ROBOT ARM PATH PLANNING USING ONSHAPE DIGITAL TWINS

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INTRODUCTION

Robot arms can be complicated and resource-intensive to program through existing methods. Although these methods allow for a lot of control, there is a learning curve when introducing this in an educational setting. This project aims to develop a simple interface for the monitoring and programming of robotic arms through onshape digital twins. Which can be used for path-planning, monitoring, and control

BRACCIO++

The Arduino Braccio++ was used for this purpose which is a 5 DOF(Degree of Freedom) robot arm. I created an onshape assembly for the robot arm with mates at each joint emulating the range of motion for the physical arm:
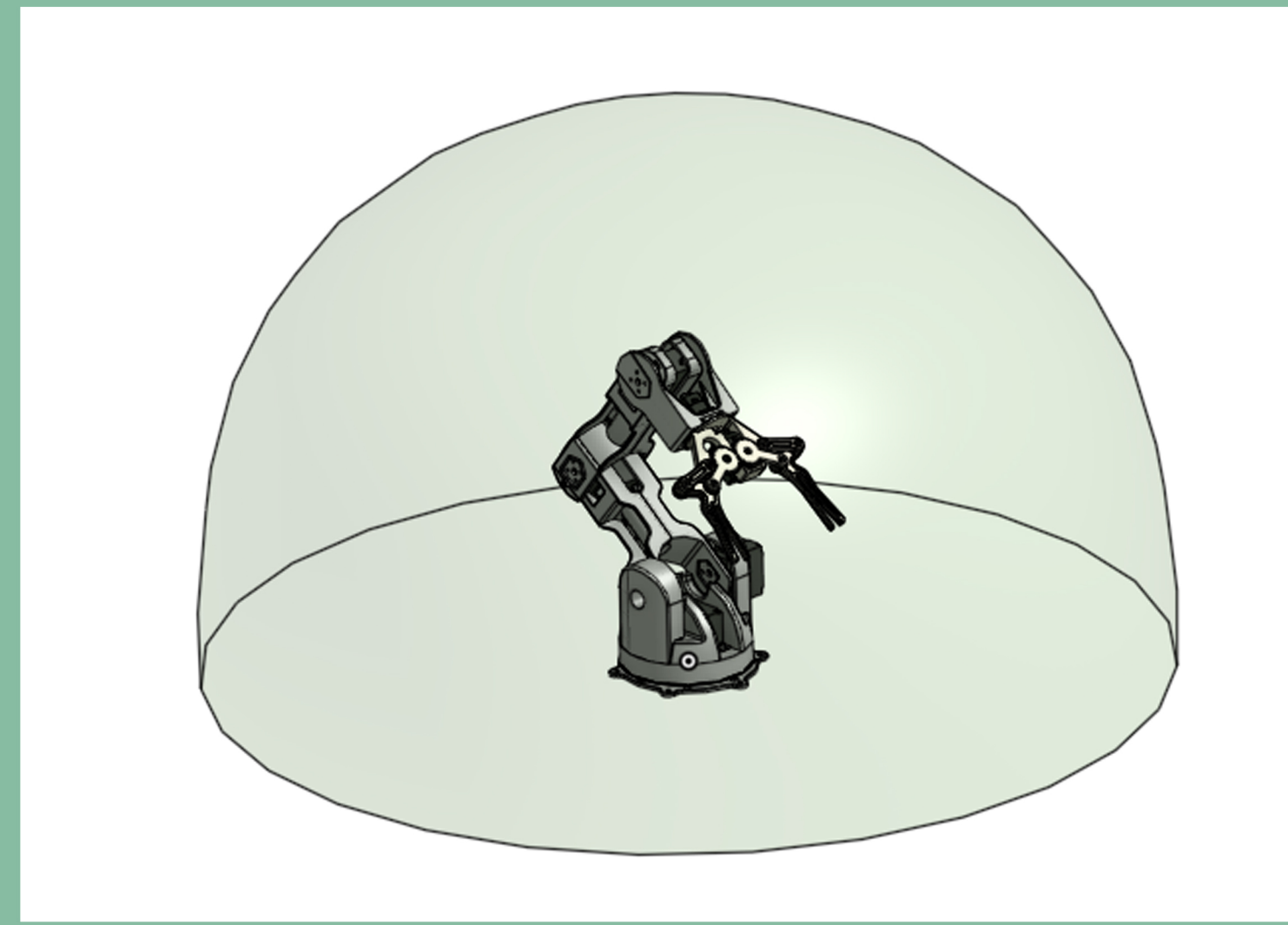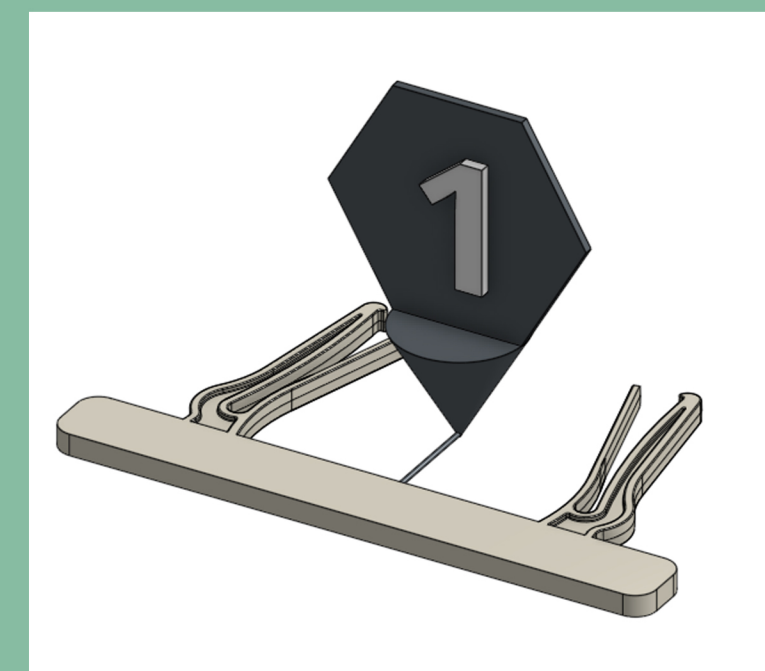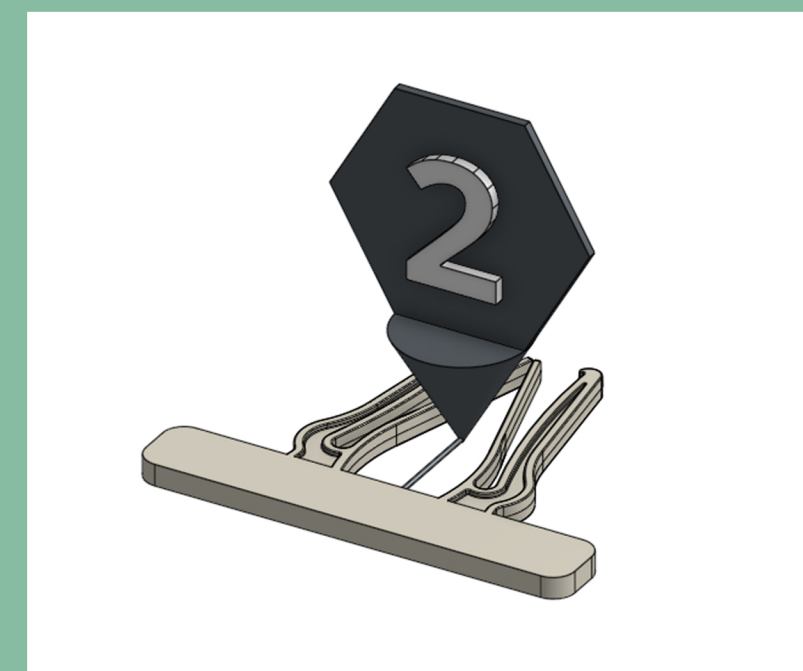

