it would on a desktop computer. We also wanted to make the main map area as clean, clutter free, and simple to use/navigate as possible.



Desktop View



Mobile View