Sundance Weekly Progress Report

Week 2 (Spring)

21.03.2023

1. Previous Week's Overview

In the previous week, we made thorough discussions about mechanical design, camera placement, and image processing. On the mechanical side, we made plans to solve the problems of the movement in the second axis. For camera placement and image processing, we settled on trying a constant camera position which is close to the ground. This will result in a shadow which is originally a rectangle, but will require perspective correction and extrapolation to understand the coverage of the whole shadow. Finally, we shared the work for the next 2-3 weeks between the team members so that we can continue our design work more efficiently.

2. This Week's Progress

Image Processing

This week, we started to work on image processing algorithms. Using our previous knowledge, we managed to eliminate noises from the system. After that, we applied line detection algorithms. However, we realized that we detected more lines than we expected. Moreover, other than shadow edges, background edges are detected. Therefore, we will research methods to eliminate or acknowledge these lines. Moreover, we realized that for proper function and parameter selection, we need more realistic images to test our algorithm.

Moreover, we find out that depending on the positioning of the camera or cameras, we might lose too much information due to the images of the poles. We started trying different processing methods to eliminate this problem that may occur. To gain a better understanding of the situation and find out other solutions to the problem, we decided to start experimenting with the positioning of the cameras in real life and get better information on problems we may end up facing.

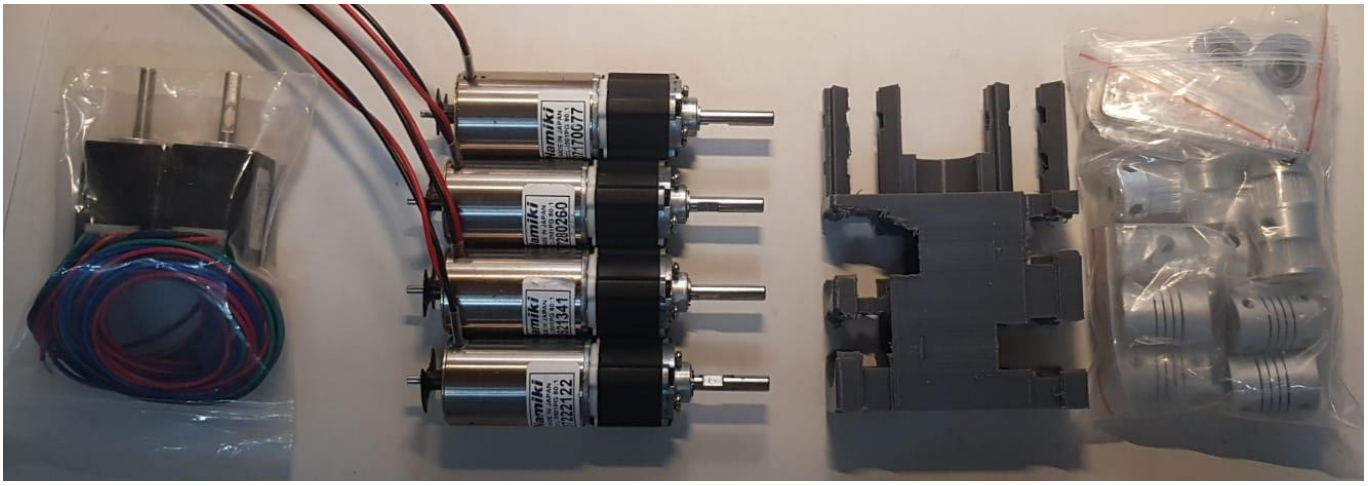
Manufacturing and Prototyping

For the mechanical part we refurbished our motors for the new actuator. This involves opening the motor up and extending the motor cables. Meanwhile the mechanical couplings have arrived and the 3D prints are being printed. This week a manufacturing process will take place.

The base where the construction takes place needs to be designed. This week we have gathered to discuss this issue and a couple of initial ideas developed. This base will also be thought to be the enclosure for the control electronics and power supplies.

The alternative motors for the screw axes have arrived, these motors are smaller but can be capable of having the job done, and needs to be tested.

The examples of serial communication between an STM32 chip & a Raspberry Pi are examined using the Internet for a range of 1 to 5 meters. The codes will be written next week.



3. Next Week's Plan

Next week, we will continue improving the shadow detection algorithm. We will consider possible camera positions and algorithms and try to find a suitable algorithm that fits the project's needs. For this purpose, we are planning to take sample pictures of possible shadows as if they were taken from the canopy's camera.

The examined communication examples and applications on the Internet, which are applicable to our case, will be implemented to our STM32F103C8 controller this week, as well as to our Raspberry Pi.

The prototyping will continue next week with the different controllers communicating with the computer to perform a movement on the motors. Second actuator with the first one reconstructed will also be finished.