Onshape Assembly
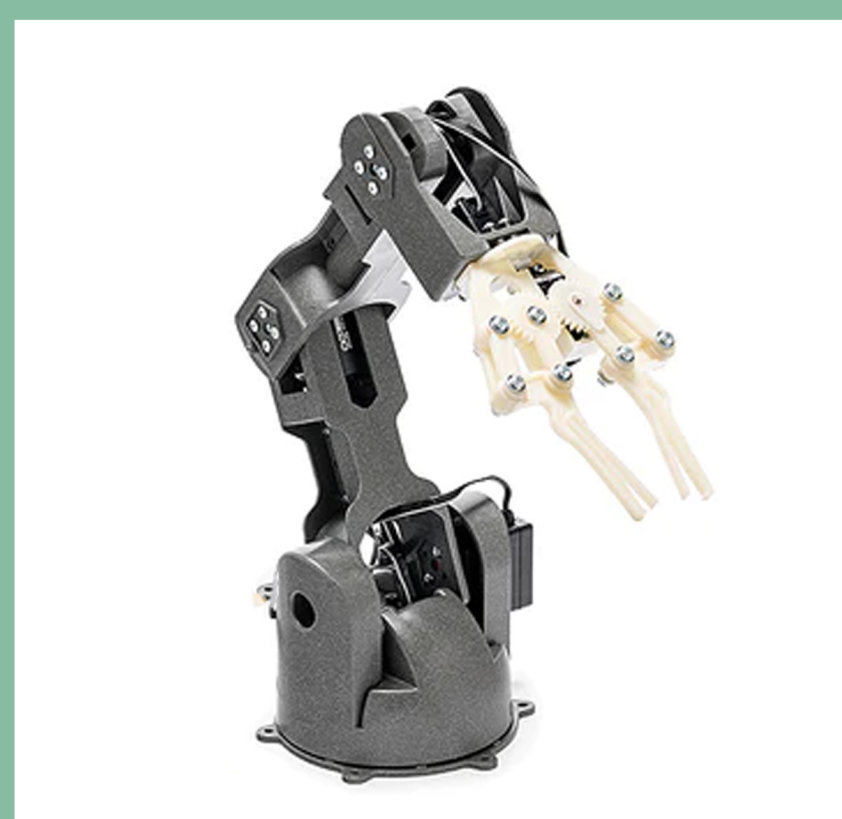
Physical Robot

USER INTERFACE
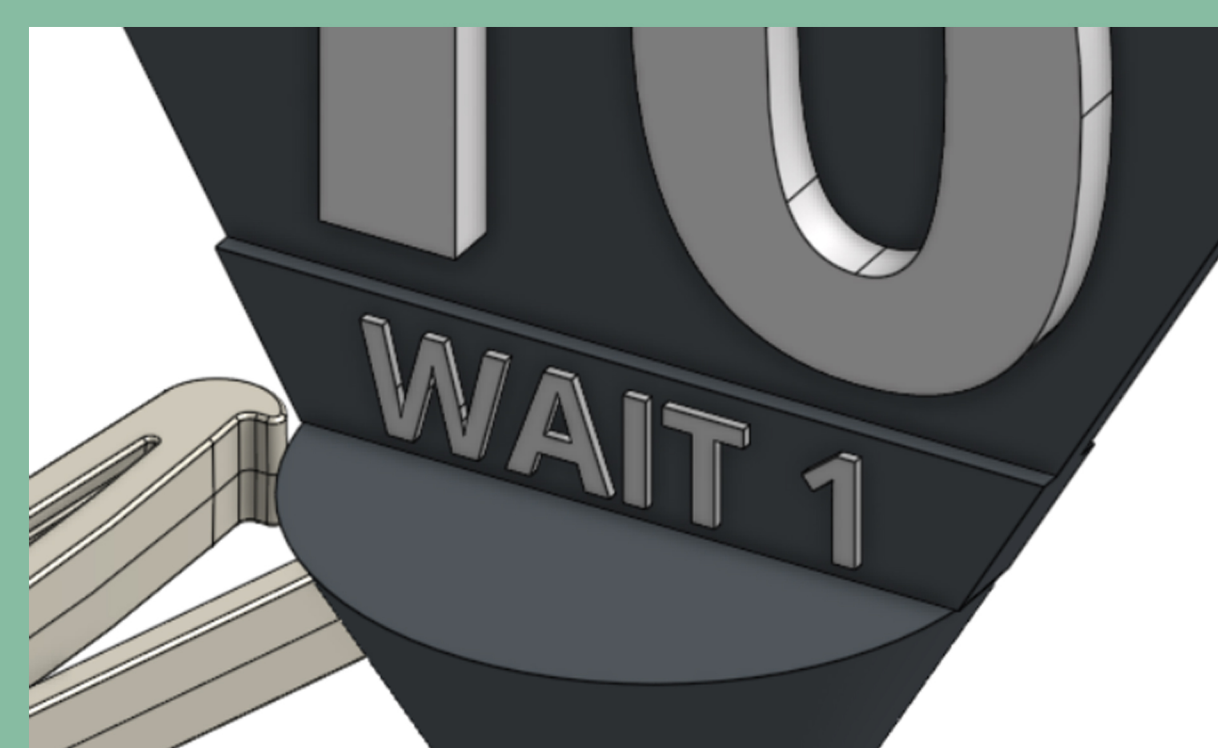

Dome represents Range of Motion
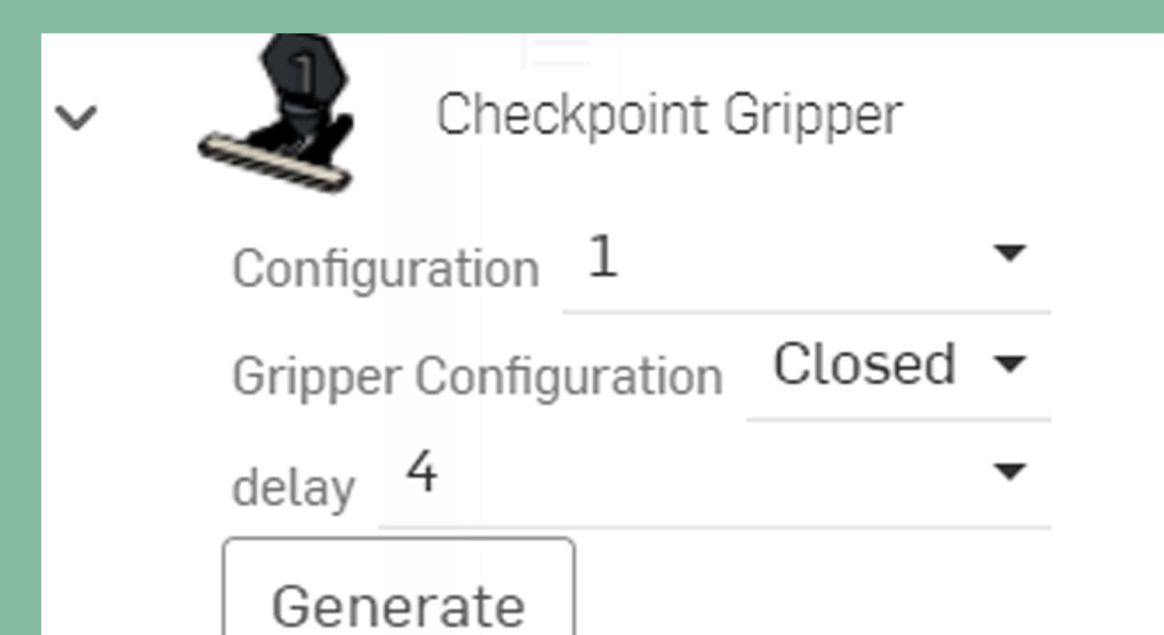

Checkpoint 1 open

Checkpoint 2 closed

Users can insert checkpoints with numbers representing the sequence and configuration for open or closed gripper.


