Sundance Weekly Progress Report

Week 1 (Spring)

14.03.2023

1. Previous Week's Overview

In previous weeks, the work done was limited. However, the decisions and components from distant suppliers are made.

2. This Week's Progress

Mechanical Design Decisions

This week we tried to tackle the pole problem. We had two principle poles and two agent poles. The requirements stated a minimum of three poles, we have 4 poles right now but the distance between them is not 50 cm for every point. We are focused on a similar design with two principle and two agent poles with 50 cm distance all around. For this the agent poles need to be longer. Possible solutions are still worked on.

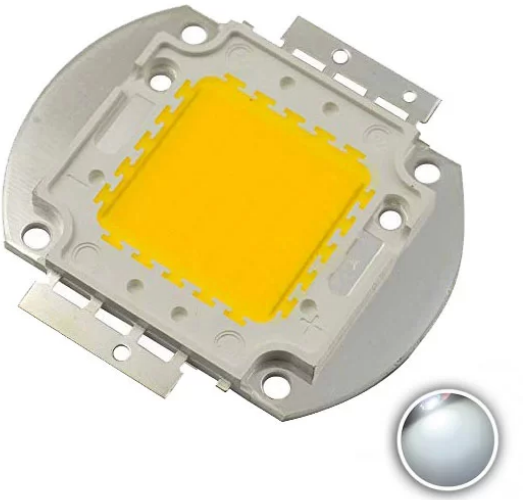
Camera Placement and Image Processing

One of the problems we face before determining the specifications of our image processing algorithms is the place, orientation, and movement of the camera. Since many parts of the system can move, it brings additional image processing and control problems to have a camera fixed to a moving part. We discussed the problem and reached an agreement that we should put the camera to a fixed position. The possible positions are mostly close to the ground, due to the motion of the poles and the canopy, and the camera may not see the entire shadow in those cases. Hence we decided that our next task is to experiment with different camera positions and orientations to see if we can manipulate the algorithm for these camera positions and angles.

Equipment Update

For our project, we have decided to use two types of sigma profiles to ensure the necessary structural stability. The chosen profiles are 20*20mm and 30*30mm, both known for their strength and durability. To ensure that our project is constructed with utmost precision and accuracy, we have determined that four meters of each profile will meet our requirements. With these specifications in place, we can confidently move forward with the construction of our project, knowing that it will withstand the rigors of use and meet our expectations for performance and longevity. We also searched for and ordered more DC motors which will realize the movement in the other axis. They have enough torque and speed specifications together with built in encoders which will help us to tackle the problem.

After deciding that keeping the camera position fixed was the most logical solution, we decided to acquire a more powerful light source than what we currently had, both to test our algorithm and to use during the demo process. We started researching high-lumen LED flashlights as a potential light source. As an alternative to these lights, we also decided to try out power LEDs, which are cost-efficient and advantageous in terms of efficiency.



3. Next Week's Plan

Image Processing on Raspberry Pi

Next week, we will take the necessary steps to implement image processing algorithms on Raspberry Pi. For this purpose, we will search for various cameras by considering the project's requirements. Moreover, we desire to keep the camera position as fixed as possible. So, we are planning to experience possible camera positions with one or more cameras to see which is more suitable. Furthermore, we will be working on different methods to modify our current algorithm to meet different angles of the camera starting next week.

One of the problems we will encounter after implementing the algorithms on Raspberry Pi is that it should communicate with our controller to give the inputs to our control algorithm. Both our controller, STM32F103C8T6, and Raspberry Pi supports various communication hardware such as I2C, SPI, USB, and Ethernet. We need to consider the distance between the agents (which will depend on the positions of the controller and the Raspberry), the interference conditions, the data bitrate, reliability requirements, etc. to determine the protocol and hardware for the communication. We will also start planning the communication between the different parts of the system next week.