

# **Unleash the Tether: The Development of a Pump-Driven Soft Actuator**



# INTRODUCTION

Soft robotics is a subfield of robotics that involves the design, construction, and control of robots made from soft, flexible materials like elastomers giving more versatility, efficiency and novelty.

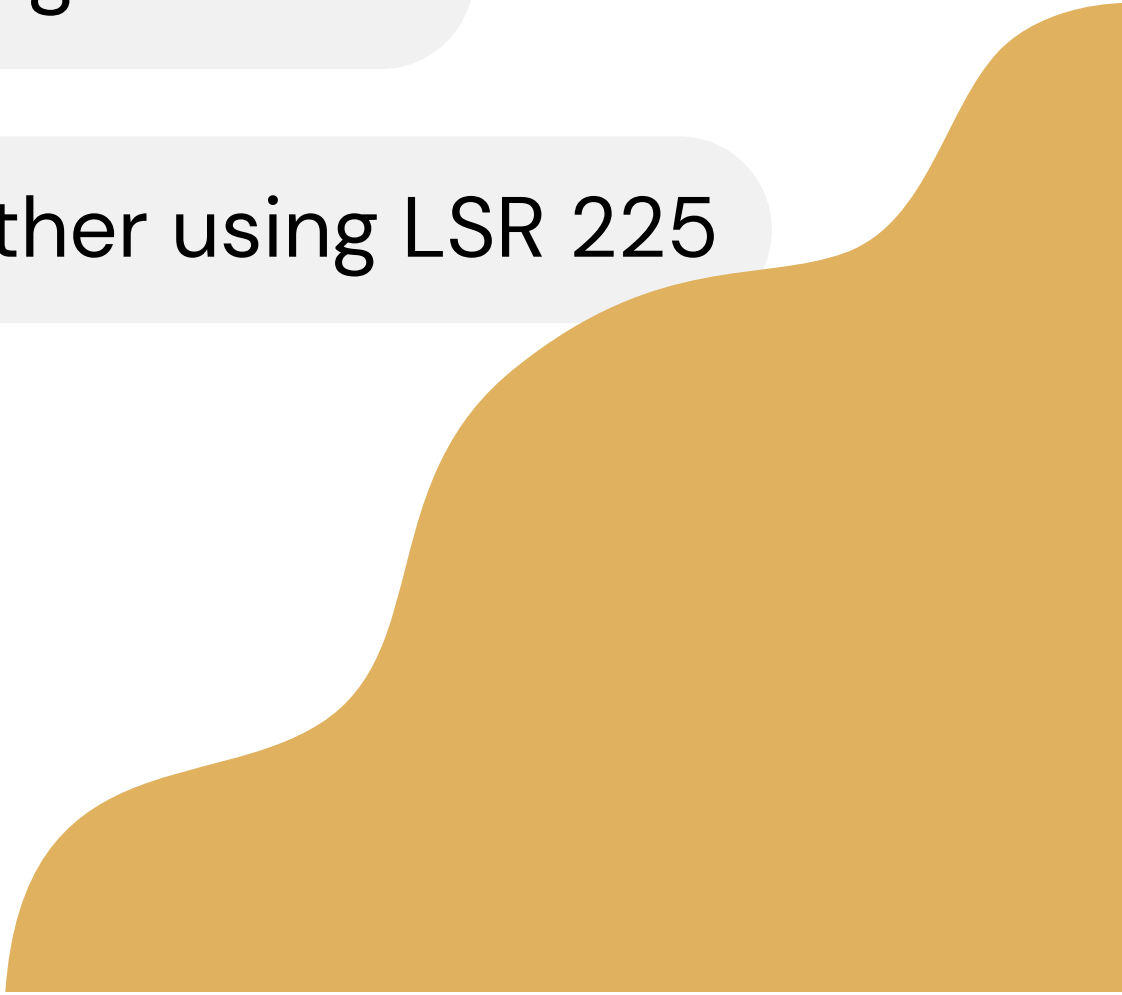
A multi-variable stiffness controller is an important component of soft robotics that allows the robot to adjust its stiffness in real-time to adapt to different tasks and environments.

Soft robots are made of flexible materials, such as elastomers, that can change their shape and stiffness. The stiffness of a soft robot can be varied by changing the air pressure inside the robot or by applying an electric or magnetic field to the flexible materials.