A delay can also be defined in seconds which makes the robot wait at a certain checkpoint for the given duration.

Checkpoint Gripper
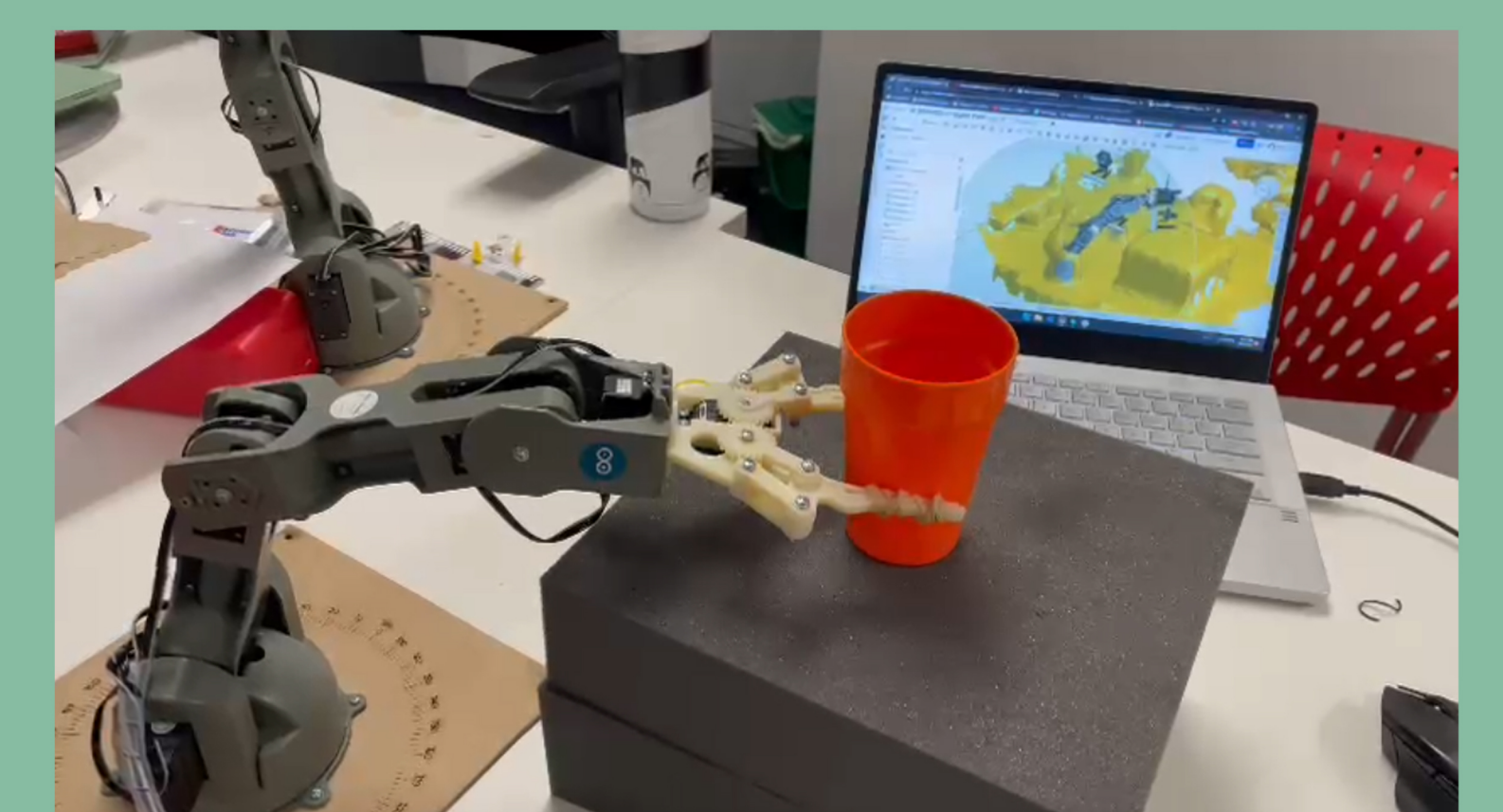
Configuration 1

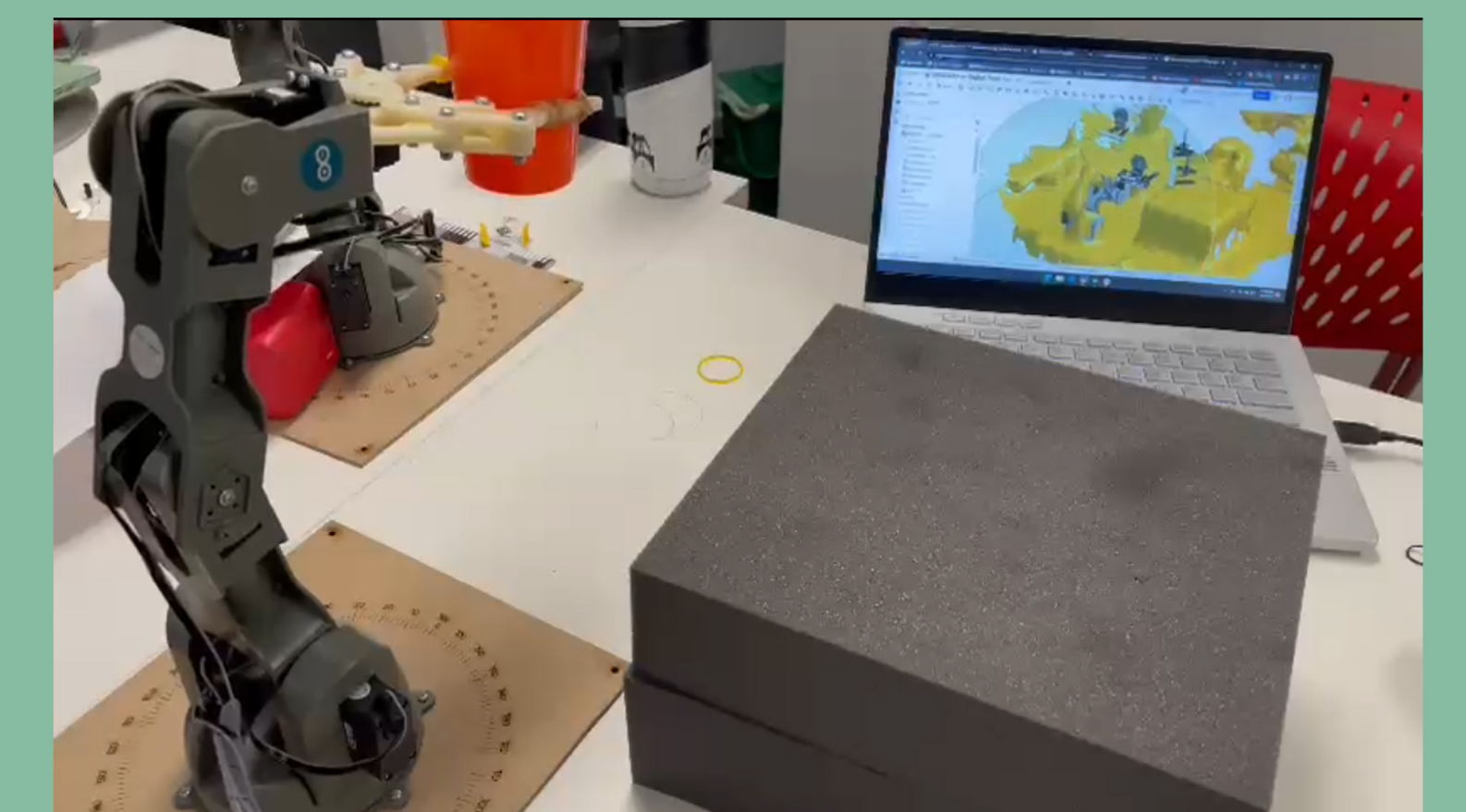