

Miniature Surveillance Security System

Final Report

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Revise and Refine Initial Proposal

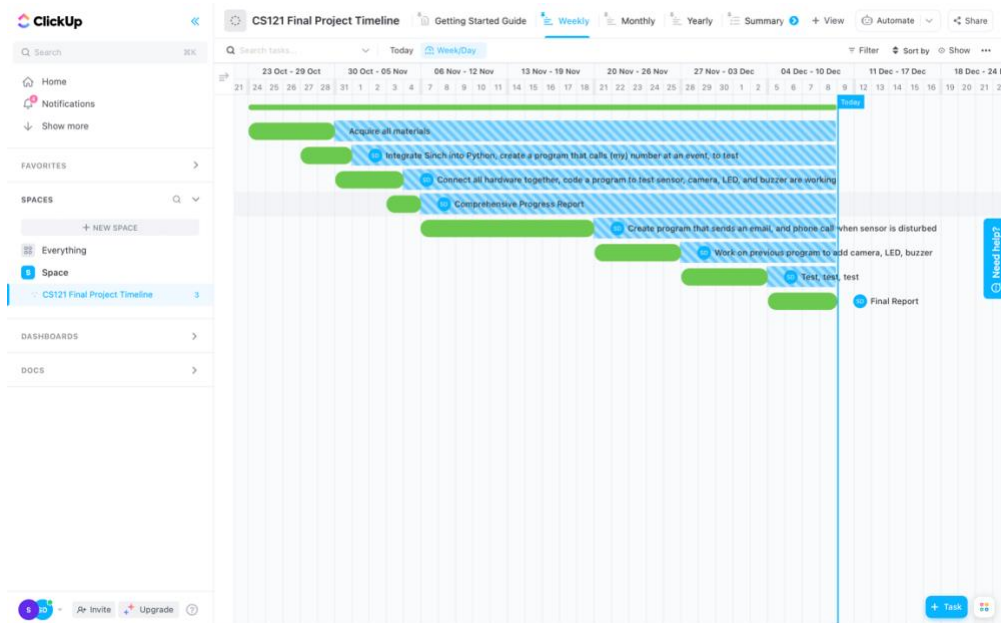
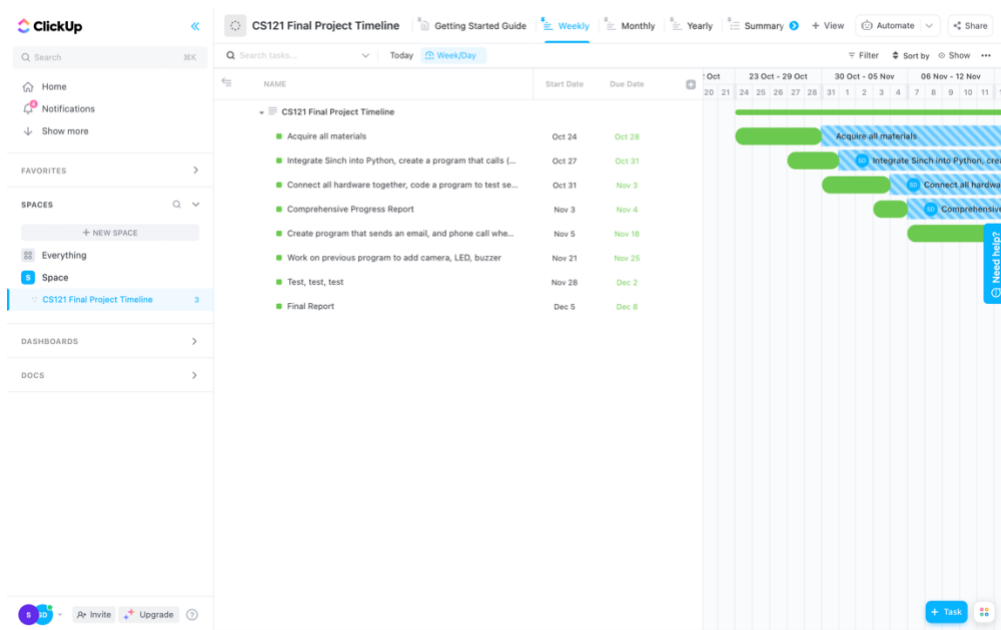
The project I initially wanted to make was a miniature version of a surveillance system, equipped with a motion sensor, camera, an LED indicator, a buzzer, and alerts to both SMS and email, with video from the camera at the time the motion sensor was tripped.

