# Sundance Weekly Progress Report

Week 7

04.12.2022

1. Previous Week's Overview

Last week we also explored more on mechanical design, on the other hand this week we focused more on fixing a design. Other work done last week captures subsystem tests for the sun position sensing, we basically run tests on two different design and evaluated and compared them.

2. This Week's Progress

Mechanical Design

This week, in the mechanical design section, we further detailed more designs. A new design consist of a cable driven tensile parallel mechanism is investigated, the foundings are such that for a viable design the aspect ratio of the system should be very wide. Further observed effects for the design is that when the sun is at 45° system should extend to a distance that is equal to its vertical distance from the ground. An isometric grid with 45° and 90° lines is created to use when sketching the mechanisms on paper to evaluate their capability in the edge cases for the sun angle.
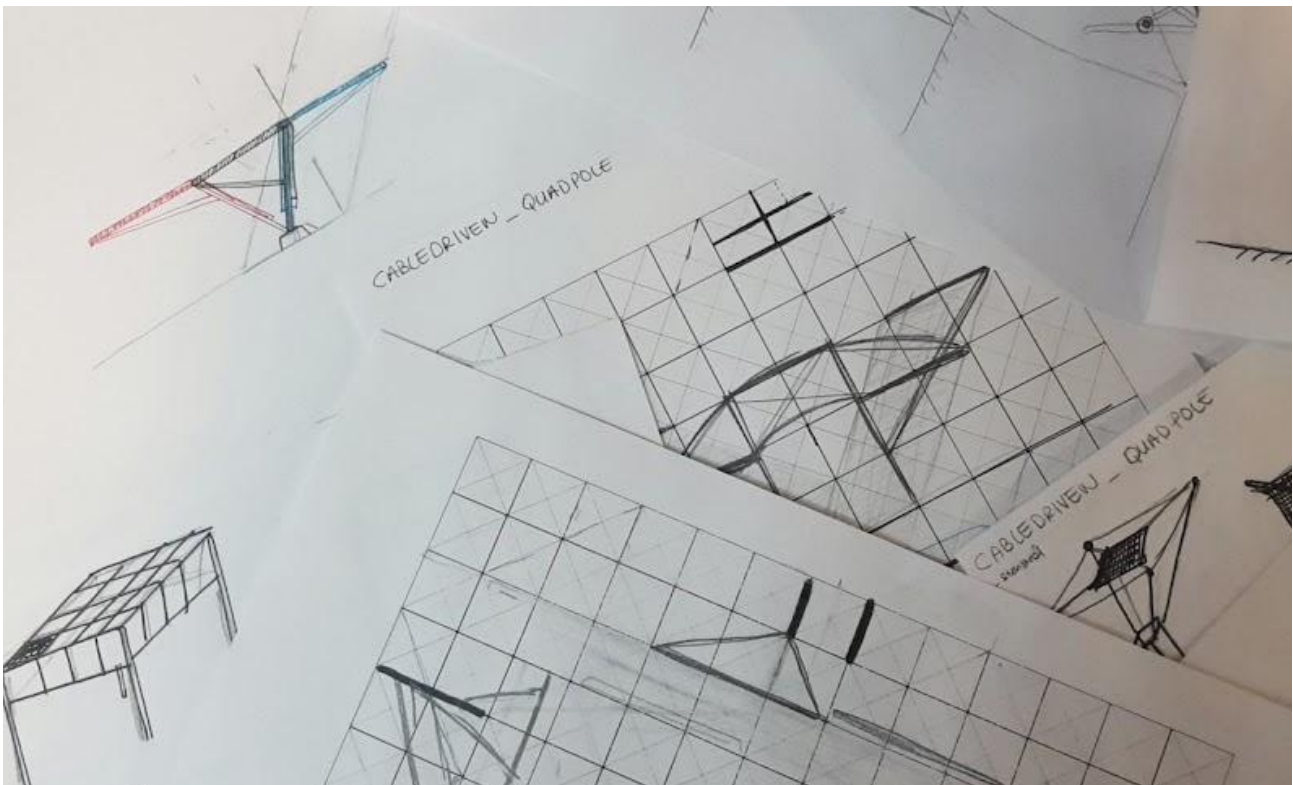
At this point we are left with about five design idea. All of these ideas are evaluated once again on the scale paper which better help us to visualize the dimension of the moving pieces and