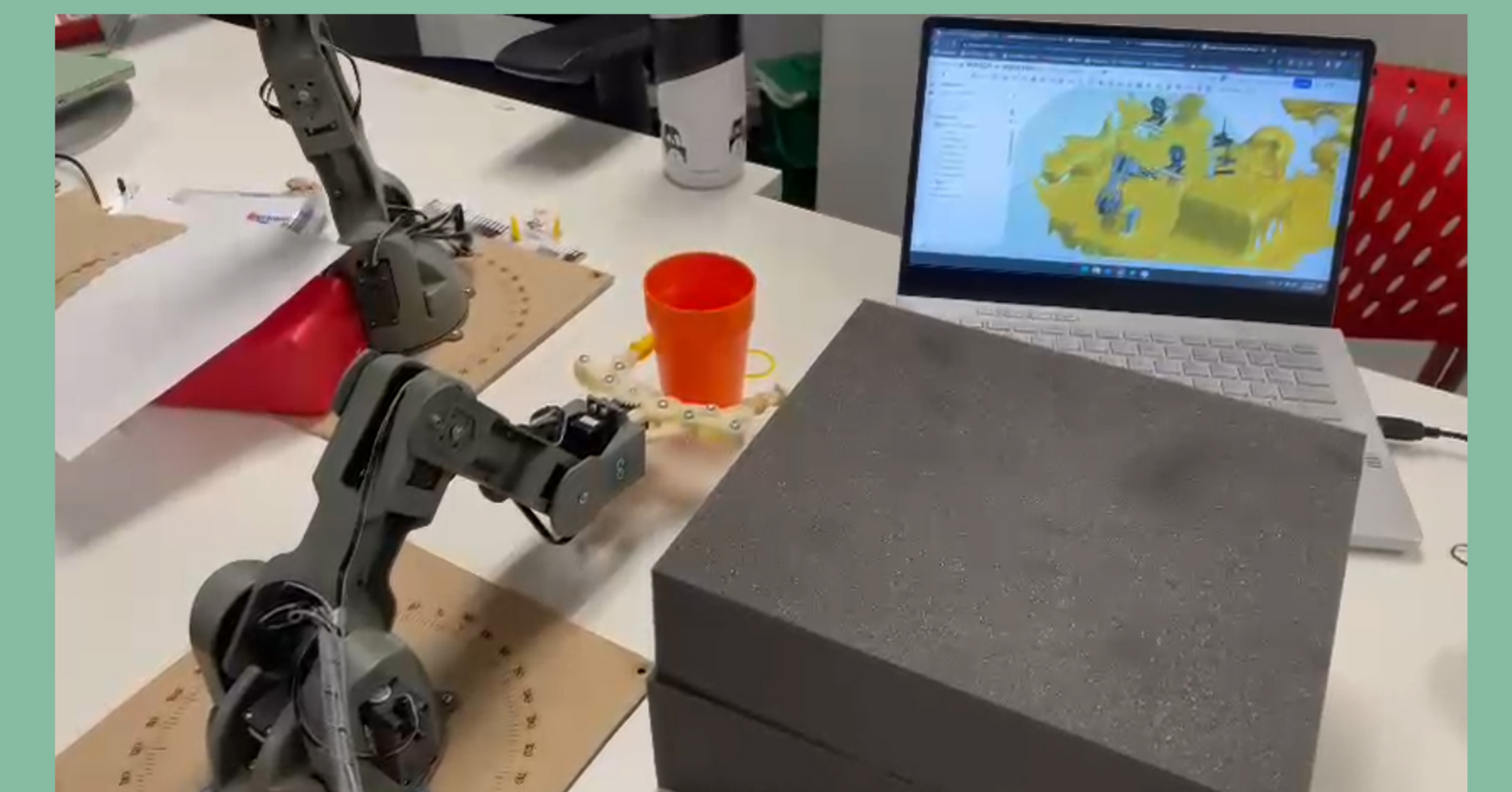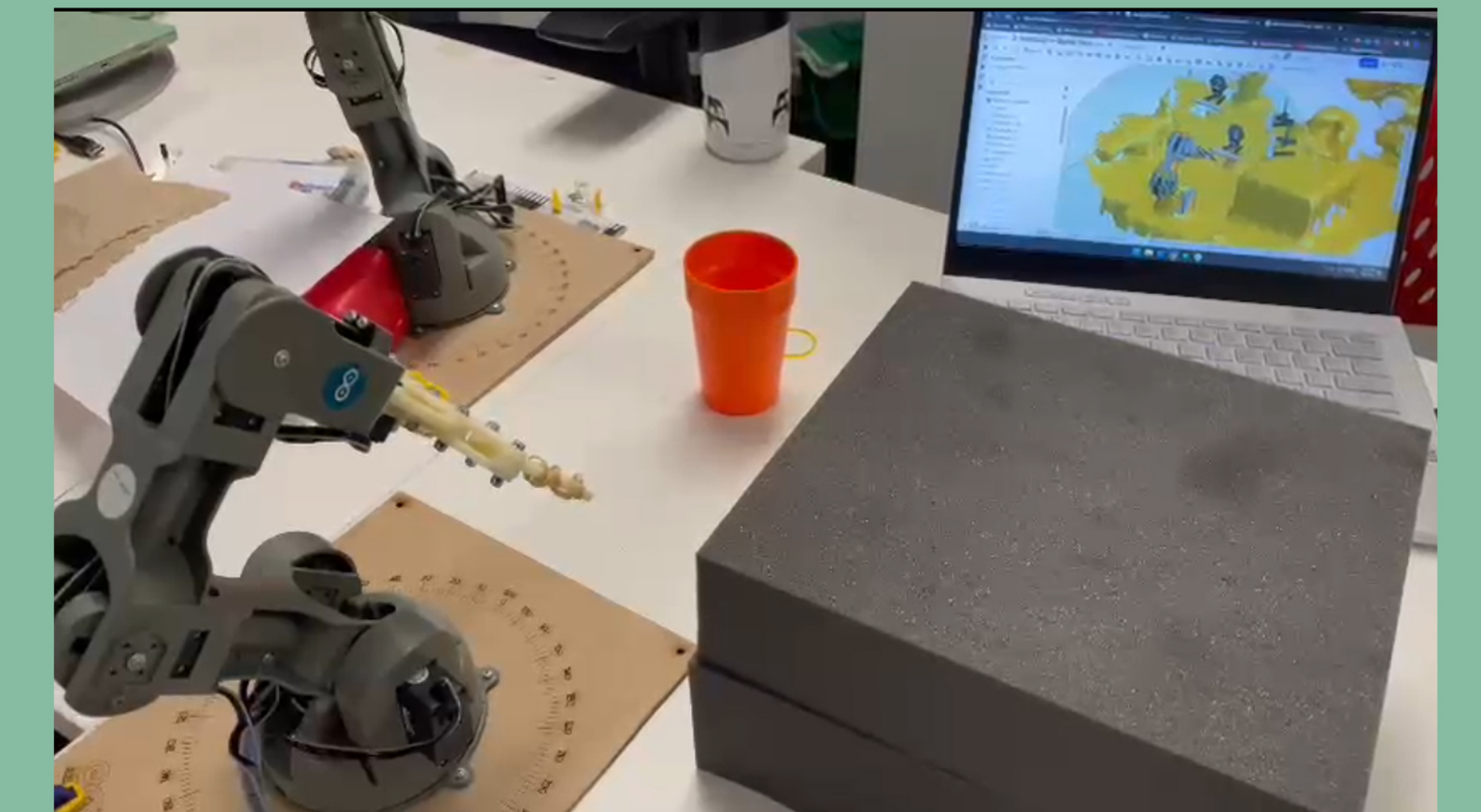Gripper Configuration Closed

