



CALIFORNIA POLYTECHNIC STATE UNIVERSITY
CENG - DEPARTMENT OF ELECTRICAL ENGINEERING

EE 471- Vision Based Robotic manipulation
Lab #0: Hardware Assembly and Software setup

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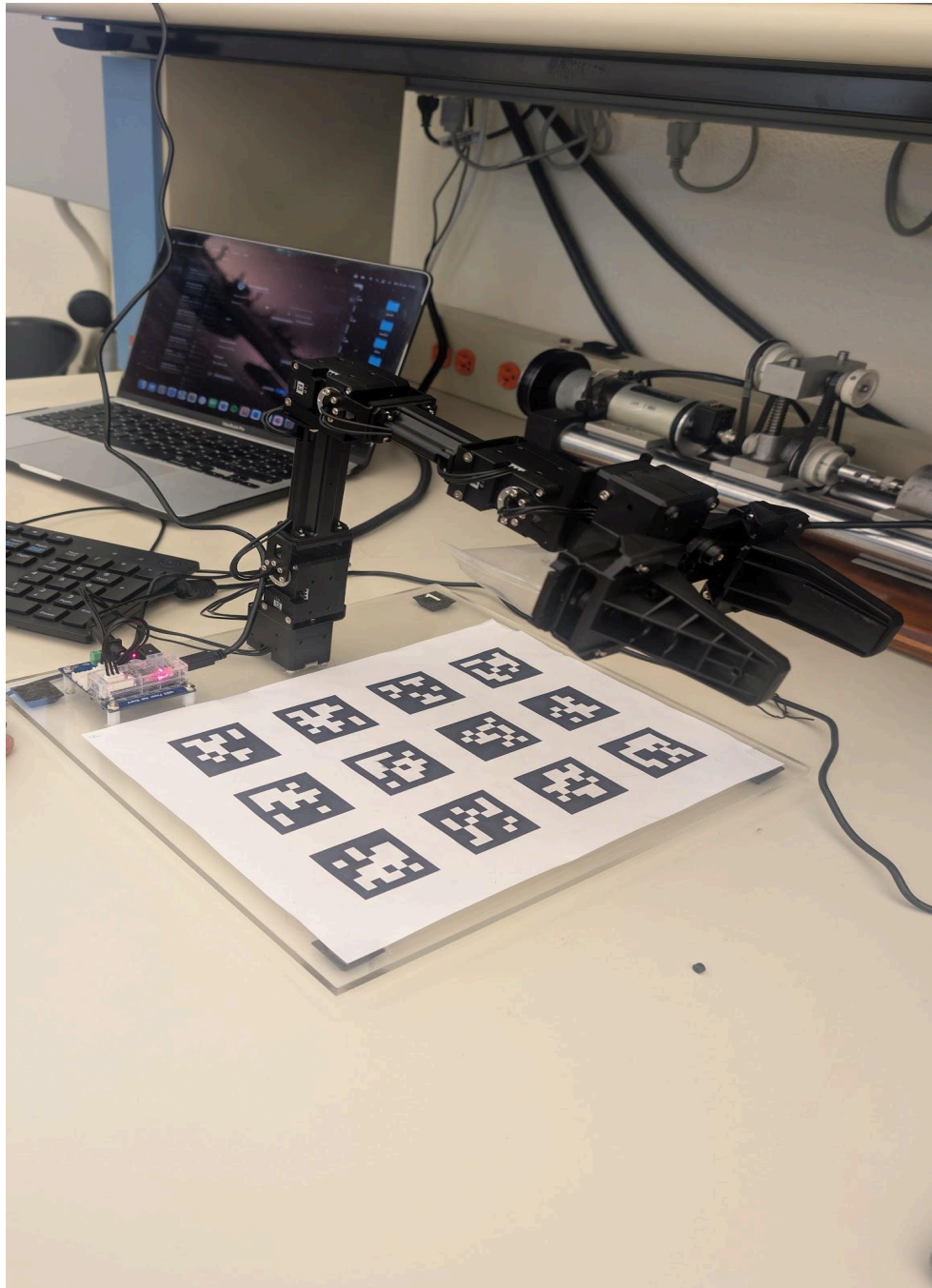


Figure 1: Assembled OpenManipulator-X Robot Arm

```
PS C:\Users\mench> python --version
Python 3.12.10
PS C:\Users\mench> |
```

Figure 2: Installed Python Version

```
PS C:\Users\gdallago> pip list
Package            Version
-----
contourpy          1.3.3
cyclor             0.12.1
dynamixel-sdk      3.8.4
fonttools          4.60.0
kiwisolver         1.4.9
matplotlib         3.10.6
numpy              2.2.6
opencv-python     4.12.0.88
packaging          25.0
pillow             11.3.0
pip               25.2
pyapriltags       3.4.3.1
pyparsing          3.2.5
pyrealsense2      2.56.5.9235
pyserial          3.5
python-dateutil    2.9.0.post0
setuptools         80.9.0
six               1.17.0
```

Figure 3: Installed Required Libraries

The `lab1_base.py` script serves as a starter demo for controlling the OpenManipulator-X through the robot class. It begins by enabling motor torque and setting a time-based trajectory profile, then sends the arm to a home position before moving the base joint through a sequence of waypoints. Joint commands are issued with `write_joints` which handles the conversion from user-friendly degree inputs to the low-level Dynamixel position goals. While the arm is moving, the script continuously polls joint feedback using `get_joints_readings`, giving live updates of position, velocity, and current. At the end, the

gripper is toggled open and closed twice using high-level read/write methods before shutting the system down cleanly. As for the different classes used in this code, the OM_X_arm class is in charge of initializing the robot arm as well as communicating all the needed parameters to ensure good serial communication between the program and the arm. The DX_XM430_W350.py class is in charge of the setting up of the motors as well as functions to control the angles, speed, etc of these motors. The Robot class is in charge of putting together everything else and has functions to set the robot arm to a certain position the user decides.