PRODUCT DESIGN PRACTICE

HACKATHON 2

AUTOMATION IN HIGH RISE WINDOW CLEANING

GROUP NO : B2 - 43

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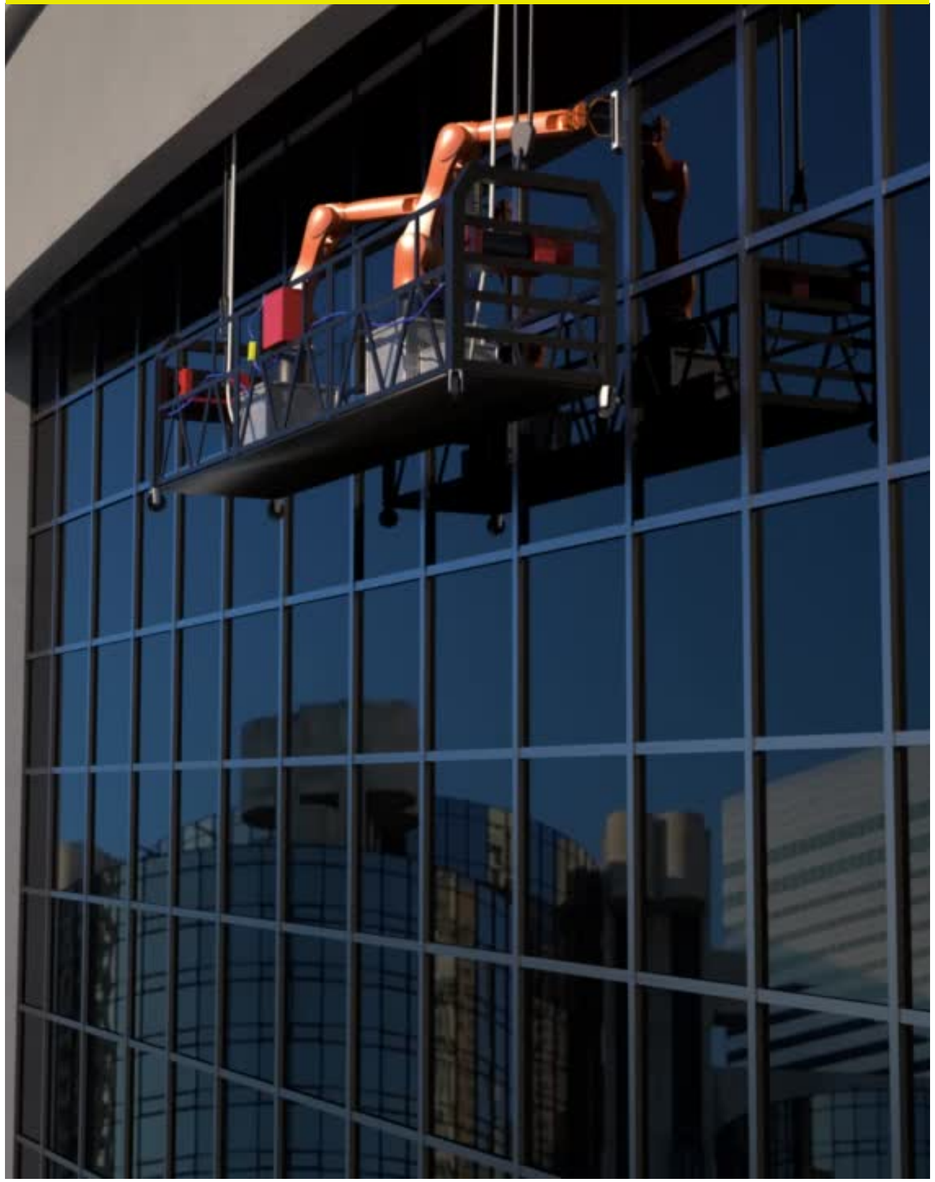
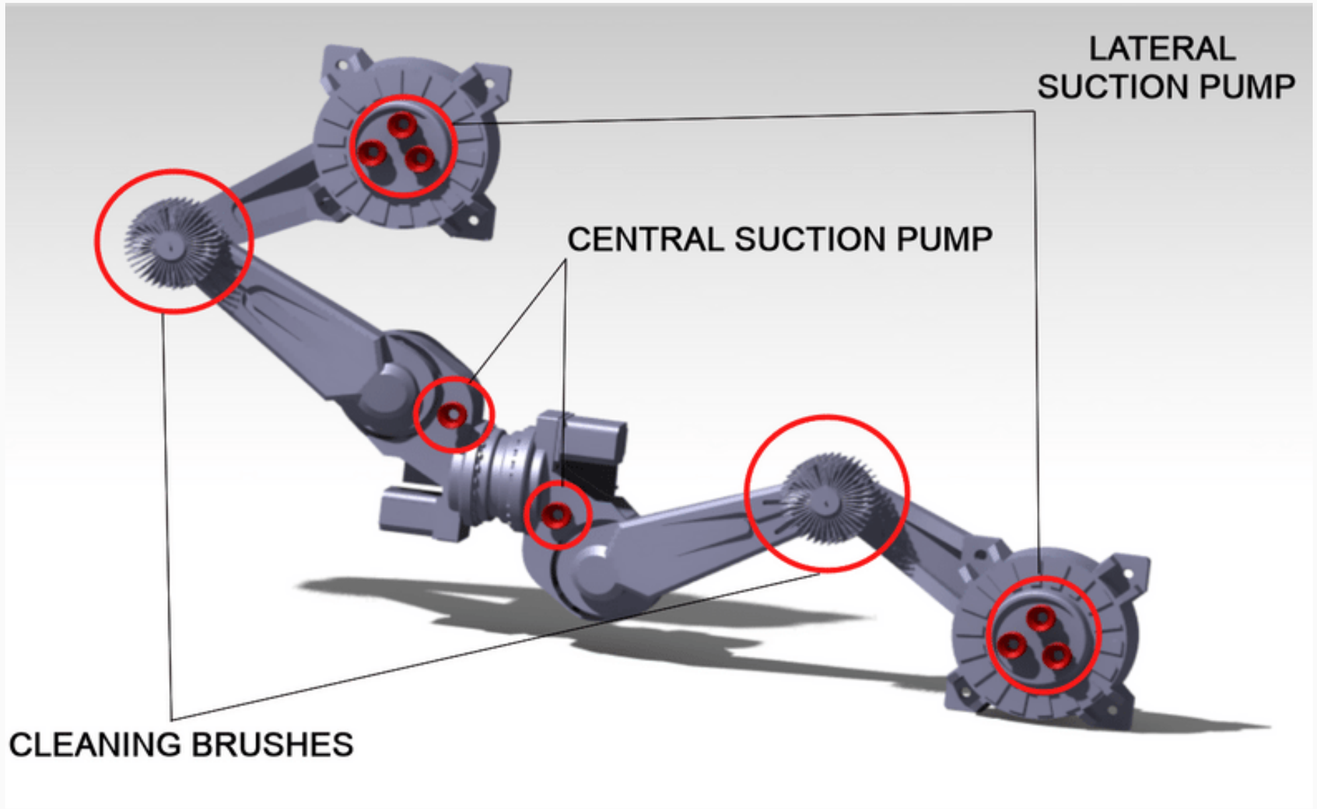
Snippet of existing customer



