Engineering Requirements

Cody Herndon

codyray.herndon@gmail.com

Abstract

This document outlines the engineering requirements for a device intended to ease locating a nearby cell phone. The device is intended to be worn as a necklace, on a bracelet, or on a key chain as a key fob. When activated, the device will wirelessly signal the connected cell phone to sound an alarm to aid in its location.

I. Introduction

This document outlines the engineering requirements for a device designed to aid in the location of a lost cell phone (herein referred to as the remote device) in the near proximity of the operator. This device is intended to bridge the gap left by GPS-based location apps which may tell the operator the general location of the cell phone, but is unable to pinpoint the cell phone's location. Additionally, this device should be capable of operating independently of a cellular network or the internet, allowing the operator to locate their cell phone when in remote locations.

As the intended use-case of the device is the activation of a connected phone which may have been misplaced, the device must be connected to phone wirelessly. Since the device is likely to be used indoors, this wireless connectivity should be reasonably capable of passing through obstacles such as walls and furniture. Additionally, the device may be needed in the course of the operator's work-day which might include travel over a considerable line-of-sight distance outdoors.

As the device may need to be used at any time, it should be easily carried on the operator's person during the course of their day. As such, the ideal form factor would be that of a necklace, ring, bracelet charm, or key fob. Additionally, because the device is to be worn on the operator's person, it should be as inconspicuous as possible to prevent annoyance, barring the use of an external antenna. Finally, due to its potential for regular proximity to its operator's skin, the device should be free of sharp edges or harsh chemicals.

The device should be as simple to use as possible to facilitate rapid location of a lost phone. Thus, the device should be capable of being activated with a single button push.

II. Scope

This document pertains only to customer requirements. Such requirements are often vague and guide designers to key features that are important to an implementation. For more specific requirements, please refer to the *Engineering Requirements* document.

This document pertains only to the device outlined above and not to a remote device. The device should be used with a modern "smart" cell phone, which often feature numerous wireless interfaces. Selection of a wireless standard and determination of the fitness of a particular device is beyond the scope of this document. For more information about the specific selection of wireless interface, and supported phones and devices refer to the *Feasibility Analysis* document.

III. Functional

This section outlines features and specifications that are required for normal use-case operation.

1. Mechanical

(a) The device shall feature a single actuator to activate the device's primary functionality.

2. Electrical

   (a) Power and Endurance

      i. The device shall feature one or more on-board power supplies.

      ii. The device shall feature a power supply system with a capacity of no less than 100 mAh.

      iii. The device shall feature a means of replenishing the power supply capacity.

      iv. If the device requires an external power supply to replenish the on-board power supply capacity, the device shall feature a USB 2.0 micro B female receptacle to receive the input power.

   (b) Wireless Connectivity

      i. The device shall connect to a remote device wirelessly.

      ii. The device shall implement a wireless communication system that is natively supported on iOS 4.0 or later, and Android 2.2 (Codename "Froyo") or later.

      iii. If a communication standard is only supported by operating systems later than iOS 4.0 or Android 2.2 (Codename "Froyo"), the design documentation must specify the minimum version supported.

      iv. The device shall connect[1] to the remote device over an unobstructed linear distance of 20 feet (6.1 meters).

   (c) Computational

      i. Uniqueness

         A. The device shall feature a unique address to differentiate itself from the other devices active in an area.

      ii. Companion Application

         A. The companion application shall be capable of receiving and interpreting transmissions from the device.

         B. The companion application shall be capable of sounding an alarm or message tone from the remote device in response to an activation message from the device.

         C. The companion application shall be capable of pairing and storing the unique address of a device.

         D. The companion application shall only respond to requests for activation from a device whose unique address matches the stored unique address.

IV. Non-Functional

This section outlines features and specifications that relate to the expected operating environment and device durability.

1. Mechanical

   (a) The device shall feature a rigid case that encapsulates all digital components and radio transceiver components.

   (b) The device shall feature mounting holes through both the PCB and the case.

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[1]Capable of both transmission and reception of data.

(c) The mounting holes in the PCB and the case shall be a minimum of 1/8th inch (3.175 mm) in diameter.

(d) The PCB dimensions shall not exceed 5 inches by 5 inches by 1 inch (127 mm by 127 mm by 25.4 mm).

(e) The PCB shall feature rounded corners of no less than 1/8th inch (3.175 mm) in diameter.

(f) The device shall be capable of absorbing repeated shock equivalent to a free fall onto concrete from 6 feet.

2. Environmental

(a) The device shall be capable of operating in temperatures ranging from -20 degrees Fahrenheit to 90 degrees Fahrenheit (-28.9 degrees Celsius to 32.2 degrees Celsius).

(b) The rigid case for the device shall resist water and solvent ingress.

(c) The rigid case for the device shall not exude fumes of any kind while operating below the glass transition or melting temperature.

(d) The rigid case for the device shall not exude chemical skin, respitory, or eye irritants of any kind while operating below the glass transition or melting temperature.

(e) The rigid case for the device shall have a glass transition or melting temperature of no less than 110 degrees Farenheit (43.3 degrees Celsius).

V. Testing and Verification

Specification	Test Description	Met

VI. Revision History

2015-05-31	Initial production