Bluetooth Tracker

ECE120

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Introduction

Statement of Purpose

The purpose of our project is to help locate lost valuable items. I am sure all of you have lost something very precious at some point in your life and cried over it. Such as your phone, keys, wallet, I-card, etc.. And let me tell you we are also one of you guys but we are working on a solution to track any of those assets. There are all sorts of GPS tracking applications online but they all require to have a secured WIFI connection. However, WIFI is not accessible everywhere all the time on our phones. Therefore, we will try to approach this problem using Bluetooth technology. So, enough is enough, next time we lose anything we are getting it back!

Background Research

At the moment, there are several different types of Bluetooth tracking devices with different sizes and functions. We decided to make a tracking device that can replace most of those tracking devices with two simple functions: tracking (within 150 ft) and buzz notifications (when tracked devices just got out of 100 ft range). Our group looked at a key finder project on YouTube. Our project is very similar to this one but at the end of the project, we may also add GPS tracking devices to find the actual location if possible.

Design Details

We decided to separate our project into smaller steps that ensure we first have a simple Bluetooth tracking device before further developing it. The steps are:

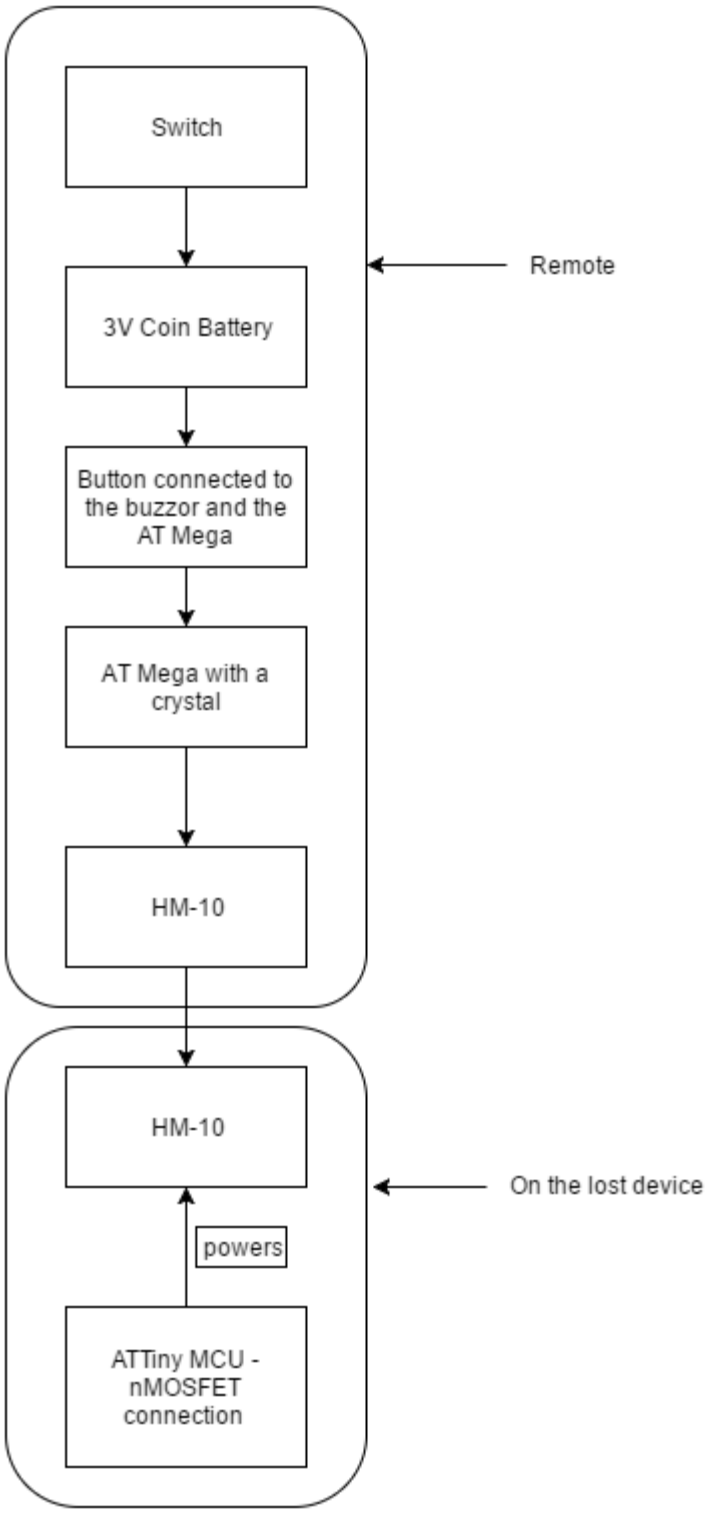
Step 1: Create a simple tracking device that when the connection is enabled (within the range of 150 ft and with battery), we can make the one on the belonging buzz and create a distinct sound to help us find it.

Step 2: We create an inverse connection that when the one on the belonging is more than 100 ft away from the one we keep, the one we keep will start buzzing to notify us that we forgot our stuff.

Step 3: We will incorporate the GPS tracking device on the product so that it can be tracked on a wider range.

Block Diagram / Flow Chart

This block diagram / flow chart shows two separate modules, showing the first step of our project. One is with the belongings that we want to track and one that we keep by our side.



System Overview

In this project we will have a remote and a setup circuit that will be on the device. Both of them have Bluetooth modules on it. The module on the remote is powered using an ATMega which is initialized or powered by a 3 V Coin battery using a button whereas the module on the setup circuit is powered by ATTiny MCU using an n-MOSFET.

The remote turns on using a switch. Then if you see the LED light on the remote lit up, it is connected to the module on the device and if it is blinking then it's still looking for the device. So, if it's blinking, press the button that is connected to ATMega and the buzzer on the device. This button asks the ATMega to send a UART comment to the Bluetooth module on the remote that also tells it to turn on the pin on the module that's on the device which makes the connection. This ATTiny constantly makes sure if the connection is secured between the two modules. If it is then it asks the buzzer to make the sound.

Parts

- 2 HM-10 Bluetooth modules
- AT-Mega Micro-controller
- AT-Tiny Microcontroller Unit
- nMosfet
- 3-volt coin cell battery
- Switch
- LED
- Resistors
- 2 buttons

Possible Challenges

There are several similar devices in the market that has already had similar features to our project so it is difficult for us to first replicate those devices while deciding on key features that distinguish our device. The difference can be based on the appearance (size and decorations) or based on the functions of the product (Bluetooth tracking, GPS tracking, buzz functions, etc.)

As we develop this project, we will run into problems such as learning to use Bluetooth, choosing energy sources, developing programs to track the device.

Around the end of the project we will also possibly need to 3D print the containment of our product.

References

"Mini Project: Bluetooth Keys Finder (Aka "No Worries Keyfob")". *YouTube*. N.p., 2016. Web. 26 Sept. 2016.

"No Worries Keyfob". N.p., 2016. Web. 26 Sept. 2016.

Weekly Updates

Week of Sep 26th:

- We designed the block diagram.
- Our problem was to understand how the components work as we all are not very familiar with the Bluetooth technology.

- In the upcoming week, we want to look further into how Bluetooth works and what are our options to best use this technology for our tracker.

Week of Oct 3rd:

- We have a closer look at the maker video to determine exactly how the parts are connected.
- Finalize ordering parts needed for the projects.
- Experiment with the AT-Mega Micro-controller.
- Our problem was to get used to the AT-Mega as we never use it before, We also need to make sure the AT-Mega has all the wire that we need.
- In the upcoming week, we will look into how AT-Mega works and how it can be best used in our projects. We also experience with the diodes and resistors controlled by the AT-Mega.

Week of Oct 10th:

- Receive the AT-Tiny.
- Finish soldering the parts.
- Experiment with the parts received. Look into the codes used for this device.
- Our problem was to understand the code used in the programs that we wanted to use for our tracker so that we can modify it as needed.
- We also need to look into how AT-Tiny works and get used to its ports.
- Finally, we need to get used to the IDL suggested being used with AT-Tiny and search if there is any more user-friendly one.
- We plan to step by step tackle these problems one at a time.

Week of Oct 17th:

- Receive the Bluetooth HM-10.
- Our problem was to figure out how to solder the Bluetooth parts. Fromthevideowedecided to look into, to need to build a special base which is out of our current ability.
- So we have two options: find the adapter board to buy on Sparkfun or to actually build our own module for the Bluetooth. We decided to look into that on Sparkfun.
- In the upcoming week, we will look into buying the adapter board.

Week of Oct 24th:

- We ordered two HM-10 modules for this week.

1. We are working on the connection between the Arduino Mega and AT-Tiny and the HM-10 modules.
   Link for HM-10 datasheet: http://fab.cba.mit.edu/classes/863.15/doc/tutorials/programming/bluetooth/bluetooth40_en.pdf

HM-10	Arduino / AT-Tiny
Pin 12 (3.3 V)	3.3 V
Pin 13 (GND)	GND
Pin 2 (UART-RX)	TX
Pin 1 (UART-TX)	RX

   We are connecting pin 23 of HM-10 with a 600 Ohm resistor and LED. LED GND goes to ground of the Breadboard.

   We are also connecting pin 12 of HM-10 with a 0.1pFcapactiorand back to the pin 13 of the HM-10.

2. Connecting Arduino Mega/AT-Tiny and HM-10 module:

- We downloaded the Realterm serial software which we will use to control the modules on how to make one master and the other slave.

- The challenge is to find the PCB board for the HM-10 modules. We could not do it with our current level so we decided to buy two new ones that are already soldered as needed.
- The most challenging part is that we do not have the modules needed yet, which are the core of our project.

- Next week, we will start to apply the master and slave connection between the two modules and try to control them using the Arduino Mega and AT-Tiny.

Week of Oct 7th:

- We received the two modules and figured out their schematic.
  http://www.sunfounder.com/wiki/index.php?title=Bluetooth_4.0_HM-10_Master_Slave_Module#For_Mega2560
- We received the coin battery as well so we have all our part now and can start with our project!
- We also looked into how to to use the buzzer and control it with a switch.
- We are working on how to communicate between the two modules.
- Challenges:
  - We received the parts very late so we don't have much time left so it is difficult to present for the midterm.
  - We need to look into the programs for communication with the two HM-10 modules. Right now we can either use the Realterm software or BleSerialPort.
- This weekend we may come to finish the connection between two modules.
- Next week, we hope to finish most of our project so that we can test our circuit before the midterm demo.

Week of Nov 14th:

- This week, we work on pairing the module using AT program
  https://learn.sparkfun.com/tutorials/bluetooth-basics
  https://alselectro.wordpress.com/2014/10/21/bluetooth-hc05-how-to-pair-two-modules/
- Challenges: The guideline we followed did not seem to work. Finally, we get the module to answer but can not get anywhere further than that. It is impossible for us to get the module to work without knowing the name of the modules.
- This week, we will continue to work on how to make the modules respond to the signals.
- Next week, we will hopefully get the two modules to interact with each other.

Week of Nov 28th:

- This week, we realized that instead of trying to pair the two modules, it is much better to use a smartphone, make an app to control it instead of a master module

  https://evothings.com/control-an-led-using-hm-10-ble-module-an-arduino-and-a-mobile-app/
- We followed this and downloaded the program and tested it. It worked well. Now we only need to make the appropriate code for that
- Challenges: None of us ever made an app before so it was difficult for us to start doing that in such a short time
- Next week, we hopefully can finish the project before the final demo.

Week of Dec 5th:

- This is the week of the final demo. We found a different app maker with a similar app:
  https://itunes.apple.com/us/app/lightblue-explorer-bluetooth/id557428110?mt=8
- We finished the project that includes a LED light and a buzzer to signal where it is.
- Challenges:None of us know how to make an app and never worked with Bluetooth before. Moreover, most of the similar apps required a different Bluetooth module, only LED light, need an Android phone while we all use Apple phones, etc.
- This week, we will finish our demo and the final report.