

EE / Cpr E / SE 492 - SDMAY 21 - 48

Learning Holiday Light Display

Week 6 Report

Mar 30, 2021 - Apr 12, 2021

Client and Faculty Advisor: Dr. Daniels

Team Members:

Christopher Woods - Chief Software Engineer

Ty Gardner - Chief Engineer (Computer Vision)

Jacob Martin - Chief Computer Engineer

Ashkirat Singh - Meeting Facilitator

Mitchell Wadle - Meeting Scribe

Joyeux Noel - Report Manager

Weekly Summary:

The objective for the past two weeks was to polish the calibration process and also get the main sequence working for the state machine on the new Tree Pi. Our team was able to get the calibration process working. We tried the approach where we first take a photo of the tree with no LED turned on and later for each LED that is being calibrated we subtract the image when no LED was turned on with the one where there is an LED that is turned on and look for the brightest spot. This technique, however, comes with a major flaw which is that if the camera gets moved mid calibration there is a phase shift that is visible in the photos when the two images get subtracted and which renders the calibration process useless. Therefore, we are currently working on different techniques to detect the LEDs. The photo below depicts the phase shift in the images when the camera gets moved since the image subtraction is sensitive to minor changes in the two images:

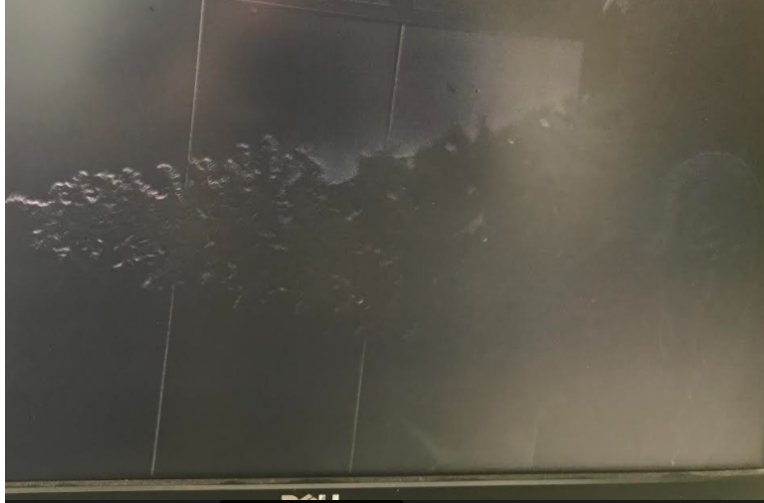


Fig 1. Phase Difference in Subtracted Image when Camera gets Shifted (No LED gets Detected)

Past Week Accomplishments:

The following figure depicts our sprints for the rest of the semester to accomplish the remaining tasks for this project:

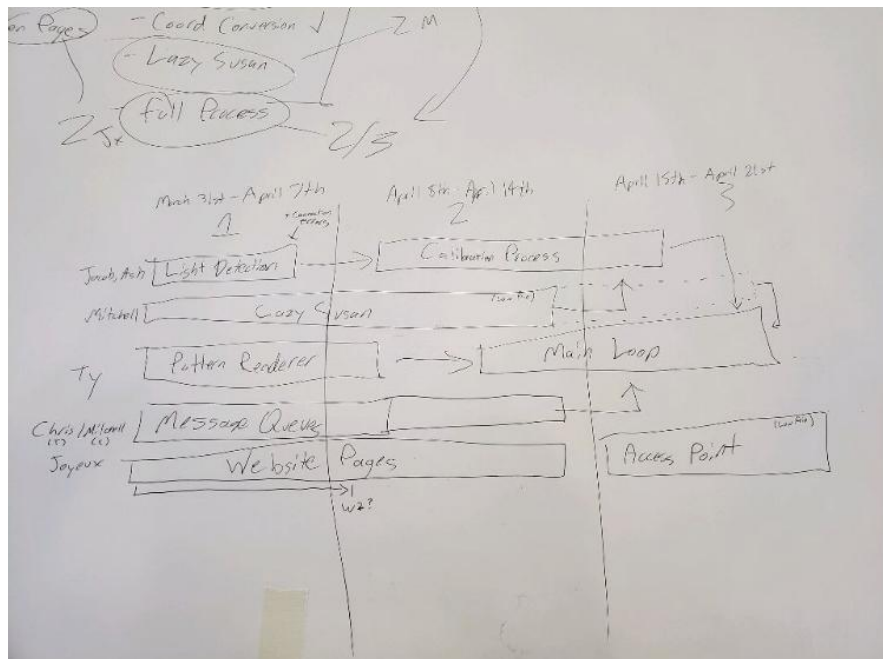


Fig 2. Sprints for Accomplishing the Remaining Tasks

Mitchell: New motor tests for lazy susan and worked with implementing message queue for the website

Jacob: Helped Chris and Ash to get the main sequence working so that the LEDs get calibrated into the xy coordinate system and the json files get transmitted over to the Tree Pi from the Camera Pi.

Joyeux: Got acquainted with the web application tasks and set up necessary in the sprint for remainder of the project

Chris: Worked on the refactor of communication between the Camera and Tree Pi and state management using ZeroMQ, a message queue suite, and also helped Jacob and Ash with getting the LEDs to display a few patterns successfully on the tree.

Ty: Refactored the image processing so that it can easily be imported with the main loop and images are now wrapped over the sides of the tree rather than being imposed along the z-axis.

Ash: Helped Jacob and Chris with getting the LEDs calibrated and the LED detection smoothed out such that background noise is not a factor in determining the LED coordinates; researched and implemented various techniques for the calibration process.

Pending Issues:

- Combine the Lazy Susan in the main loop to finish the calibration process

Individual Contributions:

Team Member	Contribution	Weekly Hours	Total Hours
Jacob Martin	Ran some tests with Ash to get the calibration process working successfully; met three times each week for three hours each besides hours also spent on research for a timely delivery	18	74
Chris Woods	Started refactor of communication between the Camera and Tree Pi	16	76

Ty Gardner	Refactored image processing to be called by the main loop and wrap the images around the sides of the tree	18	71
Ash Singh	Ran some tests with Jacob to get the calibration process working successfully; met three hours each week for three hours and also researched ways to improve the calibration of the LEDs	18	75
Joyeux Noel	Helped Mitchell with ordering the parts that would be used for motorizing the Lazy Susan	8	56
Mitchell Wadle	New motor tests for lazy susan and worked on message queue for the website	16	64

Plans for Coming Week:

- Lazy Susan - Joyeux and Mitchell
 - Test and add new motor and work on optical sensor

- Animation - Ty, and Chris
 - Run tests on the code for the animation feature and make sure that the current configuration (top view of the tree on a 2-D plane) gets rendered properly when the pattern is displayed onto the tree

- Calibration - Jacob, Ash, and Chris
 - Test better ways to detect the LEDs than one that is being implemented now, which works three quarters of the time