actuators. It is another step towards the final design and it takes some time unfortunately. For a last step on the decision process we will 3D model the 5 design and evaluate the mechanisms in the computer environment and decide on one design with one extra. The new design can be seen below.
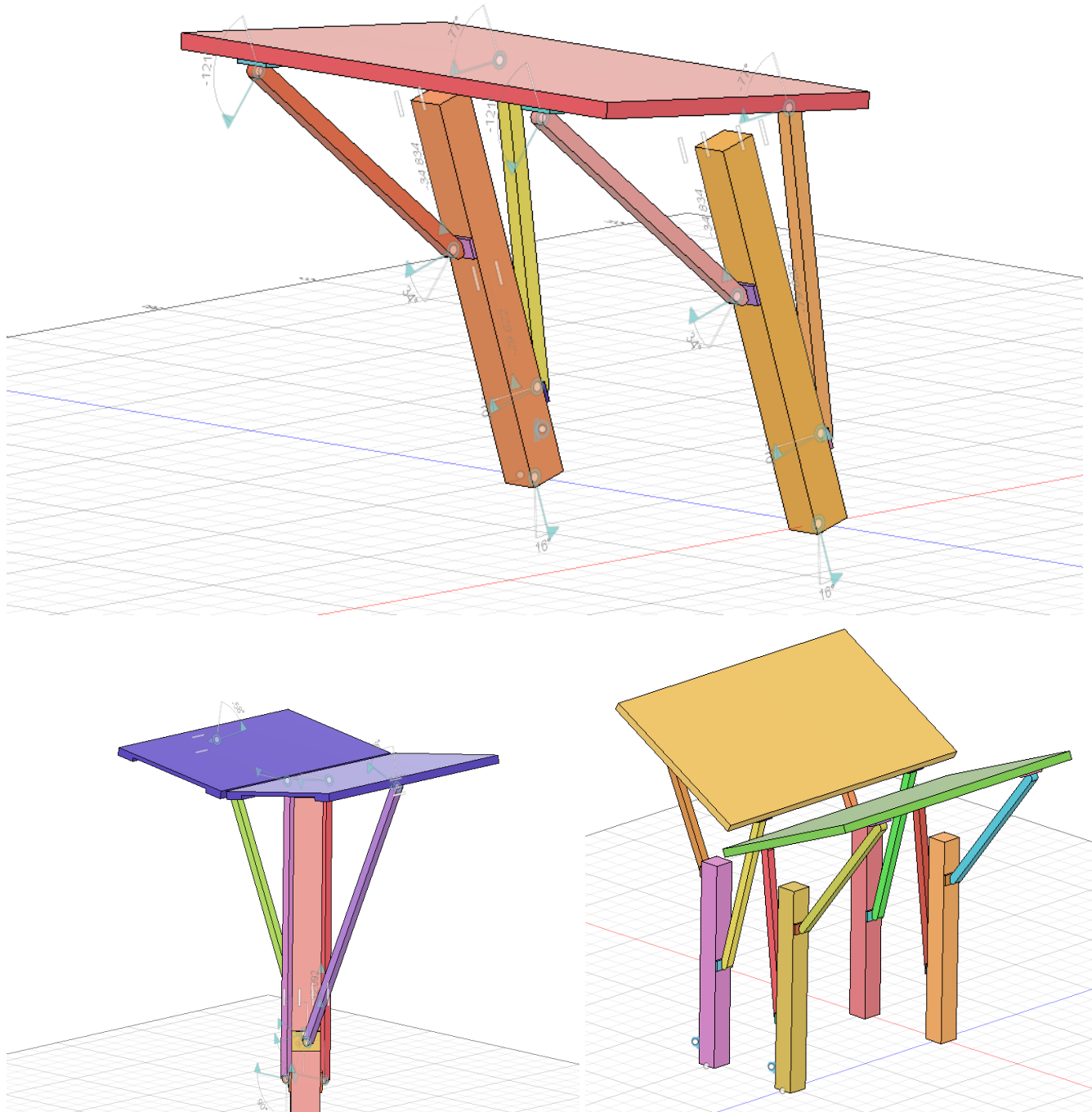
In terms of sub-components of the design we are going to go with monorail design for the actuators hence a test document will be about the evaluation of a monorail actuator system. To briefly explain what monorail design is the actuator bar lengths are controlled over a single rail with a lead screw or a belt system to alter the vertical position.

Coverage Detection
To achieve a stable, reliable closed-loop control with good disturbance rejection we need to detect the shadow coverage and extract useful information (which will be used to provide an error input to the controller) from it. This week we discussed coverage detection algorithms, and thought about test cases which will be used to test this algorithm. These test cases will be essential to design, implement, and test the algorithm. The procedure for the coverage detection algorithm is divided into sub-classes. First a raw image will be processed to make it easier to work with. This consist of lens dewarping, perspective transformation, image stitching and some color manipulation. Later this processed image will be the input of the coverage detection algorithm. Basic principles for this step is thought of and some initial ideas are formed. Some of these consist of center of mass calculation and finding vectors inbetween these points, corner detection and corner to corner mapping.

3. Next Week's Plan

Subsystem Design
For this week we need to start design the actuator, in parallel a well documented test procedure needs to be written in order to physically evaluate the constructed actuator.

Last week inverse kinematic models are not created since a mechanism is not fixed yet hence this week this model is in higher priority. For the control of the actuator preliminary preparation can be done.

Coverage detection subsystem will be started to be implemented on a computer with different algorithms and various tests including a real image and constructed will be planned for the test document and test demo.

Test Document
The most important deadline for this week is test document for the subsystems, we will mainly work on to create the required procedures in order to test our systems thoroughly.