Autonomous Mobile Robots
2020 Term Project #1

1. Setup

- Setup an Ubuntu 16.04 environment
- Install ROS kinetic, Webots R2020b-rev1 open source robotic simulator and PNU open source software framework according to the guide here: https://github.com/SJ-YI/TB3PNUOpen
- Run start_tb3_sim_1.sh and start_granny_sim.sh to make sure both robots work fine in the simulation.

2. Develop base movement controllers for two robots

- Current code uses /joint_cmd topic (trajectory_msgs/JointTrajectory) to directly control each actuator (wheels, arm joints, grippers etc…)
- Analyse how the /joint_cmd topic is generated based on the keyboard input for both robots
- Make a base movement controller that subscribes /cmd_vel topic (geometry_msgs/Twist), calculates motor velocities and publishes /joint_cmd topic (trajectory_msgs/JointTrajectory) to move robots accordingly.
- The base movement controller should also subscribe /joint_states topic (sensor_msgs/JointState) and calculate and publish the odometry based on the wheel movements (/odom topic, nav_msgs/Odometry)

3. Develop an arm controller for the service robot

- Current code uses /joint_cmd topic (trajectory_msgs/JointTrajectory) to control arm and gripper joints.
- Make an arm controller code for pickup motion, which opens the gripper, extends the arm, closes the gripper, and pulls back the arm in sequence.

- **Submission method: Report + Youtube link (upload as unlisted video)**

Robot information
- Turtlebot 3
    - wheel radius 33mm
    - wheel separation 160mm

- Service robot
    - wheel radius 50mm
    - wheel front-rear separation 200mm
    - wheel left-right separation 225mm
    - lower arm length 170mm
    - elbow offset 30mm
    - upper arm length 190mm
    - gripper length 120mm