Search & Rescue Reconnaissance Device

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Introduction

Thousands of people get lost or are injured while participating in outdoor activities and require immediate aid from search and rescue teams. Although there is an increased demand on beacon usage, many forgo buying search and rescue devices due to the cost which ranges from $250 to $500 .

The goal for this project is to develop a cost effective transmitter and receiver that can be attached to an Android device allowing rescuers to not only search for missing persons on the ground but also through the air using a UAV which can potentially reduce search and rescue times when locating missing people in backcountry areas.

Designed to be used by recreational hikers and outdoorsmen, our device reports signal strength between a missing person's transmitter and a rescuer's receiver and displays that information on a Android app. Because construction for this prototype costs $150, it can be assumed that this device is a cost effective and efficient alternative for novice outdoorsmen.

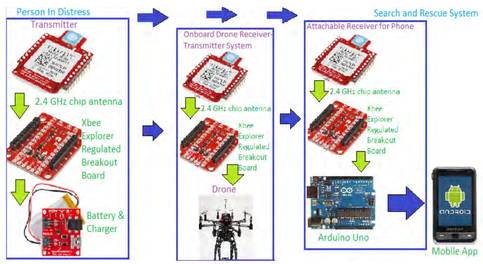

Figure 1: Device Topology

Team Members

Professor Syed Jafar, Advisor	
Aaron Dembla , EE	Team leader & responsible for drone construction.
Nicole Rodrigues, EE	Antenna and Transmitter Subteam & also responsible for CAD satellite drawings
Samuel Thacker, CpE	Android App Subteam & App Integration
Raj Vora, EE &CpE	Antenna & Transmitter Subteam & App Integration

If you have questions please contact us at adembla@uci.edu

Approach

App Subsystem

The Android application is a simple and easy to learn tool that will allow the user to track signals from distress beacons with just their phone and a USB peripheral.

The app consist of a map with that tracks where the user currently is and has gone and a meter that measures signal strength. The app activates when the user plugs in the peripheral to their phone, starting the application and scanning for signals.

When tracking a signal, the user would just need to go towards where the signal strength is higher and search the area as the strength starts to peak.

Transmitter/Receiver Subsystem

The 2.4GHz transmitter and receiver are modest in power consumption (as low as 1.18uA) and have a range of 4000ft because of a high gain 20dBm transmit amp and a -107dB receive amp.

The transmitter calls a function on the receiver every second while the receiver listens for a signal every 100ms and reports the link quality in dBm of the most recently received packet, irrespective of which node that packet came from. This link quality information is outputted to an Arduino which converts the value and interfaces with the Android device.

Drone Subsystem

Drone subsystem is designed to enhance the range and capabilities of our antenna subsystem. The drone can search an area from 12.7 M〖ft〗^2to 50.2 M〖ft〗^2carrying on the level of obstruction.

The 2200 mAh Li-Po battery gives the drone 15 minutes of max power output. Factoring both the duration flight and area coverage gives approximate maximum area coverage of 100 M〖ft〗^2 in a 15 minute flight. However, the battery can be updated so that the flight time can be extended to hours. Additional updates could be made so that the user can get the video feed to the RC control console for easier geographical position identification.

Results

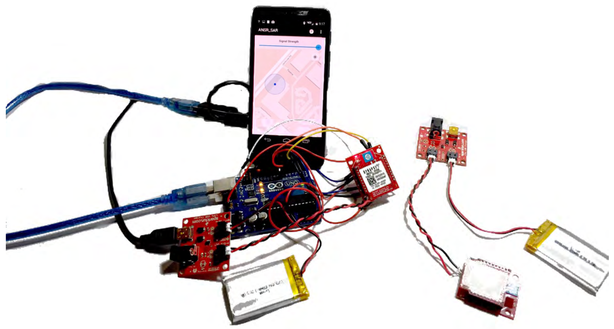

Figure 1: Handheld Search and Rescue Device

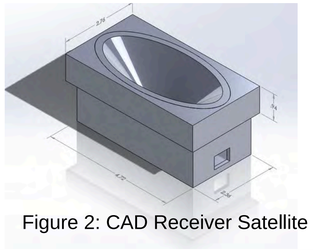

Figure 2: CAD Receiver Satellite

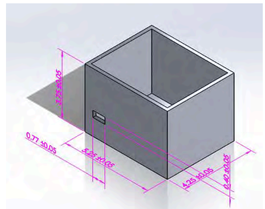

Figure 3: CAD Transmitter Satellite

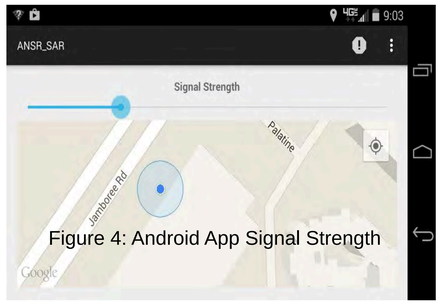

Figure 4: Android App Signal Strength

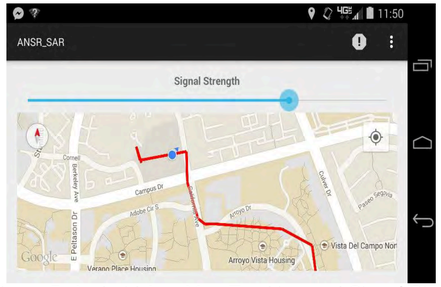

Figure 5: Android App Map Tracking and Signal Strength

Measurements

Battery Life	
Transmitter Current	130mA
Receiver Current	25mA
Lipo Battery Nominal Capacity	860mAh
Galaxy s5 Nominal Capacity	2800mAh
Arduino I/O Pin Total Current	280mA
Receiver Antenna Battery Life	24.08 hr*
Arduino & Phone Battery Life	[illegible]6 hr*
Transmitter Battery Life	4.631 hr*

*Includes allowances for external factors which affect battery life (factor of .7)

Antenna Range	
Line of sight	4000ft
With some obstruction	2000ft
Indoors	400ft

Schedule

Week 1 –3
- Build transmitter and receiver
- Design GUI for App
- Begin construction on Drone

Week 4-6
- Debug, test, & optimize transmitter and receiver
- Continue Drone construction
- Continue programming GUI for App

Week 7-9
- Communicate between receiver and Android App
- Finish construction on Drone
- Construct casings
- Prepare for final Presemtation

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