delay 4

Generate
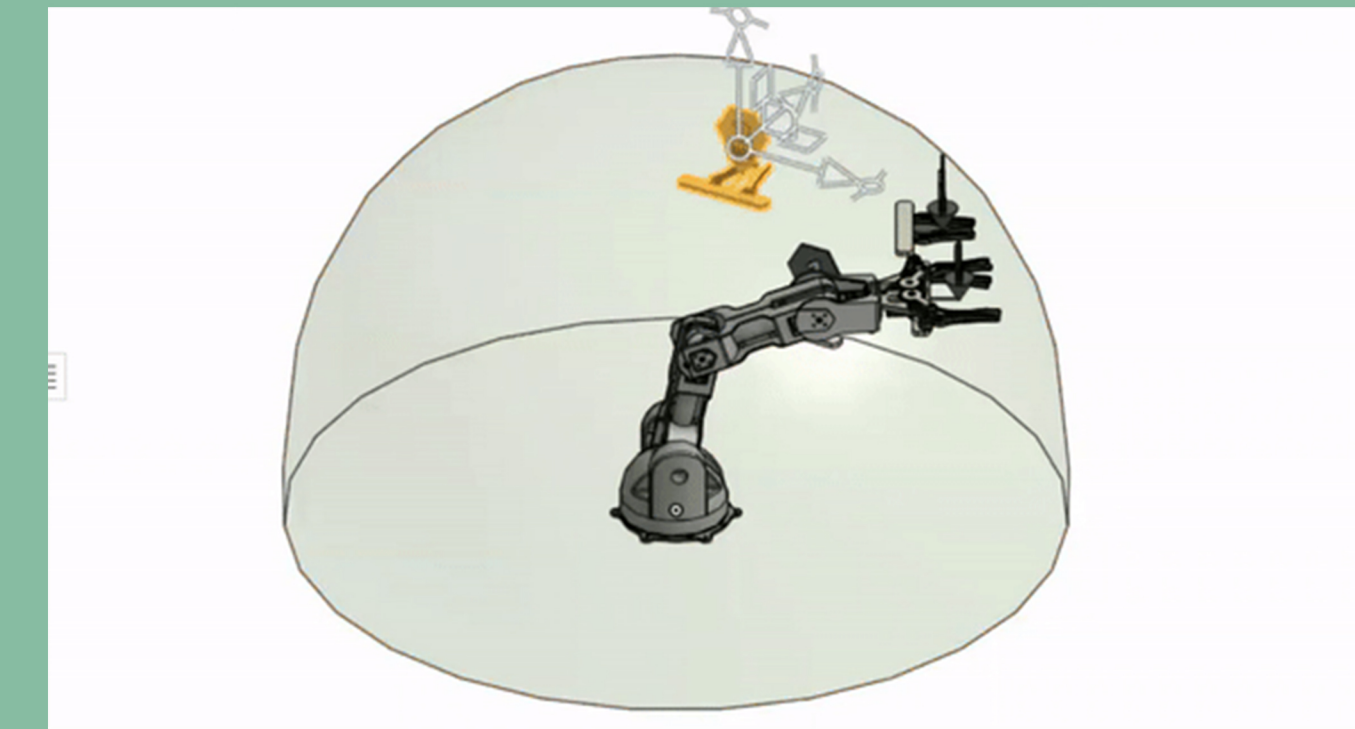
Once a checkpoint is inserted, it can be moved to the desired location. Pressing a button on the robot arm initiates the pick and place sequence. Monitoring can be enabled to update the model as the physical arm moves.