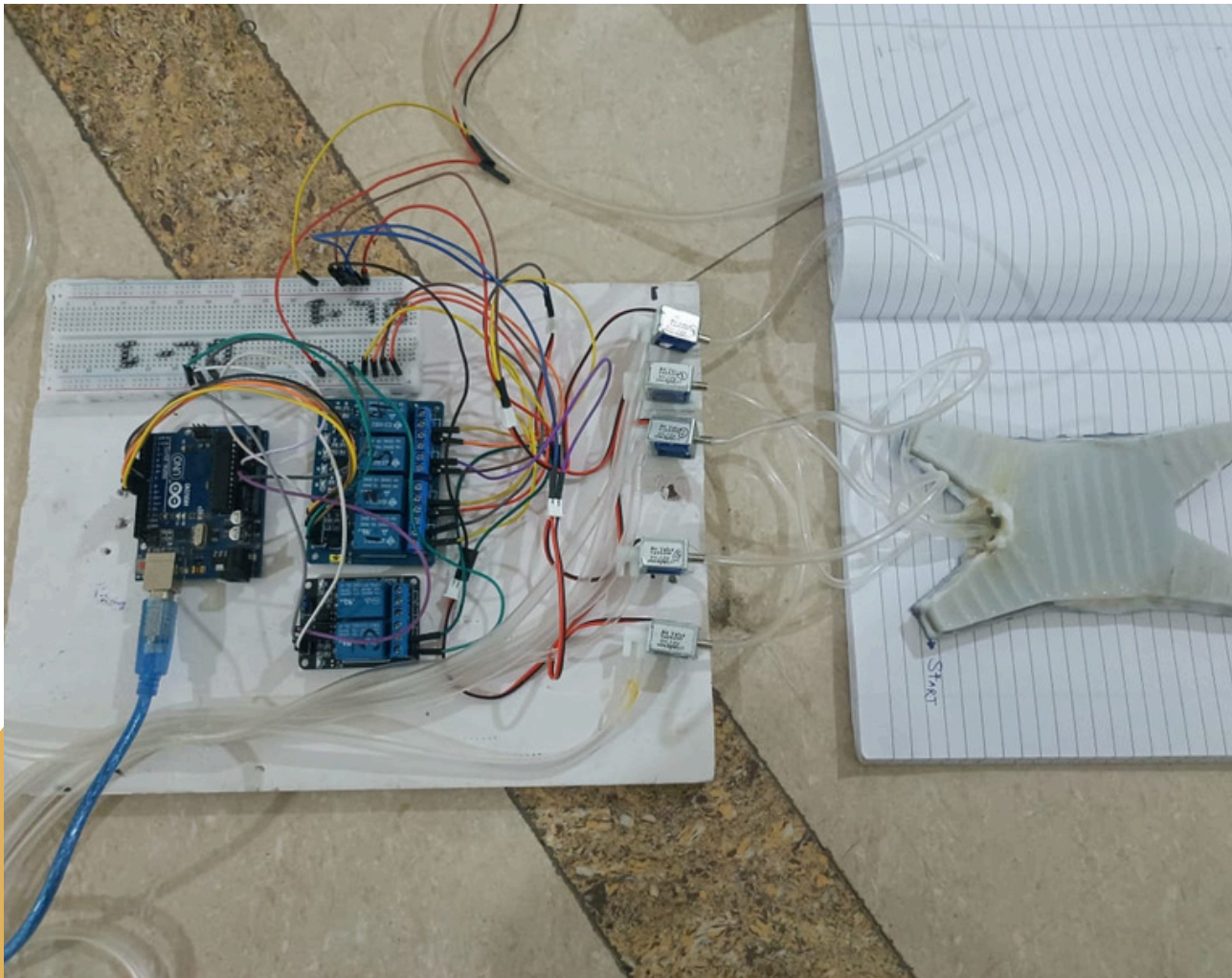
As a demonstration of which we have made a WALKING SOFT ROBOT. A walking soft robot is a type of softrobot that can move using legs or other means of locomotion, such as crawling through complex environments and over rough terrain that traditional robots may not be able to navigate.



# STEP WISE FABRICATION

- 1 Preparation of 3D printed mold
  - 2 Cast the Body – Part A(pour the liquidrubber into the mold) using LSR 110
  - 3 Cast the Base – Part B(seal the bottom of the Body part) using LSR 225
  - 4 Add the Silicon Tubes in body and stick base and body together using LSR 225
  - 5 Connect compressor and air Valves
  - 6 Programming Arduino
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# WORKING OF THE PROTOTYPE



Connect the compressor and air valve with silicon tubes and Y-shape connector, then to the robot's pipechannels.

When pumping the air in, we turn on the pump and close the valve so the air is pushed by the pump and goes into the robot.

When releasing the air, we turn off the pump and open the valve, air will then be pushed by the elasticity force from the material, like a balloon tends to go back to it's original shape

In the Arduino code, we make handy functions: individually bring up and down each legs, the middlebody, and all of them at once.

Through this variation of air pressure in the channels we can , set the stiffness of the robot and make it move.



# APPLICATIONS



01

## **Search and rescue:**

Walking soft robots can navigate through complex terrains and confined spaces to locate and rescue victims of natural disasters or accidents.

02

## **Exploration:**

Walking soft robots can be used for exploring remote or hazardous environments, such as space, deep sea, or volcanic regions.

03

## **Agriculture:**

Walking soft robots can be used for harvesting crops, planting seeds, and performing other agricultural tasks that require delicate handling.

04

## **Healthcare:**

Walking soft robots can be used as medical assistants to help patients with mobility issues or to perform physical therapy exercises.

05

## **Industrial automation:**

Walking soft robots can be used in manufacturing plants and warehouses to move and transport goods, as well as to perform tasks that require dexterity and precision.





# **SUPERVISED BY: MANISH AGRAWAL**

## **GROUP TUESDAY - E**

Mili Prajapati 2022MEB1325

Mohit Sharma 2022MEB1326

Palakpreet Kaur 2022MEB1327

Priyanshu Gupta 2022MEB1330

Priyanshu Rao 2022MEB1331

