Industry Projects Submission 1
ME 639 - Introduction to Robotics
IIT Gandhinagar

Group Name: Sophia hamari behen hai
Names of Group Members:
1. **Aarish Shah**
2. **Rohan Shirodkar**
3. **Vaishnavi Kokadwar**

We attest to abide by the stated collaboration policy: We understand that all sorts of collaboration are allowed; however, plagiarism will not be tolerated. If we use material from some other source (or from friends), we will cite them appropriately.

Pill-Picking Robot/Device

Statement of Our Understanding of the Project (in 200-300 words)

A pill-picking robot/device needs to be designed, which would pick up only one pill from a cup. All the pills will be of the same dimension and type which is known to us. However, our understanding of the exact intricacies of the project requirement is limited since some key questions have not been answered yet.

Our understanding is that the most challenging part of this project would be designing a mechanism for the gripper such that only one pill is picked up and the control strategy behind it. The requirement is such that a single DOF gripper is to be designed, but there is no limitation on the DOF of the robot itself. A camera would be used to identify pill orientation in the cup. Also, the gripper needs to pick up the pill based on its identified position and orientation.

We think a prismatic joint at the end of the robot (before the gripper) would be helpful since it would help the robot access the contents of the cup better. The gripper would have to be remotely actuated since it needs to be compact to fit inside the cup. The trajectory of the robot to reach a position from where it can grab the pill would require proper trajectory planning, for which a control strategy would have to be designed.

Tentative Approach and Tools we May Need to Use (not more than 3-4 sentences)

Tentative Approach:

1. Mechanism Design
2. Identification of whether one-and-only-one pill has been picked up or not
3. Trajectory planning
4. Control Strategy

Tools we would use: Autodesk Fusion 360, Python, OpenCV, Cinderella, MATLAB

Key Assumptions Made in Approaching the Problem (in an enumerated list form)

1. The location of the cup is fixed at all times during robot operation.
2. The opening of the cup is greater than the gripper size and stays the same at all times.
3. The orientation of the pills will be detected using a camera using OpenCV.

Key Questions to Clarify the Requirement of the Project (in enumerated list form)

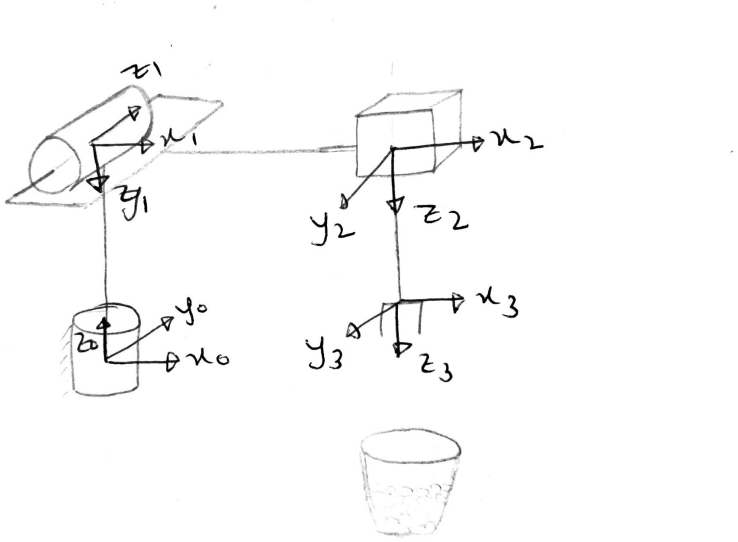
1. Is the position of the cup given with respect to the base of the robot?
2. Can we use a camera to identify the position of the cup and the number of pills picked up?
3. Is release also required after picking? If yes, where is it supposed to be dropped?
4. Is the mechanism supposed to be designed for a particular type of pill or is the design supposed to be generic for any type of pill?
5. Can a mechanism be where the pills in the cup are transferred onto a different platform and picked from there?
6. Should the mechanism to be designed be useful for all kinds of cup sizes and shapes?

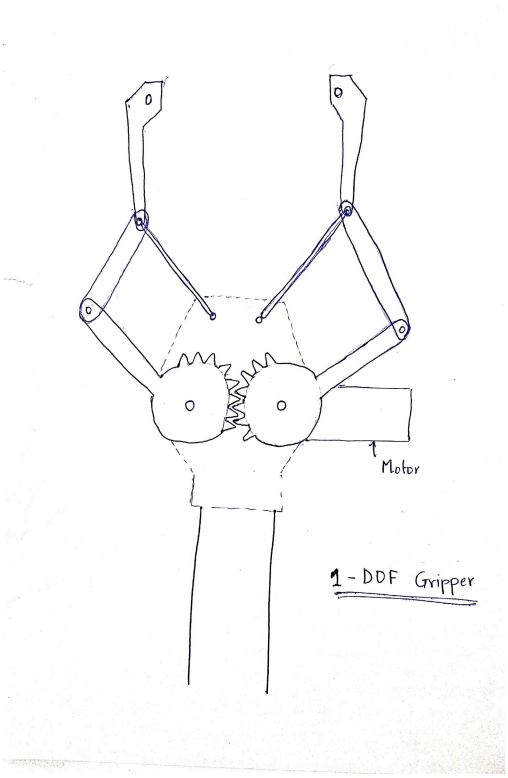
Expected list of Deliverables (check all that apply)

- ☑ ~~A brief explanation of the concept (including the type of robot, number of links and joints, and other such details~~
- ☑ ~~Figures/drawings/sketches showing the concept~~
- ☑ ~~Relevant equations of the robotics solution~~
- ☑ ~~Codes incorporating the solution~~
- ☑ ~~Representative plots/or other representative results from the codes~~
- ☑ ~~CAD drawings~~
- ☑ ~~Explanation of the solution and the results~~
- ☑ ~~Statement about limitations and future recommendations~~

- ☑ ~~Others (list as many as needed)~~
  - ☑ ~~Control Strategy~~
  - ☑ ~~Mechanism Design~~
  - ☑ ~~Actuator and sensor design~~

A Highly Tentative Sketch of the Problem and Expected Solution




Motor
1 - DOF Gripper