Not much changed from this initial proposal, only that instead of SMS notifications from Sinch (texts), I wanted to do calls instead as I believe it to be more fun and interesting. Aside from that, I also increased the number of buzzers from 1 to 4, because the buzzers I have don't make much noise and I was not satisfied with only 1. To achieve this, I connected all buzzers to 1 anode wire and 1 cathode wire, with the cathode wire going to GPIO output and the anode wire going to GPIO ground, that way they all fire at the same time.

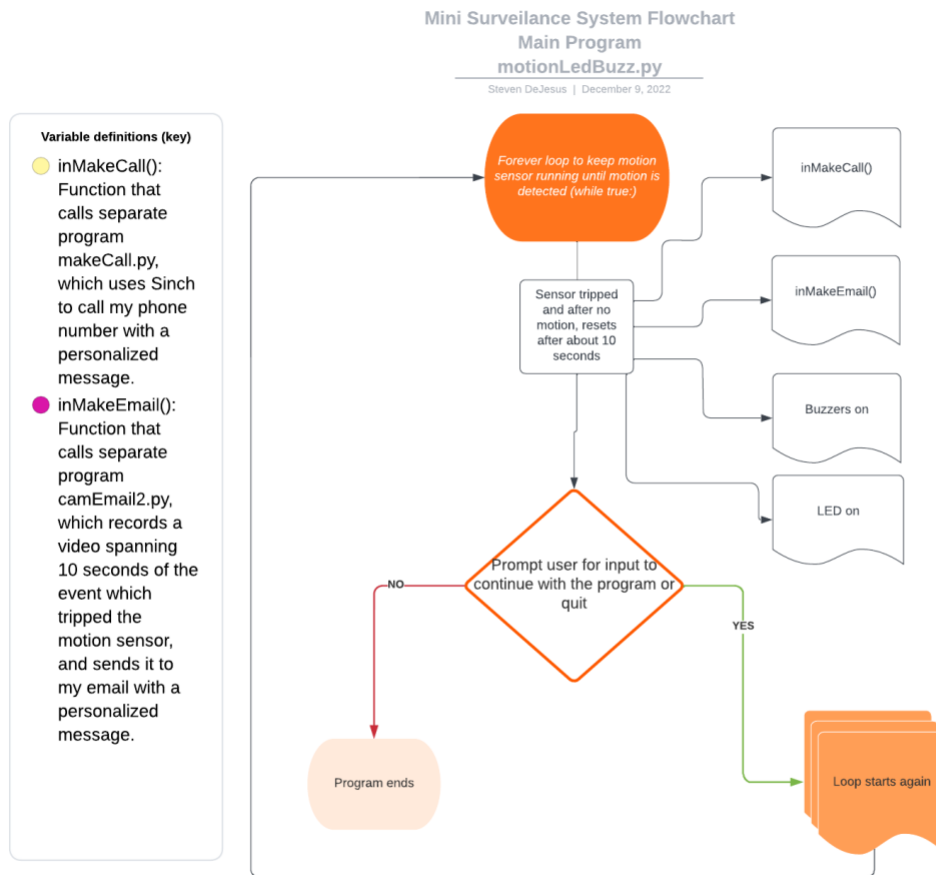
Aside from the hardware, I reduced how many programs I created by creating one program for the triggering of the motion sensor, LED, and buzzer, two separate programs for the phone call functionality and the camera functionality, respectively, and finally one program that simply provides an initial display, then asks for input on whether the client wants to initialize (start) the surveillance system or not. If yes, then it calls the motionLedBuzz program, which also calls the phone call and camera programs when the motion sensor is tripped. If no, it quits the program. The display program, as you can tell, is mainly for flair. I went with this approach instead of having multiple programs to test and individual programs for each component because I did not think the various testing programs were necessary, as I began the program with tests and then expanded on them, once I knew that the components worked and that I had enough intuition to move forward with the project. I did have individual programs for the camera and phone call functionality though, since those programs were a lot denser than the motionLedBuzz program and having individual programs for these would make each program easier to read and