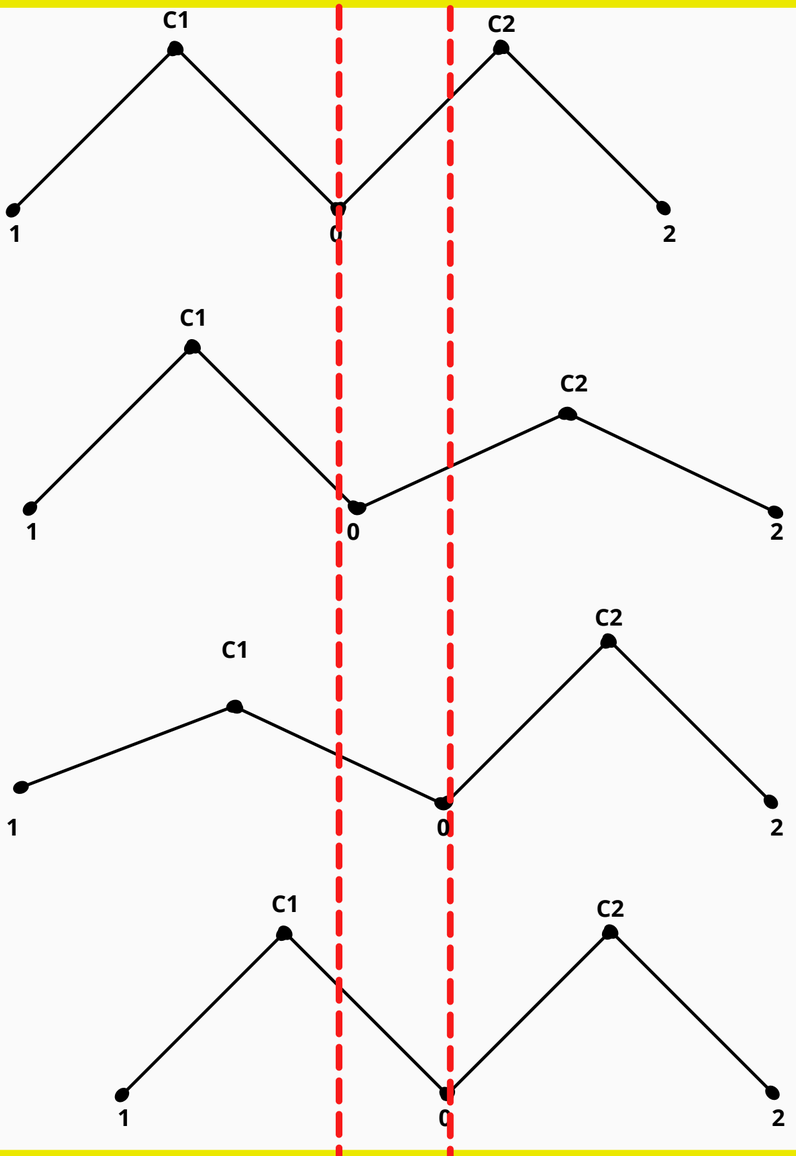
CONCEPTUAL MODEL



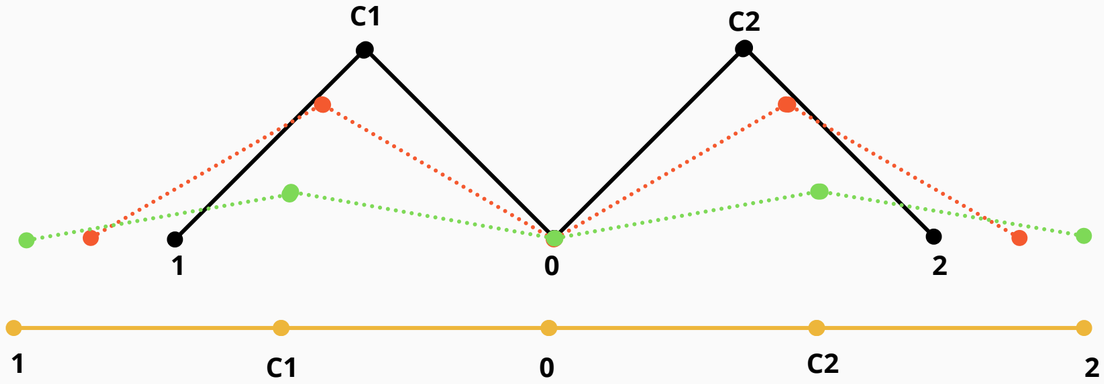
MINIMUM VIABLE PRODUCT

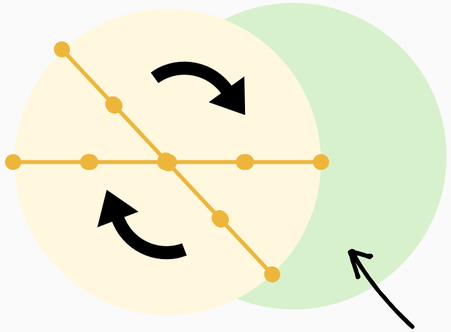
- Spider leg movement (Biomimicry) without suction plunger system
- Cleaning movement (360 degree cleaning)
- Dust Density Index Identification
- Obstacle detection and Rerouting
- Water flow via pipes for internal cooling system (Simulation)
- Window cleaning robotic system and other subsystems simulated using CAD modelling for showcasing entire feature of the conceptual model

