Home Security System

Coby Moon, Ethan Long, Cory Thatcher
Advisor: Andrea Mitofsky, PhD
Trine University
One University Avenue, Angola, Indiana 46703

Trine University
Electrical and Computer Engineering

Introduction:

The security of your own home is something that nearly every person worries about, monitoring it while out of the house and on the go is a way many people can feel more secure. In our Home Security System we made it a goal for the system to communicate wirelessly between each component, as well as the ability to be controlled and send alerts from an Android cell phone.

Testing:

The main test we did was power testing. In our scope it was expected that our system would be able to operate for at least 6 months before needing recharged, this was to make use easier on the customer. The original 1100 mAh battery we planned to use provided a max life time of 10 days. After some testing we decided to switch to a 50000 mAh battery. Due to time constraints and a fear of ruining our boards, we were unable to fully test the 50000 mAh battery directly. However, our calculations of the current draw provided an estimated battery lifetime of 7.7 months.

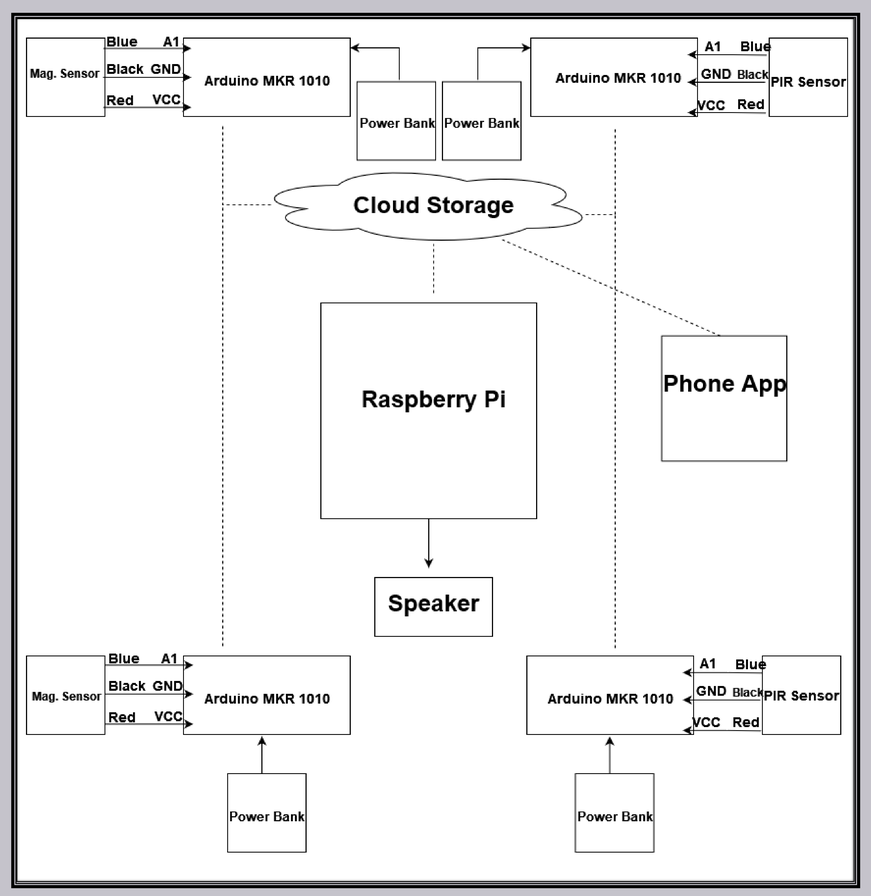

Figure 1: Circuit design
Dotted line = WiFi Connection
Solid line = Wired Connection

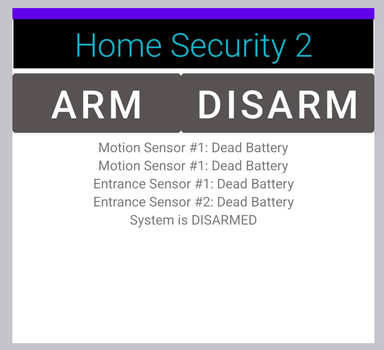

Figure 4: Android app for arming and disarming as well as notifying the user

Components and Design:

- For the power source of the Arduino's we are using a 50000 mAh power bank for each one. The Raspberry Pi is connected directly to an outlet.
- We used a Raspberry Pi 3b+ as our central control system.
- There were two passive infrared sensors and two magnetic sensors used in our entire design.
- Each of our magnetic and infrared sensors are connected to an Arduino MKR 1010 Wi-Fi in order to communicate via Wi-Fi to our cloud database.
- Everything is communicated through our chosen cloud database, Google Firestore.
- The Arduino's were coded to sleep constantly and check in every 5 minutes to ensure the batteries were still working. They also wake up on interrupt when an alarm is triggered.
- Our Android phone app allows the user to arm and disarm the system, as well as send the user a text message when am alarm is tripped.

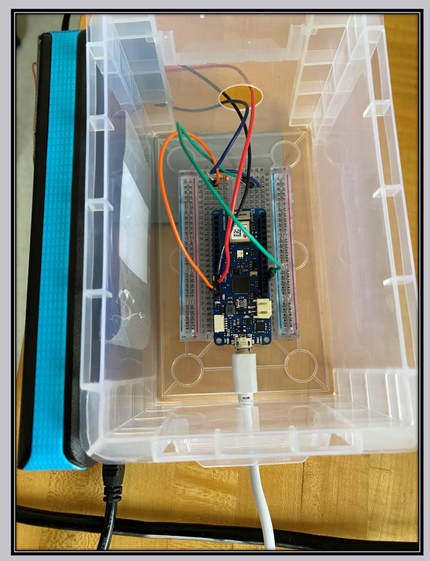

Figure 2: Magnetic sensor connected to an Arduino which is powered by a 50,000 mAh battery

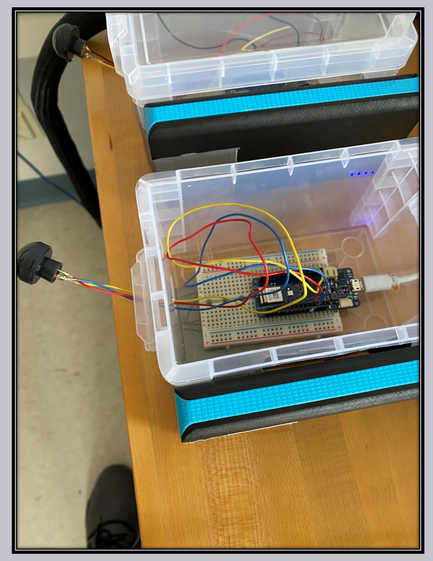

Figure 3: Infrared sensor with Arduino and 50,000 mAh battery

Conclusion:

- Our Team created a fully functional home security system with the integration of a cloud storage database. The system is able to detect an intrusion from a door/window and if any movement is detected within the premises. The design decision to implement a phone app allowed great user usability, allowing them to be notified of an intrusion wherever they are. Our team has learned a great deal in communication via Wi-Fi and cloud storage databases. In future we plan to apply our new found knowledge of security systems into our careers.

Future Work:

The following are ideas to further improve the ATNS Smart Power Supply:

- More secure data storage/path of communication between the system.
- App functionality more than arm and disarm, as well as background notifications.
- Proper testing for the 50000 mAh battery, better power source.

Acknowledgements:

This Electrical Engineering Senior Design Team would like to thank the following for their contributions, facilities, and resources:

- Trine University Electrical and Computer Engineering Department
- The Fawick Family
- The Sun