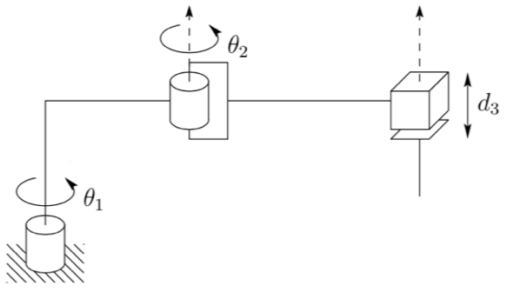
RBE 500 – Group Assignment – Part 1

1) **(4 pts) Create the robot:** Create the following SCARA robot in ROS and Gazebo.



For this assignment, you receive ROS packages and guidelines about how to install and interact with the Gazebo simulation environment. In the lectures we have also discussed the content of these packages and guidelines.

In this part of the assignment, you are expected to create the robot shown above. Please start with the already existing robot URDF in the provided package and modify it to have the motion axes accordingly. Please note that only the configuration of the robot is important (a SCARA robot for two revolute joints and one prismatic joint); it does not need to visually look like it is in the figure.

Please note that you can read the joint values of the robot via topics published by Gazebo to the ROS environment.

Spawn your robot in your ROS-Gazebo environment and take an image of your robot. Include the image in your report together with your robot definition file.

2) **(3 pts) Forward Kinematics:** Implement a forward kinematics node that
   - Subscribes to the joint values topic and reads them from the gazebo simulator
   - Calculate the end effector pose
   - publishes the pose as a ROS topic (you can choose to do this inside the callback function that reads the joint values, so that each time you receive a new joint value from the simulator, you publish the end effector pose)

This is a publisher-subscriber implementation. Move the robot to 3 different locations by ending position references to the joints. For each pose provide the screenshot of the robot and print the resulting pose to the terminal by using “ros2 topic echo…” command and include the screenshot of it in your report.

3) **(3 pts) Inverse Kinematics:** Implement an inverse kinematics node (a separate node) that has a service client that takes a (desired) pose of the end effector from the user and returns joint positions as a response.

   This is a service server-service client implementation.

   Test your node with the “ros2 service call” command for three separate end effector positions. Since your robot is a 3 DOF robot, you can just consider the position of the end effector. Take the screen shot together of the terminal responses and include it to your report.

   Be sure to submit your code.