HOW DOES IT CLEAN



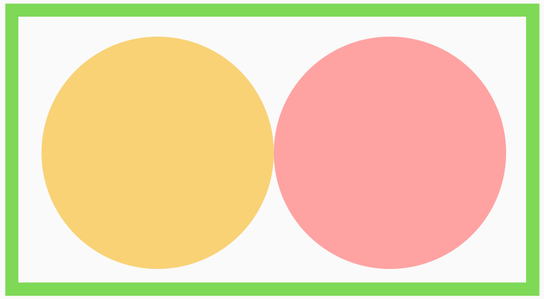
Spatial X movement - Only two out of three suction system is activated when the robot traverses in x direction



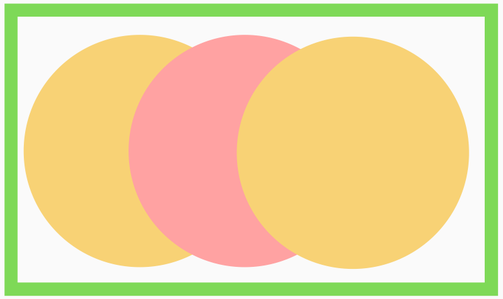


Node 1,2 - Lateral suction pump (Dectivated)
Node 0 - Central suction pump (Activated)
Node C1 ,C2 - Cleaning brushes (Activated)

The distance between one cleaning area and the next successive cleaning are is reduced to reduce the amount of uncleant area



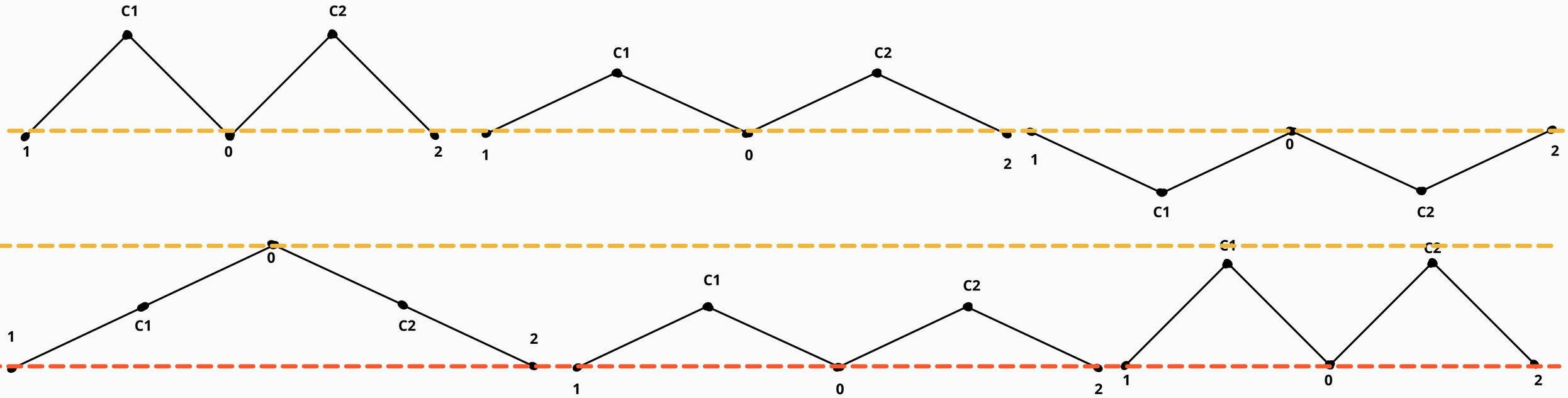
More uncleaned area when step size is high decreasing the efficiency of cleaning process



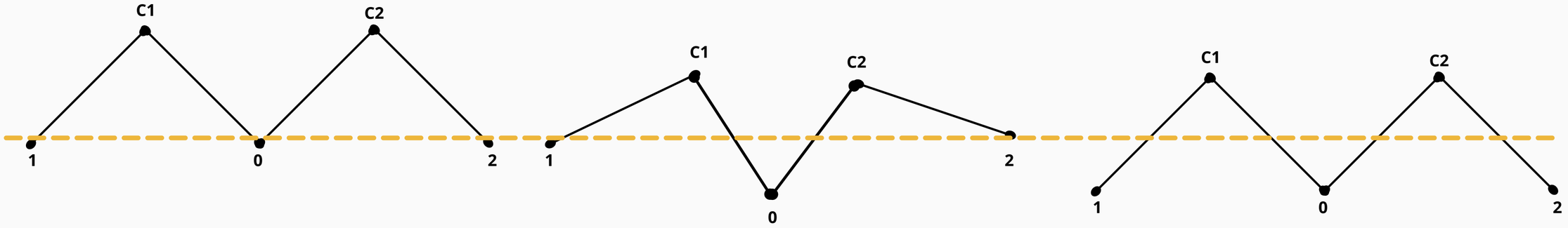
Less uncleaned area when step size is less increasing the efficiency of cleaning process

How does it work?!

