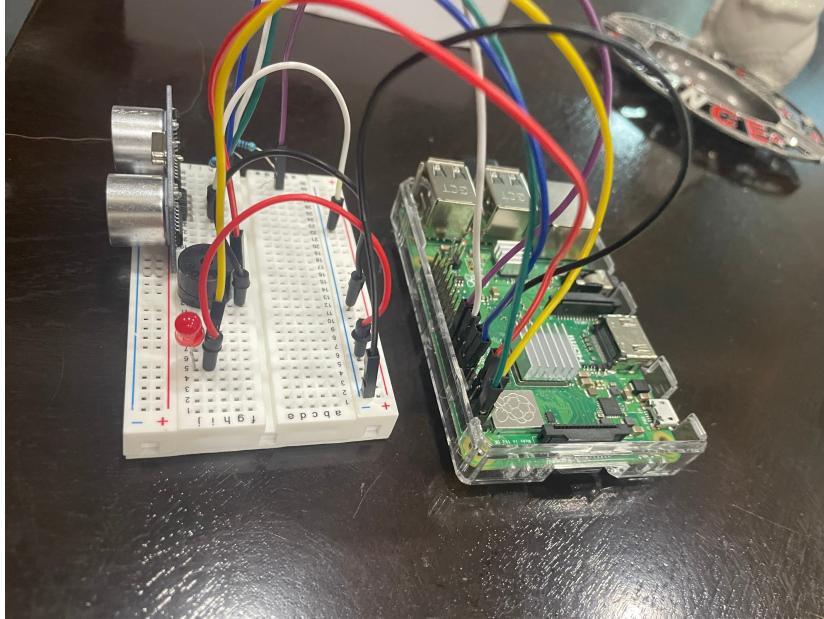


Home Alarm System

by Michael Issa, Noah Garcia, Demarcus Mckan, Abraham Estrada

May 10, 2023



Overview

We have designed and built a simple home alarm system that notifies a user with both sound, light, and mobile notification whenever their house, room, or business has been breached or broken into. According to Statista.com, there are 314.2 burglaries per 100,000 residents in the United States. Over 1 million burglaries alone occur a year and one happens every 25 seconds, according to Forbes. These burglaries could have possibly been prevented if the victims had a working alarm system that notified the victims that their house had just been broken into. For this, alarm systems are a very crucial feature all homes should have installed.

Motivation & Objective

From our own experience, alarm systems are not very common in households. Common reasons for this is that alarm systems can be very expensive and complicated to install, leading to many people being reluctant to put in the effort required for one. We firmly believe

that all households should be able to afford an affordable, yet efficient, alarm system in order to protect their homes, businesses, and loved ones. We wanted to create an alarm system that is simple, affordable, portable, and secure so that customers and users can move it from one place to another more easily. Our hope is that this would add a firm layer of security to most homes and businesses to reduce any future crime such as burglary or assault, helping to make the world a safer place.

Design & Functions

This home alarm system is designed with simplicity, portability, affordability, and security in mind. It can be created with few low cost materials, which are available online. Also it is very light and small, and can easily be transported to different doors or even households in your bag-pack or hand. To use it and install, it is simply placed around any door in a room you want to detect its motion. This alarm system product has many functions such as a light that turns on, a sound that is produced by a buzzer, and a notification to your mobile device when the alarm is activated. The alarm will be activated when the ultrasonic sensor senses proximity to a door. There are also two different modes. One mode is called 'Normal Mode', this mode rings an alarm and sends a mobile notification alerting you that your house or business has been breached and broken into. The second mode will be called 'Silent Mode', which will only send a mobile notification with no audible sound that your property has been breached. 'Silent Mode' is useful when you want to discreetly know if a household or business has been visited by someone when you are away, or at what time someone comes and goes from the premises.

The two modes and their features:

Mode	Sound	Notification
Normal		
Silent		

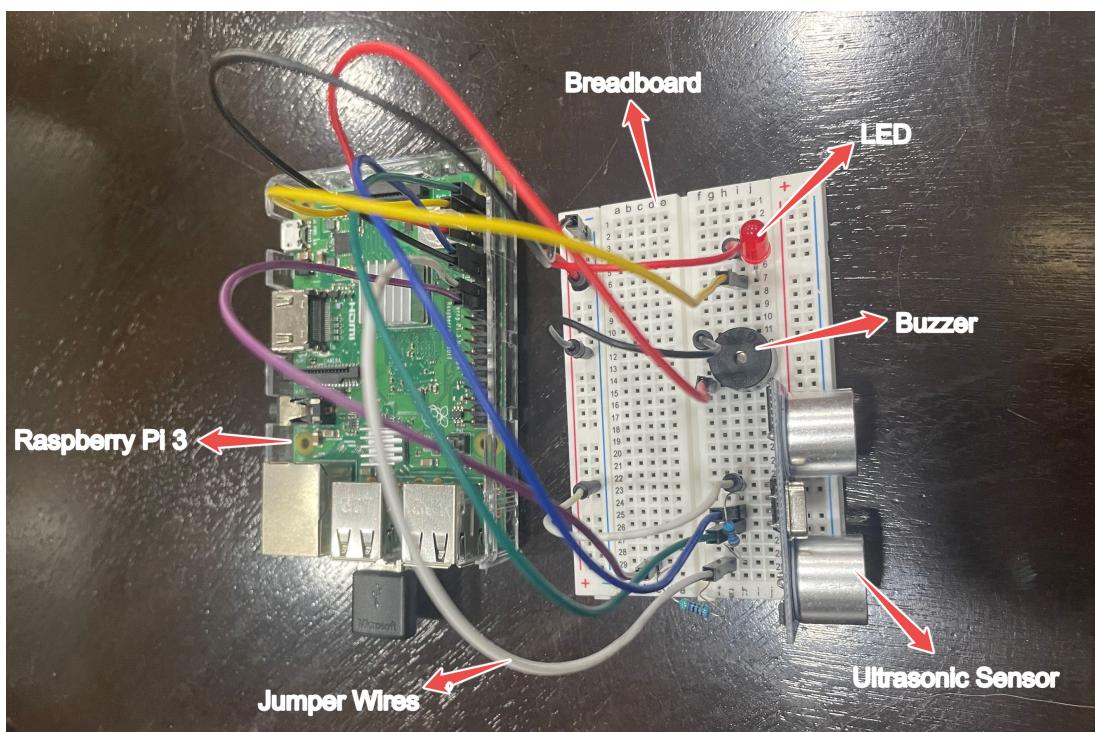
Implementation

Before we start, we need a list of all the required materials and their functions:

Material	Function
Raspberry Pi 3	the brain/computer of the alarm system
Ultrasonic sensor	detects motion and proximity
Buzzer	produces an audible sound when triggered
LED	visual light indicator
Breadboard	plastic board that allows components to connect
Jumper Wires	connects components in the breadboard

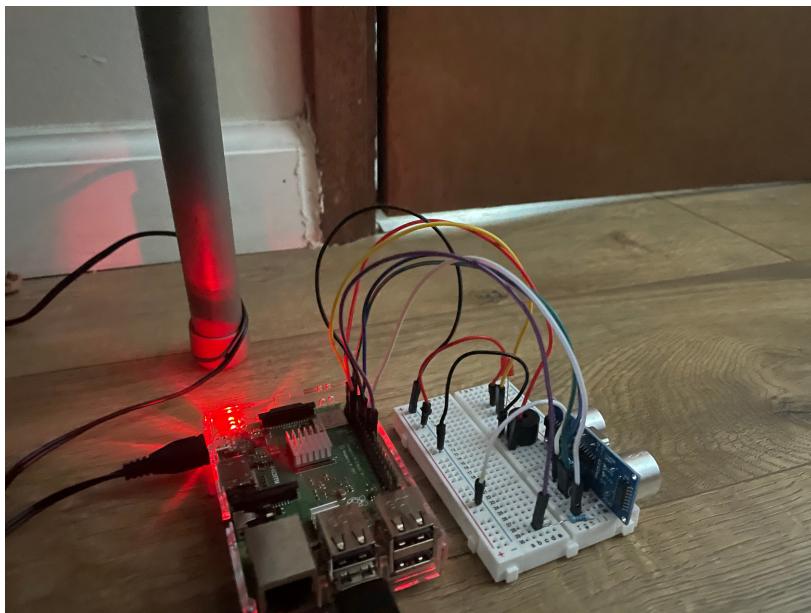
First, we connected the Raspberry Pi, ultrasonic sensor, buzzer, and LED to the breadboard on the appropriate pins with the jumper wires. Next, we needed to register an account with Pushbullet. This is the service that will allow for device notifications. Afterwards, we wrote the logic of the alarm system. This was done by writing code in Python for the Raspberry Pi to execute. The source code is attached in a separate file.