PICK AND PLACE
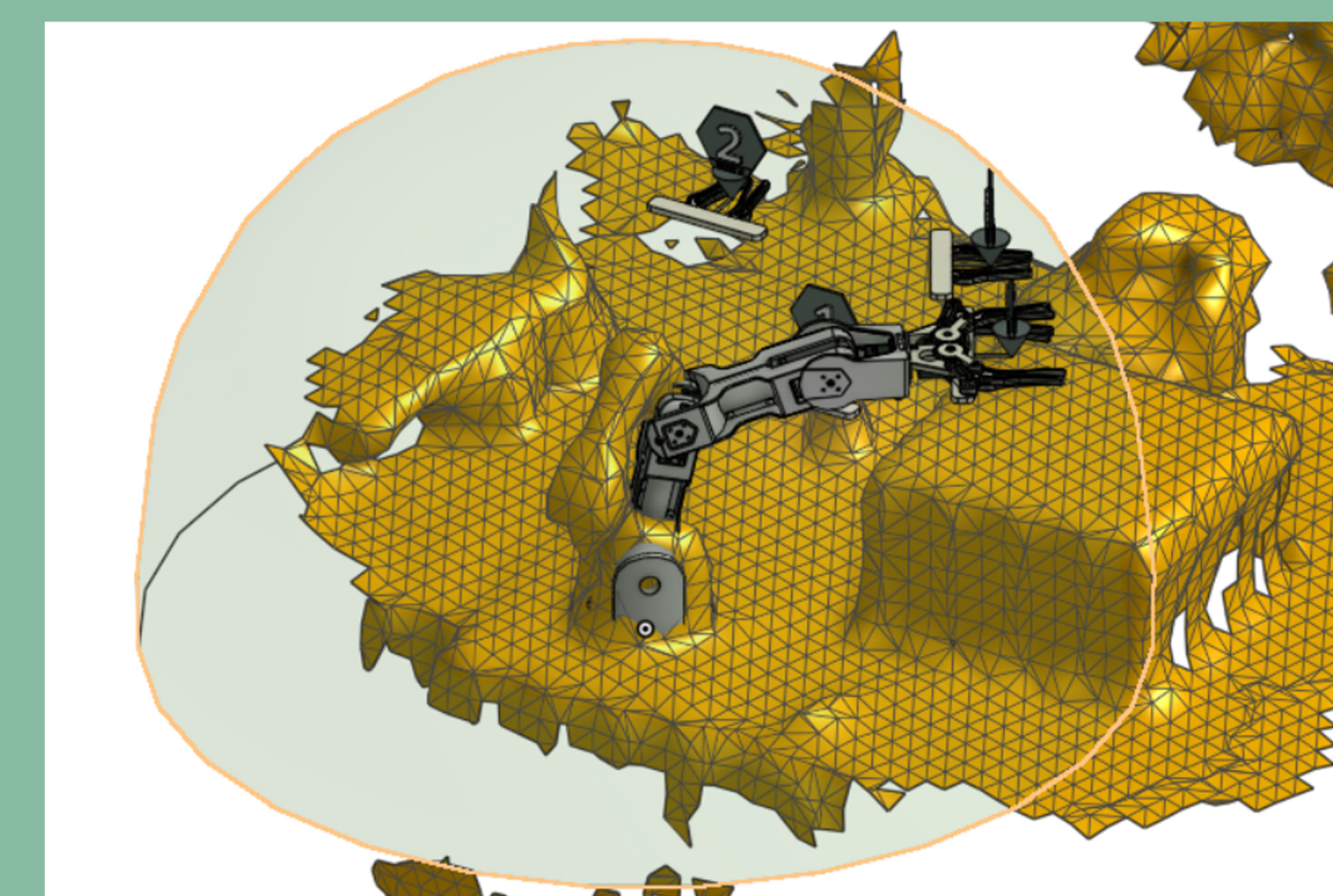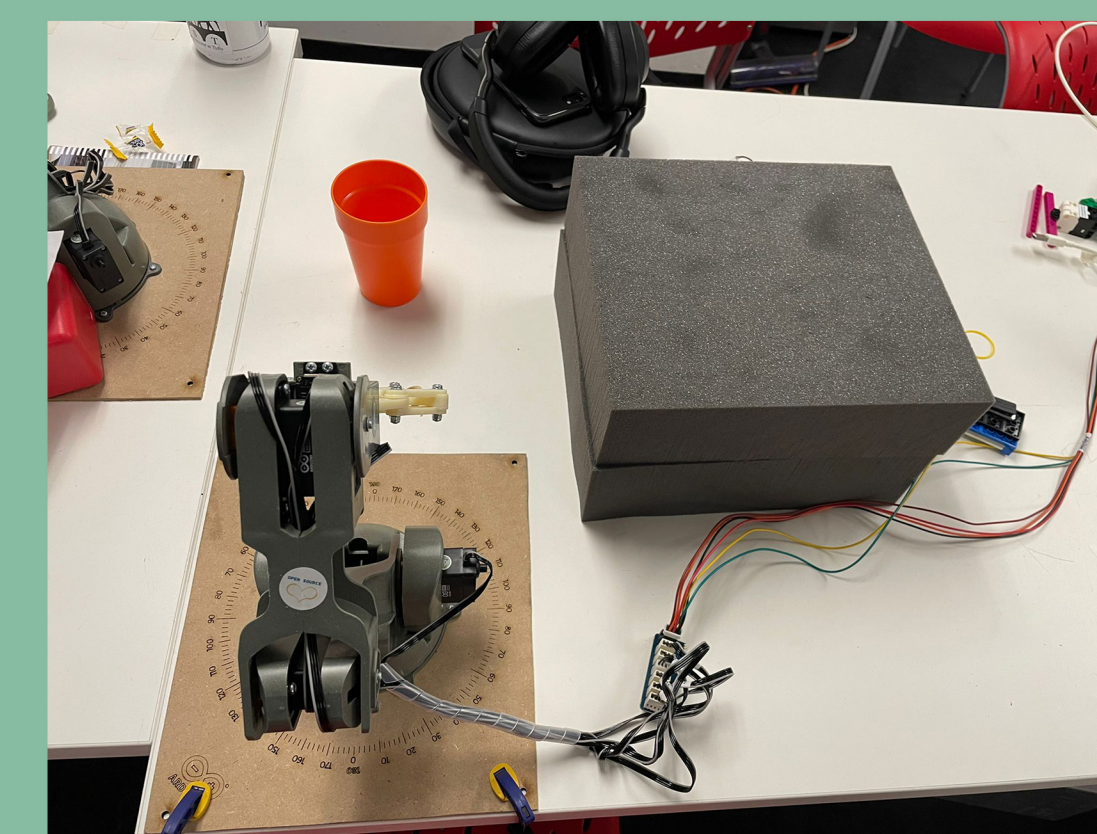
Surrounding terrain can be imported for reference using the onshape ios app which uses LIDAR scanning. This scan can be aligned to the assembly space and used as a reference for the checkpoints.

Video Link

Document Link