EXPLAINED USING LINE DIAGRAMS



For small y axis displacements



PREVIOUSLY ON HACKATHON 1

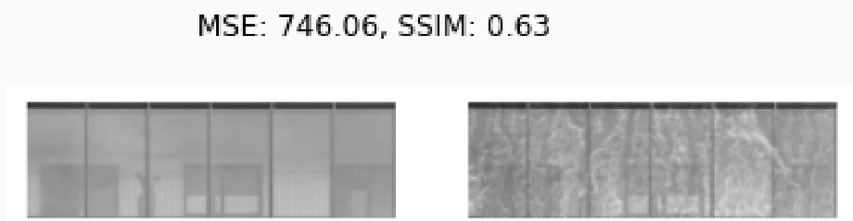
DUST DENSITY DETECTION

Image 1 - Reference image

Image 2 - Image with higher percentage of dirt

Image 3 - image with slightly lesser percentage of dirt

Reference image versus reference image



Reference image versus image 2

Reference image versus image 3

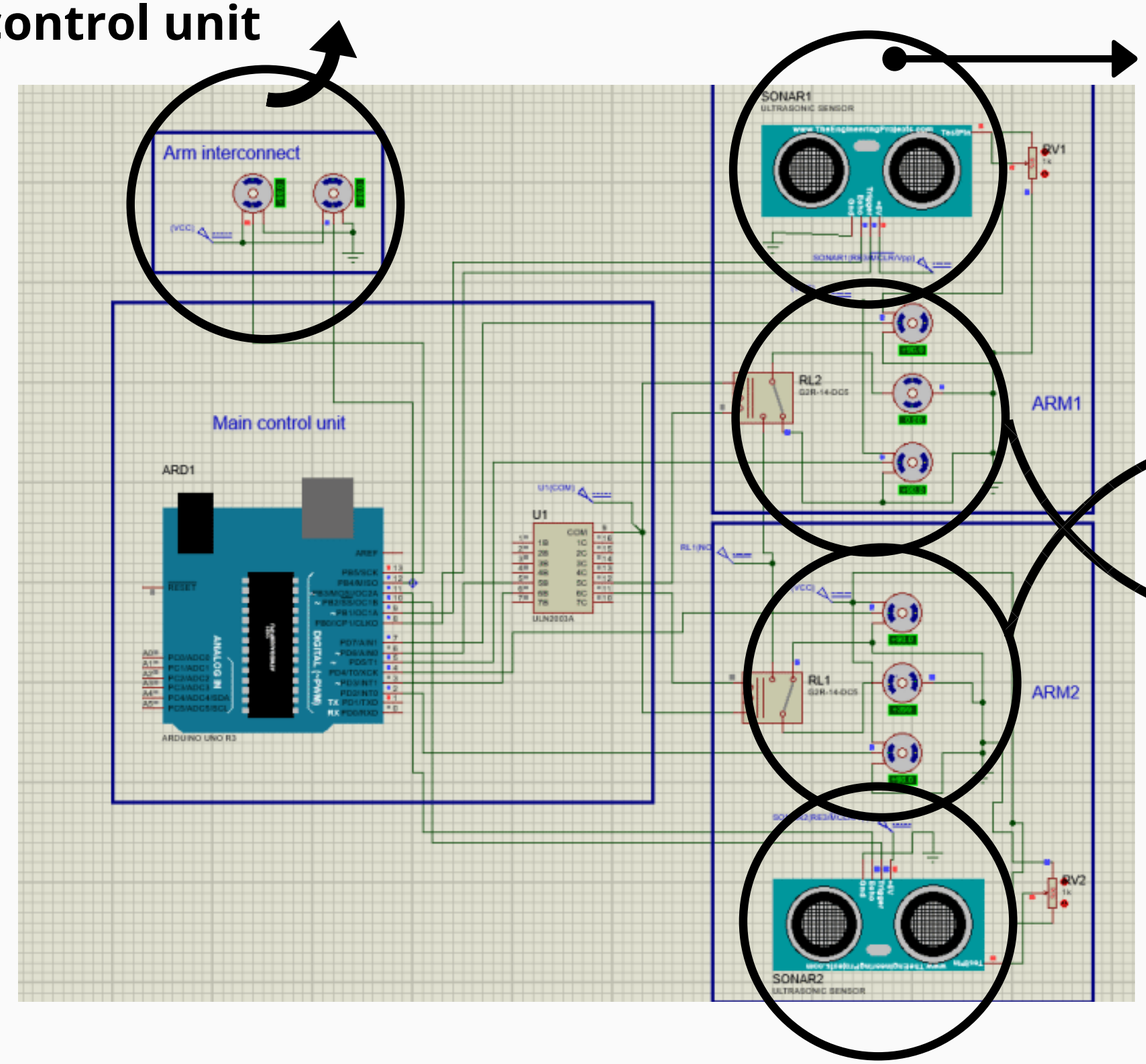
Using python programming language

https://drive.google.com/drive/folders/18C5tVUPjzVYr8ipMcY00pPMyV1wvK2S6?usp=sharing - google drive link for python code and proteus file

PREVIOUSLY ON HACKATHON 1

ELECTRONIC SIMULATION

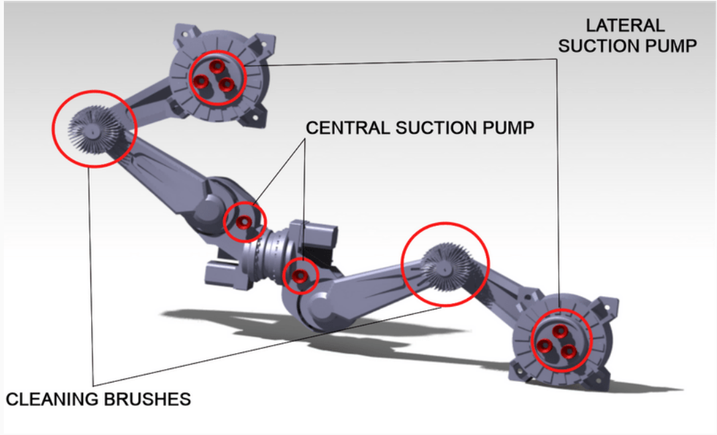
Servo motors which connect the arm to the control unit



