Experiment No: 4

Experiment Name: Point to point and continuous path control

Objective:

1. Perform point to point path control of the end effector of a manipulator.
2. Perform continuous path control of the end effecter of a manipulator.

Theory:

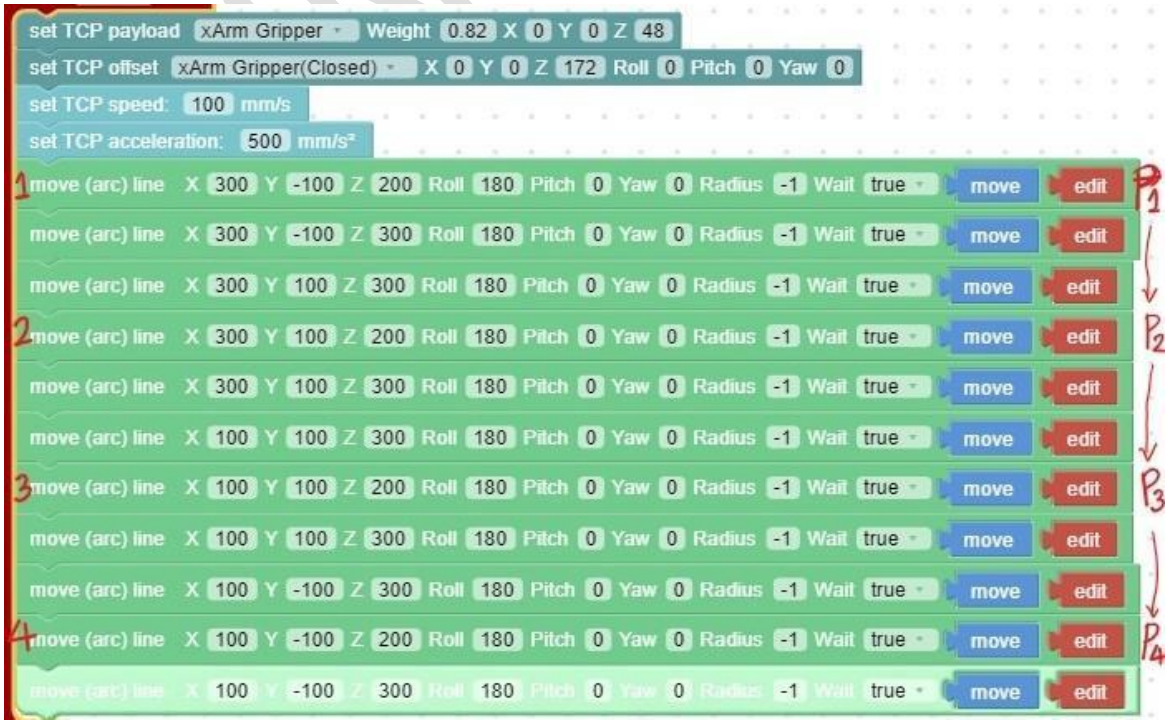
Irrespective of the type of joint-space or Cartesian-space motion planning, one comes across two types of trajectories, namely, point-to-point and continuous. The former is typically applicable for pick-and-place operations, whereas the latter is more applicable for applications like welding, etc. In the Point-To-Point (PTP) motion of a robot, it has to move from an initial to a final joint configuration in a given time t_f. Here, the actual end-effector trajectory is not important. In several applications like welding of two pipes, on the other hand, the path needs to be described in terms of a number of points which are typically greater than two. A set of intermediate positions are set for lifting off and setting down a work-piece so that reduced velocities are obtained with respect to direct transfer of the object. For more complex applications, it is desirable to specify a series of points so as to guarantee better monitoring of the executed trajectories.

Procedure:

1. Turn on the X-arm manipulator.
2. Connect it to the computer using robot IP.
3. Use X-arm studio to program the robot.
4. Run the code to see the end effector movement and halts.

