Wireless Garage Door Alarm System
Built around a Raspberry Pi

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Outline

- System Plan and Motives
- Components
- Design
- Development
- Problems
System Plan

- Warn a user when they leave their garage door open
- Assure the user receives the warning
- Car can be in the driveway without alarm
- Door can be open without alarm
Technology

- Use modern exciting tech
- Make a reliable robust system
- This may not be the simplest solution
Components

- Car detector
- Alarm
- Garage door reader
- Application processor
Car Detector

• Method
  – Toggle detector
  – Ping micro controller
  – RFID

• Requirements
  – Long range
  – Very low to no power in car
Alarm

• **Method**
  - Speaker with micro controller
  - Text message

• **Requirements**
  - Very long range
  - Very low to no power in car
Door reader – Application Module

• Door reader
  – Infrared detector
  – Magnetic switch

• Application module
  – Micro controller
  – Raspberry Pi
Our Design

- Linksprite Cottonwood UHF RFID Module
- Text messaging
- Magnetic reed switch
- Raspberry Pi
Our Components

http://www.bit-tech.net/modding/2013/03/22/raspberry-pi-case-competition-update/1
System Diagram

Door Switch

Base Controller

Home Network

Alarm

Text Message

Cell Network

Email

User

Transmission Types

Wired

Wireless
Raspberry Pi Requirements

- USB communication with RFID Module
- Read GPIO input
- Send test messages (sms)
USB Communication

- C++ support for a standard HID driver
- HIDAPI
- Can treat USB as a ttl UART
Read GPIO Input

- No native C++ support on Pi.....
- WiringPi library– based on Arduino
- Initialize, I/O, no deinitialize
Text Messaging

- Send email through SMTP
- Email to users network carrier
- Relay to phone as sms
- Gmail – 100 SMTP per day
- For Verizon
  1234567890@vtext.com
Text Messaging

- No native C++ email support
  - Sendmail
  - Postfix
- Native Python email support
- System call
  - Messy?
  - Embedded
Pseudo Code

initialize WiringPi_DoorInput
initialize HidApi(RFIDReader)
while on
  if start
    if (readGPIO(DoorInput))
      if TagNotInRange
        SendEmail(DoorOpen)
        while(TagNotInRange)
          sleep(.5)
        sleep(.5)
    sleep(.5)
deinitialize HidApi
Problems in Code

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deinitialization never happens</td>
<td>Cntrl-c interrupt handler</td>
</tr>
<tr>
<td>Noise on GPIO</td>
<td>Debouncer</td>
</tr>
<tr>
<td>Noise on RFID</td>
<td>Check multiple times</td>
</tr>
</tbody>
</table>
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Questions