Ultrasonic sensor

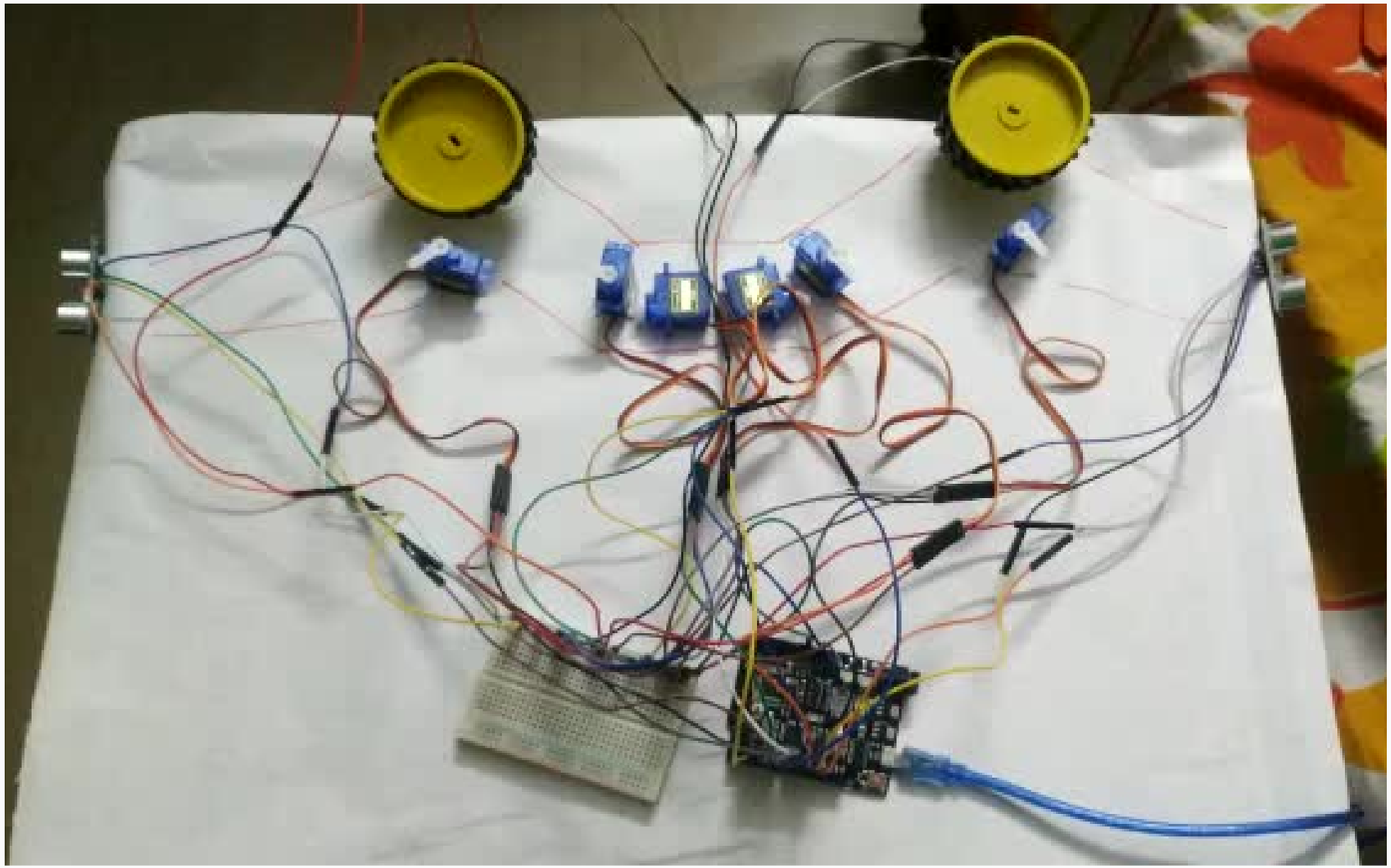
Servo motors and Dc motor which help in cleaning and movement.

Arm 1 and 2 are used for movements. The brushes are attached to the elbow joint and the water outlet is located at the elbow joint. The arm interconnect circuit is used in connecting the arm to the main control unit of the robot.



