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Robotics & Professional Practice

LED Security System

Project Closeout

What my project was:

- Initial Description
    - My project was to implement an automatic solar-powered LED security system designed to collect enough energy during the daytime to power a series of LEDs during the nighttime. Motion sensors were then to be added to the system to detect movement and thus brighten the LEDs and notify with a message. Power failure will send a message as well. The project will also incorporate a power saving mode with an extended lifetime. The solar panels are intended to charge a battery in order to power the system/LEDs—for the longest period of time. This project will consist of using a DragonBoard microcontroller, ultra-bright LEDs, photovoltaic silicon solar cells, and active infrared sensors.
- Final Description
    - The design of the solar-powered LED security system changed in its course of the semester. The system was to initially be powered by photovoltaic solar cells, but the project took its turn in the motion detection direction and to obtain LED communication thus making the project a little more autonomous. The goals of the project turned to attempting to turning on the LEDs with a sensor and thus transmitting frequencies from hub to hub using phototransistors, photo-

transmitters, and photo-receivers. Once the LEDs are able to light up on the detection of motion, the DragonBoard microcontroller and python programming comes into play. The goal is then to communicate between the LEDs and the transistors who have frequencies of 36 kHz, 42 kHz, and 54 kHz (matching frequencies communicate). Once the LEDs can communicate, those sharing the same frequency will be able to illuminate at the same time.

- Initial Deliverables
    - Determine energy and power requirements for the entire system
        i. Lighting
        ii. Motion detection
        iii. Communications
        iv. Special effects
        v. Intelligence
    - Pole-to-pole communications
        i. Reliable
        ii. Content
- Final Deliverables
    - Design geometry & overall capabilities
    - Communications between posts
    - Power distribution and management
    - Movement detection
    - Autonomous tasks
    - Coordinated tasks

- Deliverables Completed
    - Unfortunately, not all of the deliverables were able to be completed. I think the transition from a solar based project to more of and LED communication project hurt this. With that being said, the deliverables that were in fact were the power distribution, the movement detection, and the overall design geometry. The more complicated portion of the project consisted of the communications between the posts and implementation of the autonomous tasks.
- Project Timeline
    - Remaining up to speed with my initial timeline was slightly difficult. I was fluent with doing the research and gaining the resources I needed and was able to build a series of successful circuits, but the DragonBoard part set me back. This area was deviant because I am not familiar with the DragonBoard and did not have a background of using python, so I think that using another microcontroller may have worked slightly better. Any code that was created to modulate the LED communication was a failure.

What I accomplished:

- Project Documentation
    - All of documentation for this project and other information regarding the professional practice investigation can be found within my lab notebook and within the online portfolio.
- Project Continuation
    - I believe that this is a good project to continue. I think it would be great to see a system that is ultimately powered by solar cells. Along with that, the LED

communication aspect, although tough, would be really efficient in a security situation—where LEDs can speak to one another based on frequency movements.

- Completion
    - The only thing that would need to be done in order to complete this project is to set up the individual LED hubs on the course provided and to then communicate between the LEDs. The communication aspect requires using the microcontroller, which I would recommend not using the DragonBoard because I had numerous troubles with it.
- Demonstration
    - At this point, I would be able to demonstrate individual LEDs detecting motion and the implementation of the transistors at different frequencies. The circuit would consist of both a measuring divider and a reference divider. The measuring divider shows that if light intensity is high, the resistance is low, so the overall divider voltage is low (and vice versa). The reference divider is there to set a value intended to turn the LED on (the given frequency ratings). I was able to retrieve a frequency for each phototransistor on the oscilloscope while attached to its given LED circuit.