Here is an image of the connected alarm system:

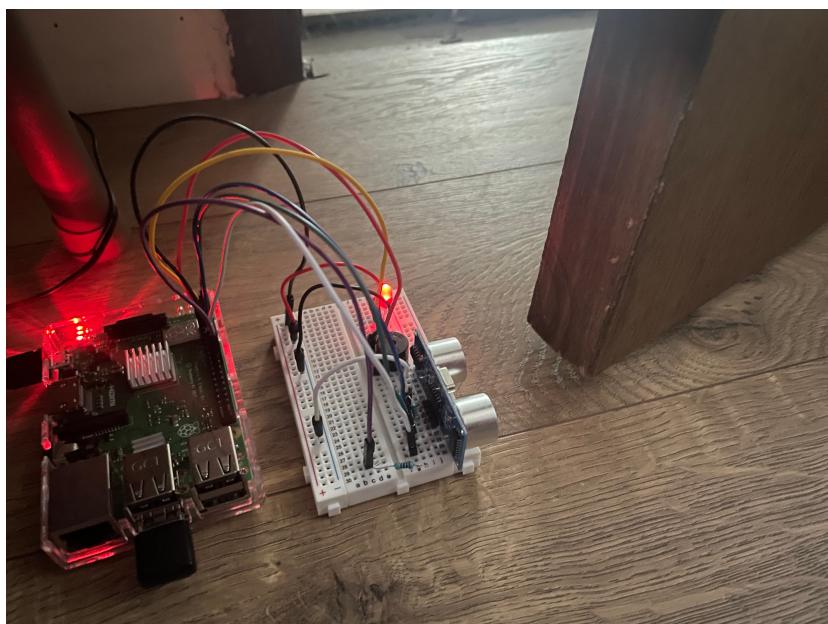


Testing

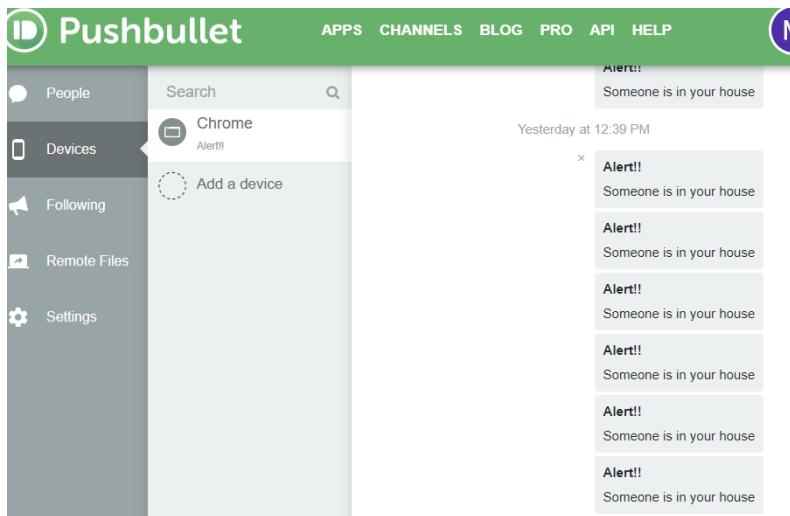
In the following image, we placed the alarm system under a closed door. You can tell that the alarm is not activated because the LED connected to the breadboard is not shining.



In the next image, we have now opened the door, and since the door is now in close proximity to the ultrasonic sensor, the alarm system is activated. Since it is in normal mode, there is an alarm and a notification is sent to the user. You can tell that the alarm is activated because the red LED connected to the breadboard is now shining.



Here are the notifications sent to the Pushbullet app (which can be downloaded on an android phone or used in the computer) when the alarm is triggered:



Distribution of Tasks

Our group consisted of four members: Michael Issa, Abraham Estrada Gonzalez, Noah Garcia, and Demarcus Mckan. Each of us was tasked with completing an important portion of the project. Michael and Noah were tasked with providing the hardware pieces, connecting the components together, and making sure the physical parts of the product function. Abraham and DeMarcus were tasked with writing the code for the project's complete functionality, ensuring the alerts for mobile devices were enabled properly, and completing this document for presentation. Once the different parts were completed, we connected all the pieces together in order to test the full product.

Conclusion

In conclusion, the creation of our simple Raspberry Pi 3 based home alarm system was a collaborative effort that brought out the unique skills and expertise of each team member. Michael and Noah worked hours on the hardware components, demonstrating their technical insight and awareness while piecing together intricate circuits and devices. Their attention to detail ensured the system's physical structure was operational. On the other hand, Abraham and Demarcus took on the software components, writing and refining code that brought the hardware to life. Their programming skills ensured the full system's functionality and user-friendliness. This project taught us not only about the strengths of collaboration, but also the balance that we must have between hardware and software in order to create a successful, functional alarm system. Our combined efforts led to the development of a portable, efficient, reliable, yet affordable home alarm system. This project shows the level of our teamwork, commitment, and shared vision.