CURRENT PROGRESS

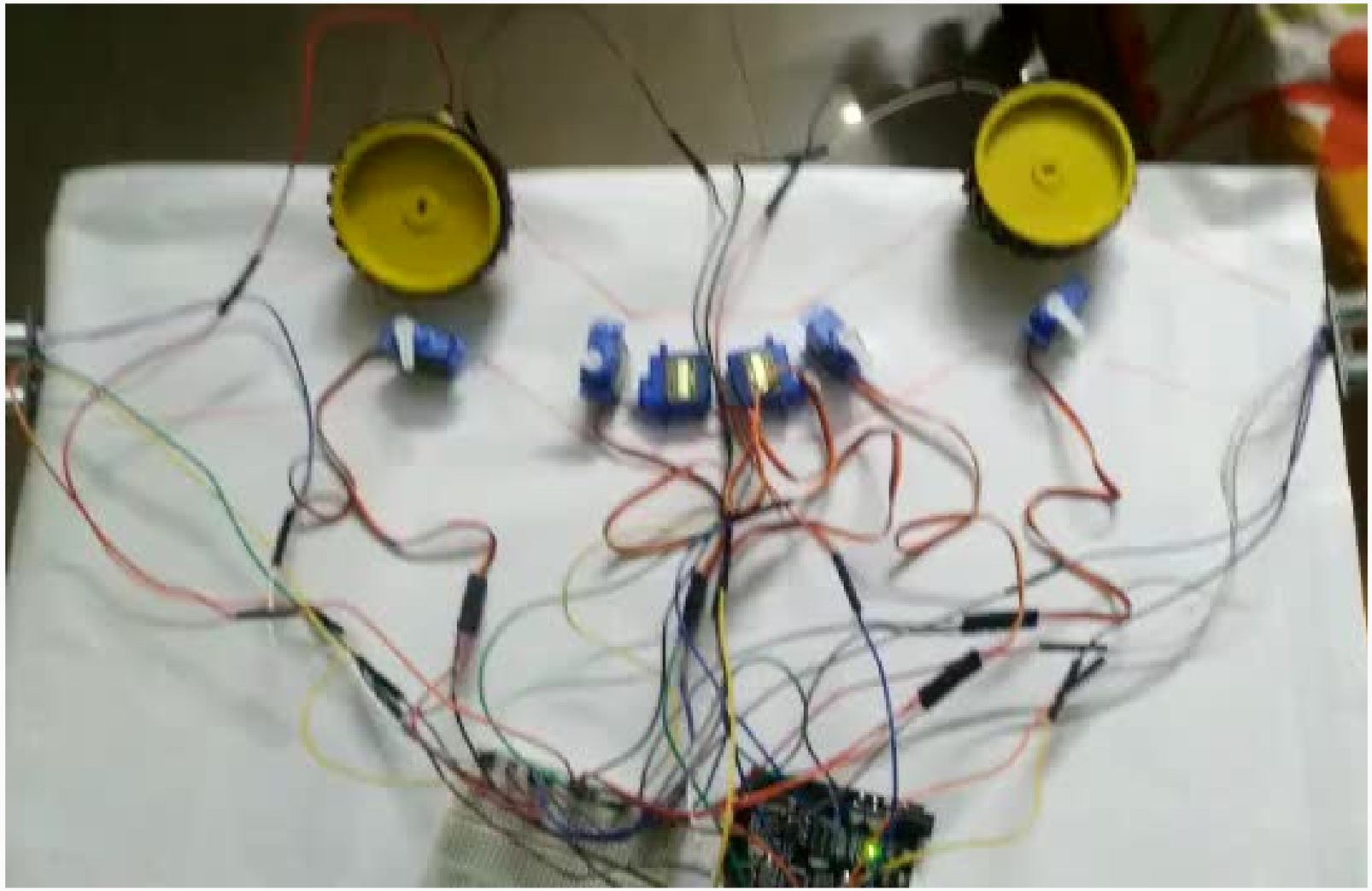
PROTOTYPING



The servo motors at the extreme nodes rotate in in opposite direction with small time lapse for the suction pump system to release and lock to perform Spatial Y direction movement

CURRENT PROGRESS

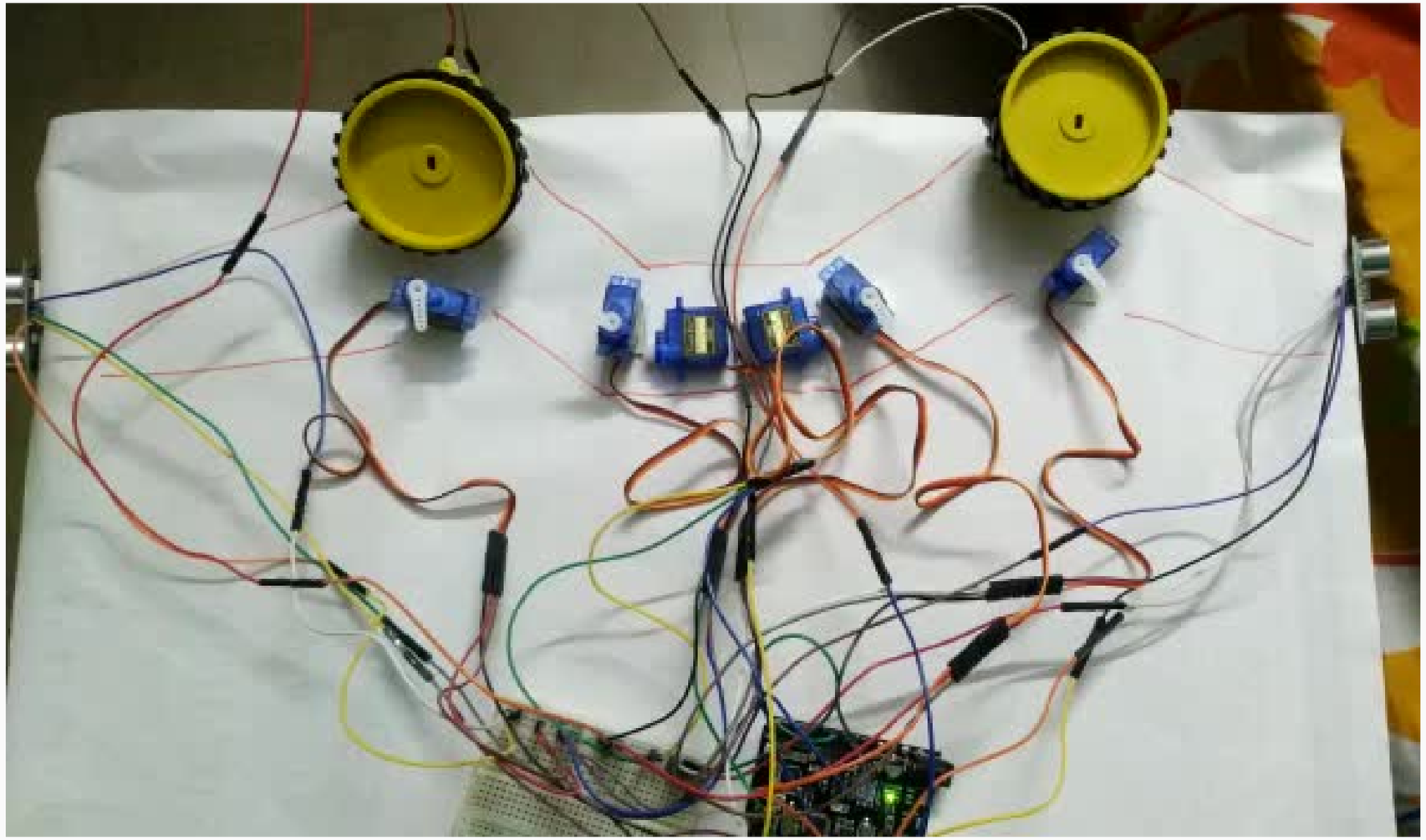
PROTOTYPING



The cleaning brushes rotates simultaneously about their axis as well about the central axis at higher speed to shred off the dust from the glass when cleaning motion is in progress

