



CALIFORNIA SCIENCE & ENGINEERING FAIR 2018 PROJECT SUMMARY

Name(s) Justin N. Levy	Project Number 38652
Project Title Building a Smart Home for Less than 250 Dollars	
Abstract Objectives/Goals My objective was to create a smart home for less than 250 dollars. I set out looking for an inexpensive solution and discovered there was nothing established and budget friendly. This system was built to help the average person attain a smart home that is both practical and feature rich. Additionally, this smart home system can provide the consumer with added safety and energy efficiency. I achieved my objective by using inexpensive and widely available devices and open source programs. Methods/Materials I started out by creating a small server by downloading Open Habian, an open source operating system, and editing the source code using Notepad plus plus to add wifi connectivity onto the server. Then, I flashed the OS onto a MicroSD card which was inserted into a Raspberry Pi. I was able to boot up the system and set up the MQTT Broker to allow connection of the smart home devices. Next, I soldered pins onto the Sonoff switches and then wrote my own firmware to use on the Sonoff devices, so they would connect to the MQTT broker. I wired the Sonoff in order to connect it to the electricity in my home. Next, I added a switch into my server's code in order to tell the MQTT broker to turn on or off the devices. I bound the D-Link motion sensors to the Open Hab server. Next, I wired the magnetic door sensors onto a ESP8266 board using a custom PCB. I coded custom firmware for the ESP8266 and flashed the program onto it. I bound a Google Chromecast to the Open Hab server. The smart home devices connected to the hub included: 4 Sonoff Basic switches, 3 D-LINK motion sensors, 2 magnetic door sensors with ESP8266 boards and a Google Chromecast. Lastly, I installed the devices in my house and tested their connectivity and operation thoroughly and made any necessary corrections to the system. Results Through my research and time spent with the home automation devices, I was able to show that it is possible to build a fully featured smart home for under my budget of 250 dollars. Conclusions/Discussion This smart home system was fully automated to allow me to control the lights in my home from anywhere in the world, via cellphone or computer. I also enabled security features to protect my home from unexpected motion. I was able to create a budget friendly smart home with comparable features to a professionally installed retail system.	
Summary Statement I built a smart home for less than 250 dollars with comparable features to a professionally installed retail system.	
Help Received I designed, built and programmed my smart home project myself. My dad made sure my wiring was safe before plugging it in.	