edit, rather than including everything into one large program. I also wanted to learn how to call different programs from one program, as it seemed like a fun, convenient and practical concept to learn.

Updated Gantt Chart



Updated Flowchart



Projected vs Actual Time / Cost

I projected to be done with the project by December 4th, which ended up true, but the road to get there was very different. I had planned to spend about an hour or two every few days for about a month to slowly work on it while maintaining a balance with other classes and work. However, this did not happen as I did not pace myself as well as I could've, even with this plan. I completely missed the progress report, and I ended up working the same number of hours but in a much smaller window. I worked on the project for multiple hours every day for about 1-2 weeks researching, testing, writing the code, and wiring the hardware. I did complete the 4th though, and the final report is getting completed the 9th rather than the 8th, which I planned for.

In terms of cost, I thankfully did not have to spend any more than I had planned, and I was right at budget.

Summary of Contributions

Since I was the only one in my group, I oversaw everything and completed everything. Everything from research, to wiring and hardware, to programming, and planning, I oversaw.

Final Reflection

Overall, this has been the most difficult, yet rewarding project thus far in my college career. I thoroughly enjoyed the process of building my own project from scratch, and having the agency to create whatever I like, and knowing enough about computer hardware to expand my ideas. My favorite part of the brainstorming phase was thinking of issues I face day to day where I wish I had a convenient solution and thinking of practical solutions to satisfy that. At first, knowing I had a final project to work on at the beginning of the semester was a bit daunting, as it felt like a looming doom, but once I started researching for my project, that feeling quickly morphed to one of excitement.

A challenge I faced was pacing myself well enough to consistently work on the project, to allow myself enough time and room to encounter errors and troubleshoot. Instead, the project stayed in the back of my mind for about half the semester, as I was careless enough to be occupied solely with immediate work. As a result, I only allowed myself about 2 weeks to finish the project and test enough to make sure it delivered. It worked out in the end, but I could've saved myself stress pacing myself better.

The main takeaways I took from this project was that engineering (to a very small degree) is incredibly fun and rewarding, and be more organized and pace myself better, to prioritize the large tasks, as they need more time to ensure its success, and possible room to grow.

Citations

- Code template for using Sinch to send SMS with Python:
 - <https://developers.sinch.com/docs/voice/getting-started/python/make-call>
- Guide to connect and test PIR sensor:
 - *Connecting the PIR Sensor – Raspberry Valley*. (n.d.). Raspberry-Valley.azurewebsites.net. <https://raspberry-valley.azurewebsites.net/Connecting-the-PIR-Sensor/>
- Guide to connect and test camera for Rpi:
 - *How to Test the Raspberry Pi Camera Module*. (n.d.). Dummies. Retrieved October 24, 2022, from <https://www.dummies.com/article/technology/computers/hardware/raspberry-pi/test-raspberry-pi-camera-module-246246/>
- Guide to connect and test Piezoelectric buzzer:
 - ArdumotiveMore. (n.d.). *Raspberry Pi Tutorial: How to Use a Buzzer*. Instructables. Retrieved October 24, 2022, from <https://www.instructables.com/Raspberry-Pi-Tutorial-How-to-Use-a-Buzzer/>
- How to email with Python (including files)
 - <https://www.abstractapi.com/guides/sending-email-with-python#the-real-deal-gmail>

Video Presentation

<https://youtu.be/xnm4uF6o9SQ>