

Yaroslav Khalitov

CPT 210

Final Project Documentation

RFID Home Security System

Components & Parts

Below there will be a list of all the components used. They will later be explained in detail how to be hooked up in order to create the home security alarm system.

- RGB LED
- Active Buzzer
- Ultrasonic Ranging Module
- RFID Module
- Jumper Cables
- 3x 220 Ohm Resistors
- 4x 1K Ohm Resistors
- NPN Transistor (S8050)
- Breadboard
- Raspberry PI

Specifications

This project is intended to demonstrate the capability of the Raspberry PI OS and use several components in the process. The home security system monitors movement between it and the opposing door frame. It uses a RFID card and a reader to enable/disable the alarm. Once

enabled, walking past the system through the door triggers a panic mode that repeatedly beeps and alerts of an intrusion. You can disable the alarm using the RFID card.

Setting Up Raspberry PI for RFID Module

This process is simple and sets the stage in order to use the RFID module correctly. In the command prompt enter “raspi-config” and select interfacing options. Select “P4 SPI” and enable the SPI Interface if it’s not already enabled. Finally reboot your raspberry pi. Run the command “lsmod | grep spi” and look for “spi_bcm2835” to make sure everything was properly set.

Installation

RGB LED

To install the RGB LED you need the 3 220 Ohm resistors, and a few jumper cables. Going from left to right on the LED you connect the leftmost pin through the resistor to GPIO5, then the second one to 3.3V, third one through the resistor to GPIO6, and fourth one to GPIO26.

Active Buzzer

For the active buzzer connect the VCC of the buzzer to 5V. Then connect the other pin of the buzzer to the collector of the NPN transistor. The emitter of the transistor is connected to ground and the base (middle) is connected to GPIO4 through a 1K Ohm resistor

RFID Module

The RFID Module is simple to connect with no resistors or other parts needed. Simply connect the power and ground as labeled. Then connect...

1. SDA to CE0.

2. SCK to SCLK
3. MOSI to MOSI
4. MISO to MISO
5. RST to GPIO25

Ultrasonic Module

Simply connect the VCC to 5V and GND to ground. Then take the Trig and connect it to GPIO23. The echo should go through a 1K Ohm resistor to GPIO24, however loop/connect the other side of the 1K ohm resistor additionally through two more 1K Ohm resistors that lead to ground as well.

Setting Up the RFID Cards

In order to correctly run the program with a functioning card the card should have the password “Alex” written to it. There should be a ReadAndWrite.py python file attached that allows you to write to a card and read its contents. Run the program with your current hardware setup, select write, and write the password “Alex” to a RFID tag of your choice by tapping it to the reader. The main program is initially designed to look for the password “Alex”. If you wish to change the password the program looks for you can edit line 61 in the main program and subsequently you will need to write the correct password to a card as well.

Loading the Program

To run the security system simply load the program onto the Raspberry PI. Next attach the hardware setup to a door frame with the ultrasonic sensor facing inward towards the other side of the frame. Run the program and you should be able to use it as intended.

Using the Home Security System

Once loaded, the LED should be a constant orange/yellow light signifying its waiting for your input. Simply scan the correct RFID card to the reader to enable the alarm. In 10 seconds the flashing yellow will change to a flashing red indicating the alarm is set. You can once again scan the RFID card to disable the alarm. If someone walks through the frame when the alarm is armed, the LED will turn a constant red and the buzzer will loudly beep repeatedly. Once again you can turn this off by scanning the correct RFID card to the reader.

Anytime during a correct scan a green light will briefly show followed by a beep and change of states. During an incorrect scan with the wrong password a red light will briefly show followed by a beep without a change of states.

During execution you can press “CTRL - C” to turn off the program and disable the alarm completely.

References

Schafer, Corey, director. *Python Threading Tutorial: Run Code Concurrently Using the Threading Module*. YouTube, YouTube, 12 Sept. 2019,

 Python Threading Tutorial: Run Code Concurrently Using the Threading Module

Gus. “How to Setup a Raspberry Pi RFID RC522 Chip.” *Pi My Life Up*, 10 Feb. 2021,
<https://pimylifeup.com/raspberry-pi-rfid-rc522/>.