CURRENT PROGRESS

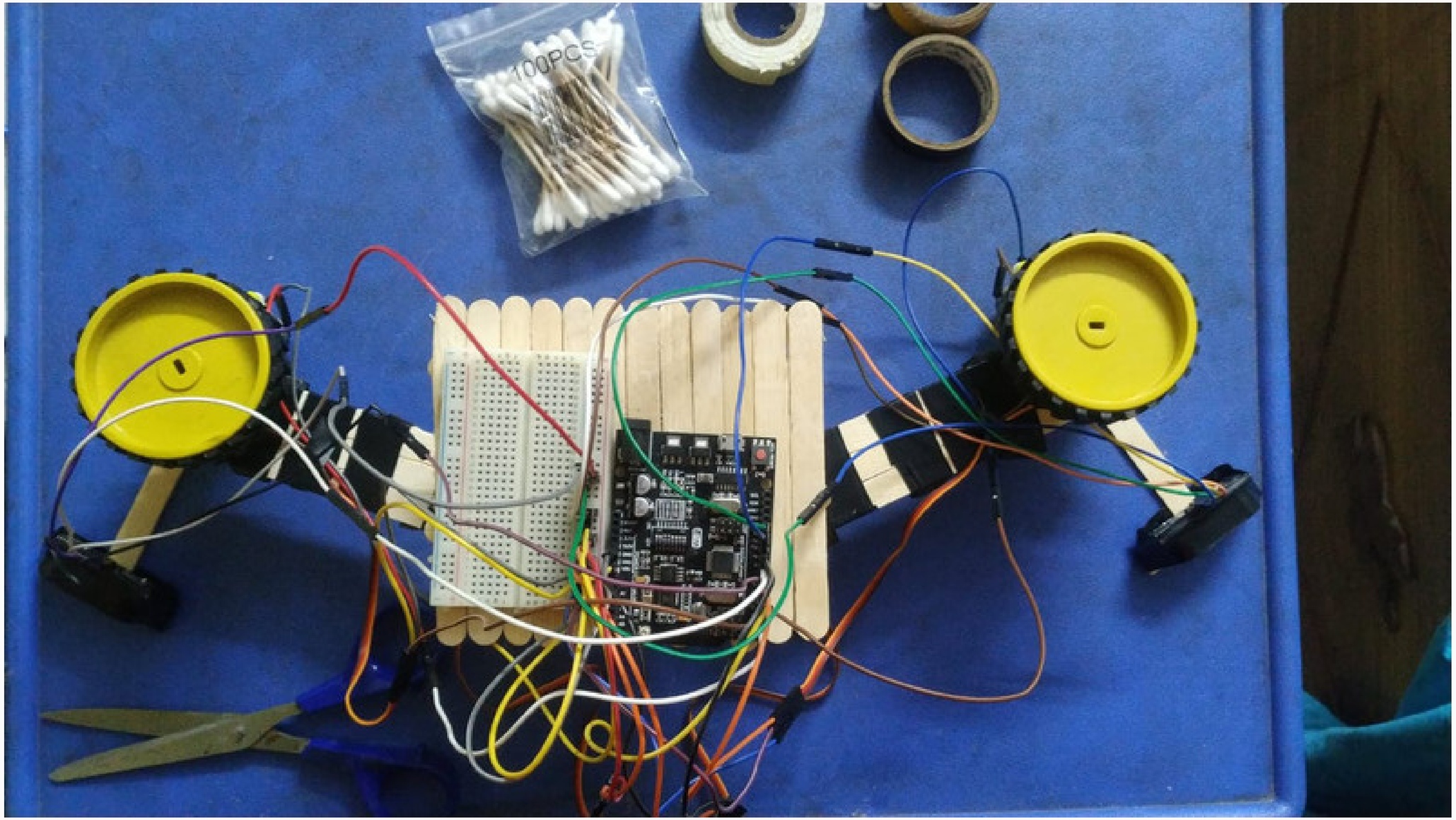
PROTOTYPING



The servo motors at the extreme nodes rotate in in same direction with small time lapse for the suction pump system to release and lock to perform Spatial X direction movement

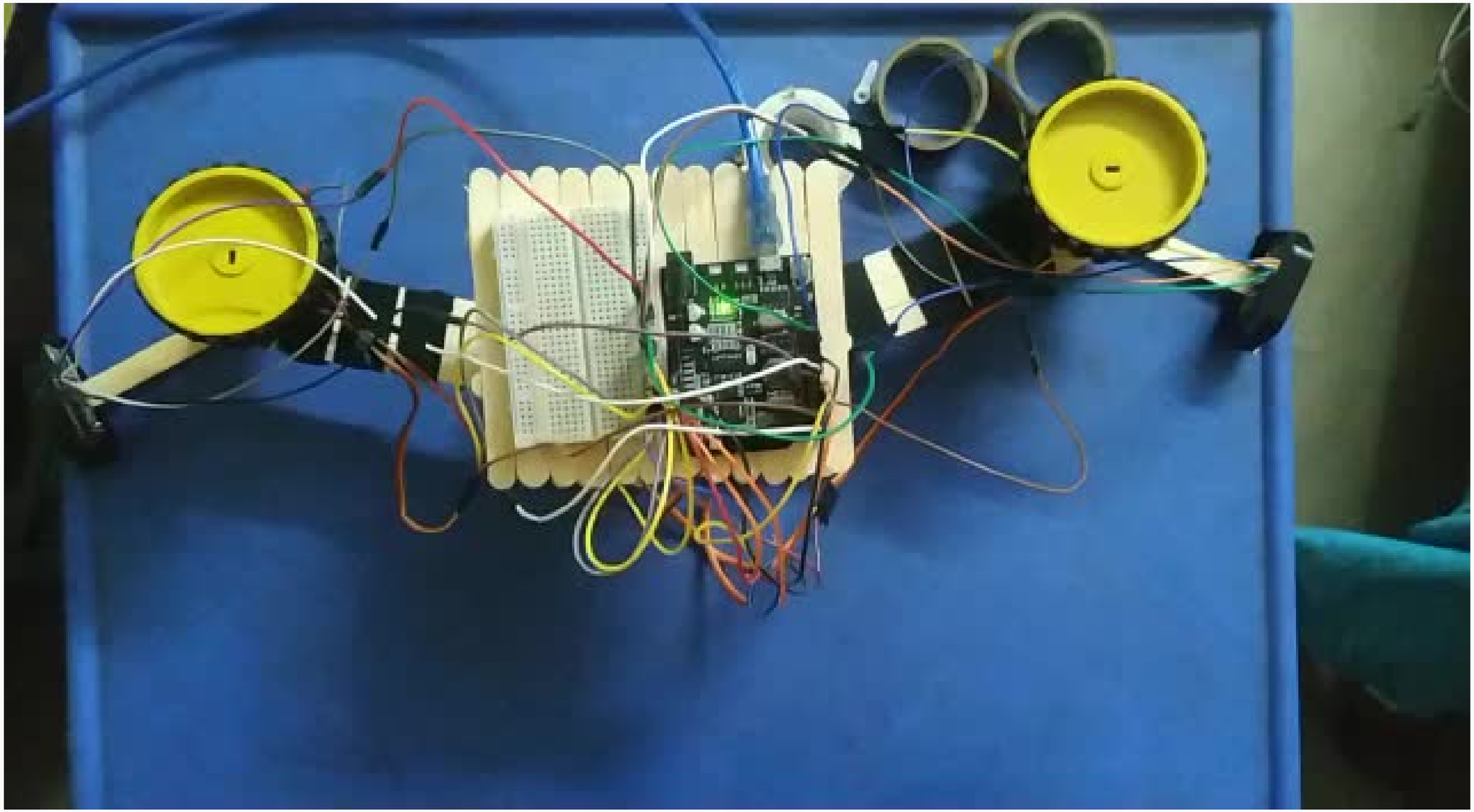
CURRENT PROGRESS

PROTOTYPING



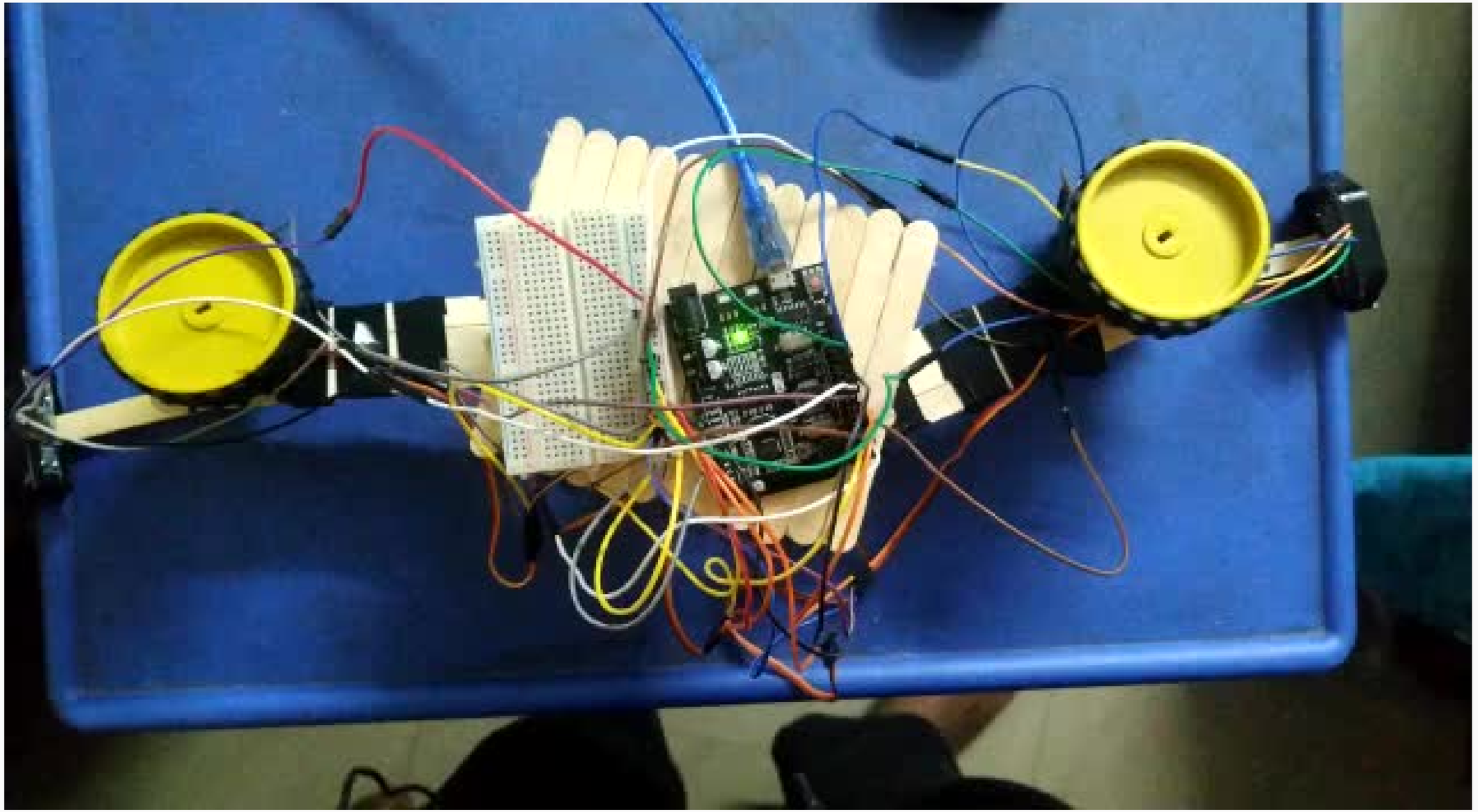
CURRENT PROGRESS

PROTOTYPING



CURRENT PROGRESS

PROTOTYPING



CURRENT PROGRESS

PROTOTYPING