Calculation:

Sample code – Point to point



Steps:

1. Set payload, speed and acceleration.
2. Move the end effector to point $P_1(x_1, y_1, z_1)$
3. Lift the end effector in z direction.
4. Move end effector to align with the x and y coordinates of P_2
5. Adjust in z direction to reach P2.
6. Repeat steps 3,4 and 5 for P3 and P4.

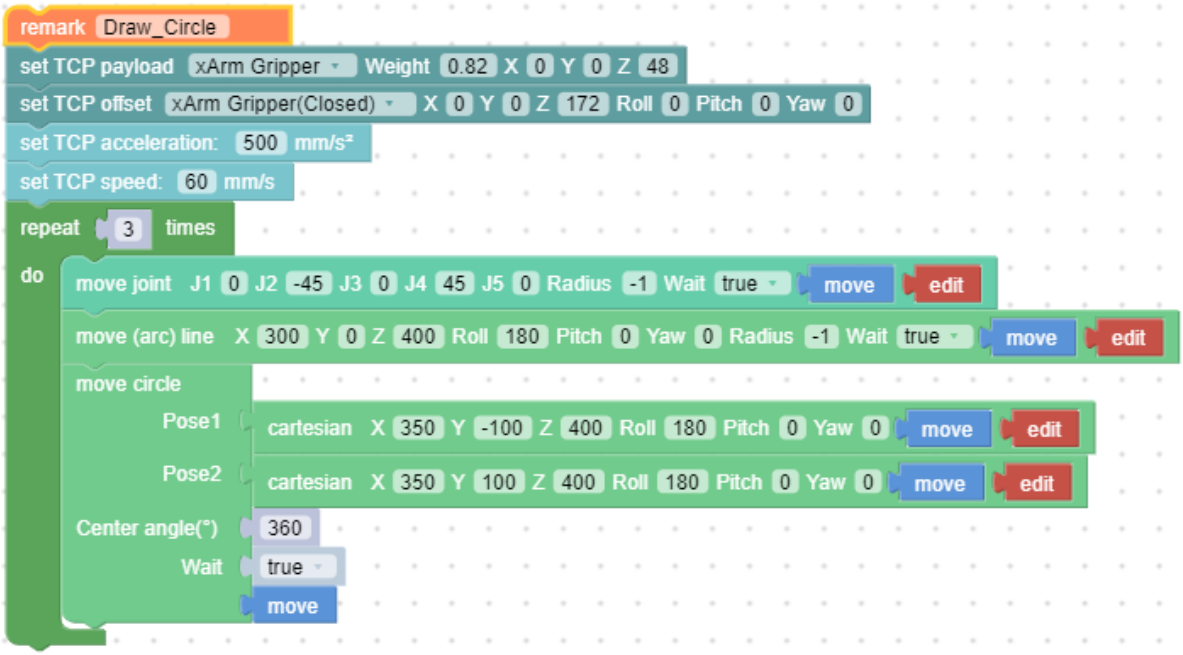
Blockly command description

【move(arc) line X() Y()Z() Roll() Pitch() Yaw() Radius() Wait(true/false)

[move] [edit]】

- Set the Cartesian coordinate target value of the linear motion and the TCP rotation angle in mm and °.

Sample code: Continuous path



Steps:

1. Set payload, offset, acceleration and speed.
2. Move to a convenient point using joint control.
3. Use move (arc) line command to specify the first point on the circle.
4. In the ‘move circle’ block , specify two more points on the circle. Note that distance between y -co-ordinates of these two points decide the diameter of the circle in above mentioned code.(These 3 points are used to create a circle.)

5. To complete one circle ‘centre angle’ should be 360 degree.

Blackly command description.

【move circle position 1 to position 2】

- From current position, the whole circle is determined by current position and position1 and positon2, “center angle” specifies how much of the circle to execute.

【center angle (°) () 】

- Indicates the degree of the circle. When it is set to 360, a whole circle can be completed, and it can be greater than or less than 360; (Note: To achieve smooth track motion, you need to set Wait = false).

Observation:

Result: