Robotics II Laboratory

Report on Task 03

Perception

SS 2020

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INTRODUCTION:

Perception of robot is to make decision and act according to the object detection by using sensor measurements from environment. The application of perception may vary according to the operations like environmental representation, human detection, scene understanding and many others. In real world, machine learning and artificial intelligence techniques are used for robots to learn from sensor data [1].

TASK 1: OBSTACLE AVOIDANCE

The given pioneer robot has 6 ultrasonic sensors in front which is used to detect the obstacles in the range of 1 meter. The threshold which we have chosen is 0.4 meter where the sensor will send data to both left and right motors of the wheel to turn accordingly.

We used distal (rule-based) control method where the sensor values are fed to set of rules (if – then statements) that determines the motor speed [2].

When any of the first three sensors on the left side of the robot detects an obstacle with in the given threshold distance, then we control the motor velocities to move the robot to the right side. Similarly, when the three sensors on the right side of robot detects an obstacle, then the robot moves to the left side. The obstacle avoidance is done successfully.

The robot position is obtained by using robot object handle and saved in terms of time-sequence. The following plot shows the robot's position in x and y axis (meter).

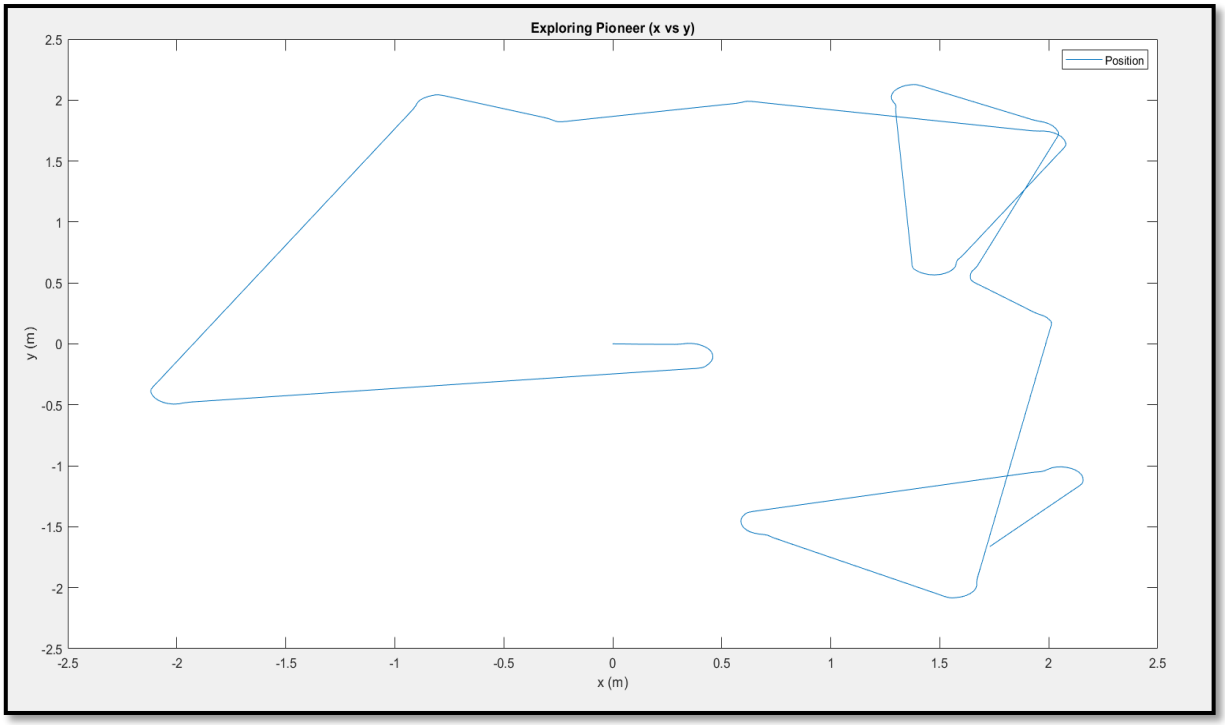

Fig 1: Position of Exploring Pioneer in x and y axis

The following plot shows the robot's position in x and y axis (meter) with respect to time (sec).

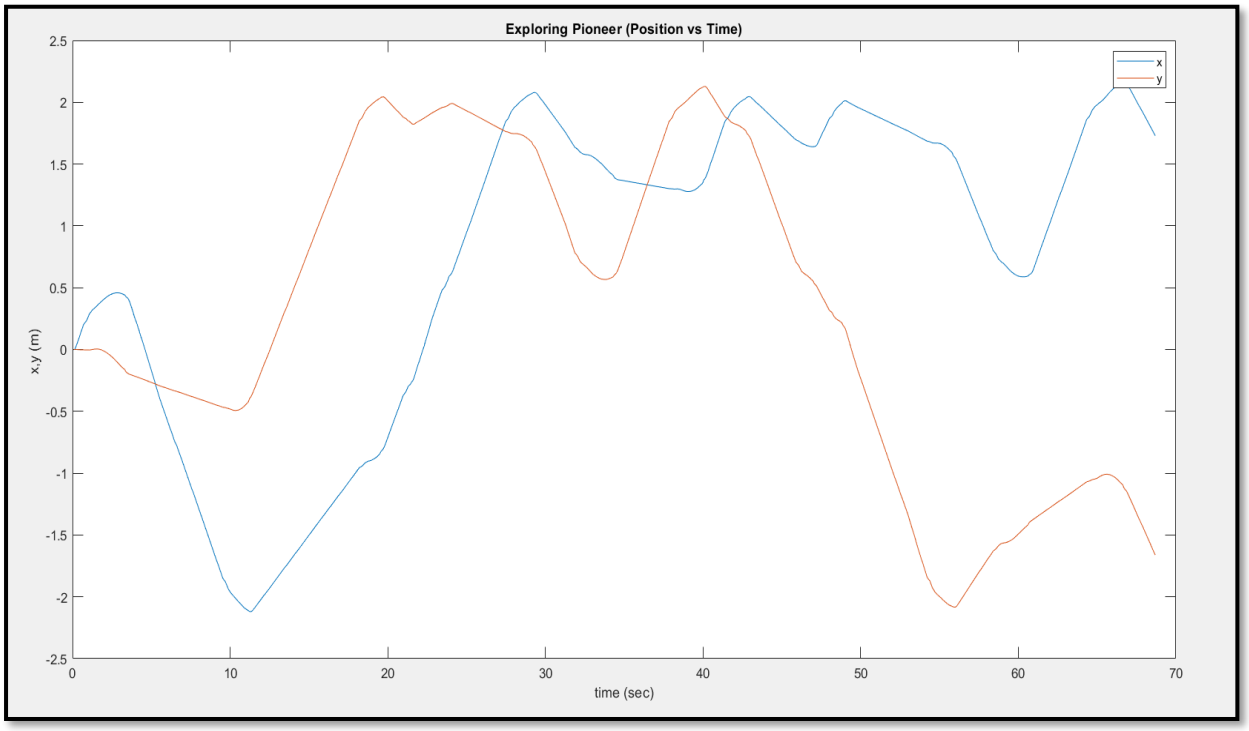

Fig 2: Position of Exploring Pioneer with respect to time

TASK 2: TRACKING PIONEER

To track the robot, a vision sensor is used. The vision sensor is controlled by a pitch motor and a yaw motor to track the blob and maintain its position at the centre of camera image. We have chosen our resolution as 64 x 64. PID controller is used for controlling the pitch and yaw motors in y and x axis respectively.

We get an image with a vector of dimensions 64 x 64 ,which gives the intensity of the blob. This intensity position is compared with reference position and error is found. This error is further given to PID controller. We achieved the tracking by giving proportional value as one and maintaining zero for both integral and derivative.

The robot position is obtained by using robot object handle and saved in terms of time-sequence. The following plot shows the robot's position in x and y axis (meter).

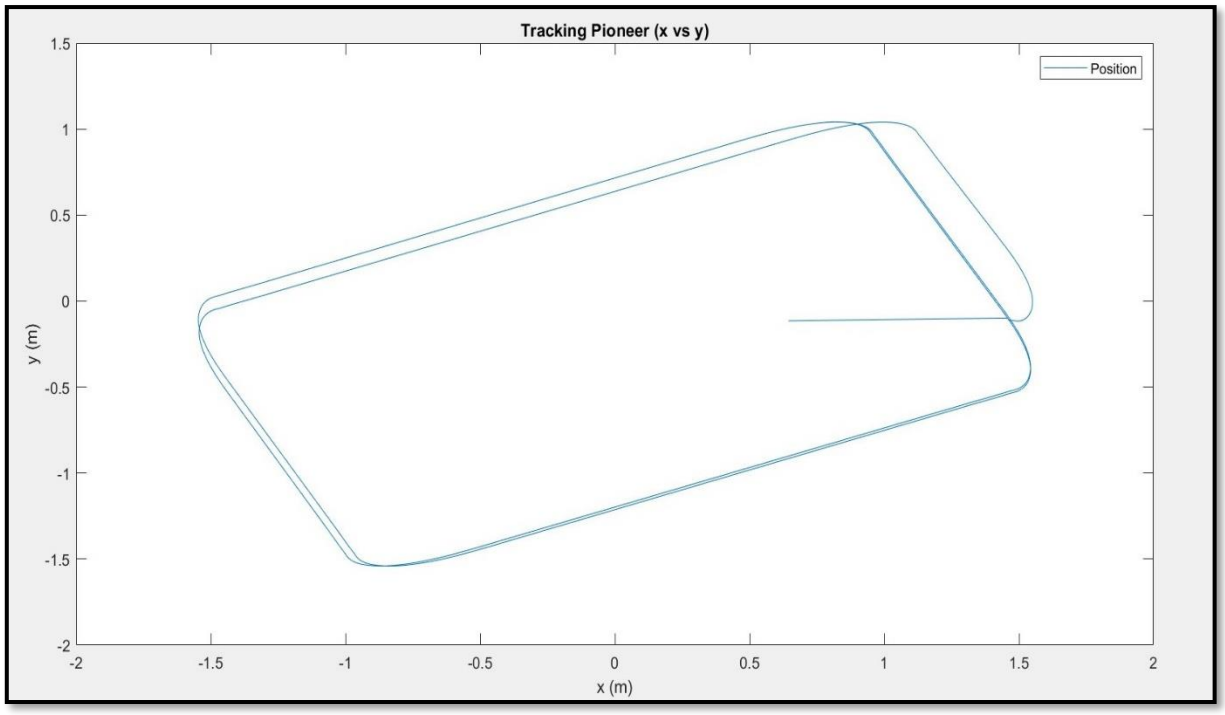

Fig 3: Position of Tracking Pioneer in x and y axis

The following plot shows the robot's position in x and y axis (meter) with respect to time (sec).

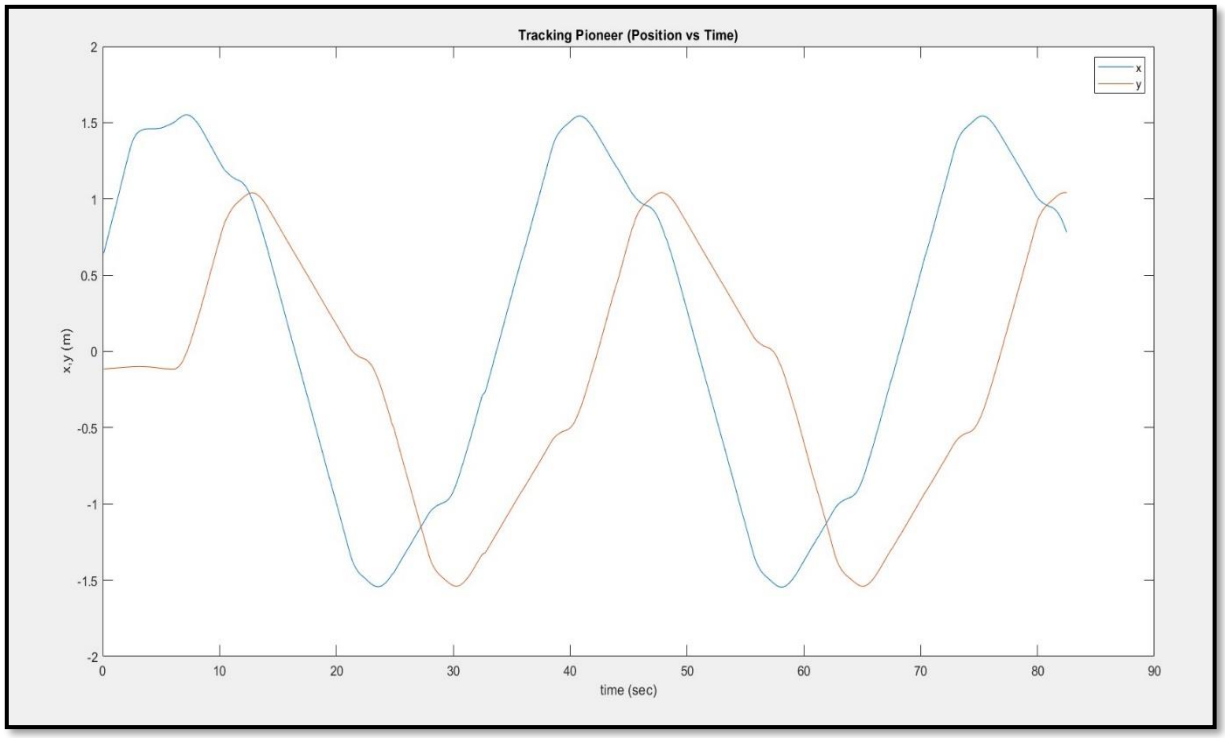

Fig 4: Position of Tracking Pioneer with respect to time

TASK 3: LEADER FOLLOWER

The pioneer leader is equipped with an ultrasonic sensor to detect and avoid any obstacles in its path and move in the environment.

The pioneer follower is provided with RGB-D sensor to detect the pioneer leader. RGB sensor is used for tracking the green blob of pioneer leader and Depth (D) sensor is used to maintain the distance of 1 meter.

The camera's resolution is maintained as 64 x 64. Two PID controllers are used to control the pioneer follower by using RGB-D sensor which detect and track the green blob (sphere) of the pioneer leader. We achieved the tracking by giving proportional value for depth controller as 40 and for the orientation controller as 0.8. The integral gain is 0.01 and derivative gain is 0 for both the controllers.

The robot position is obtained by using robot object handle and saved in terms of time-sequence. The following plot shows the robot's position in x and y axis (meter).

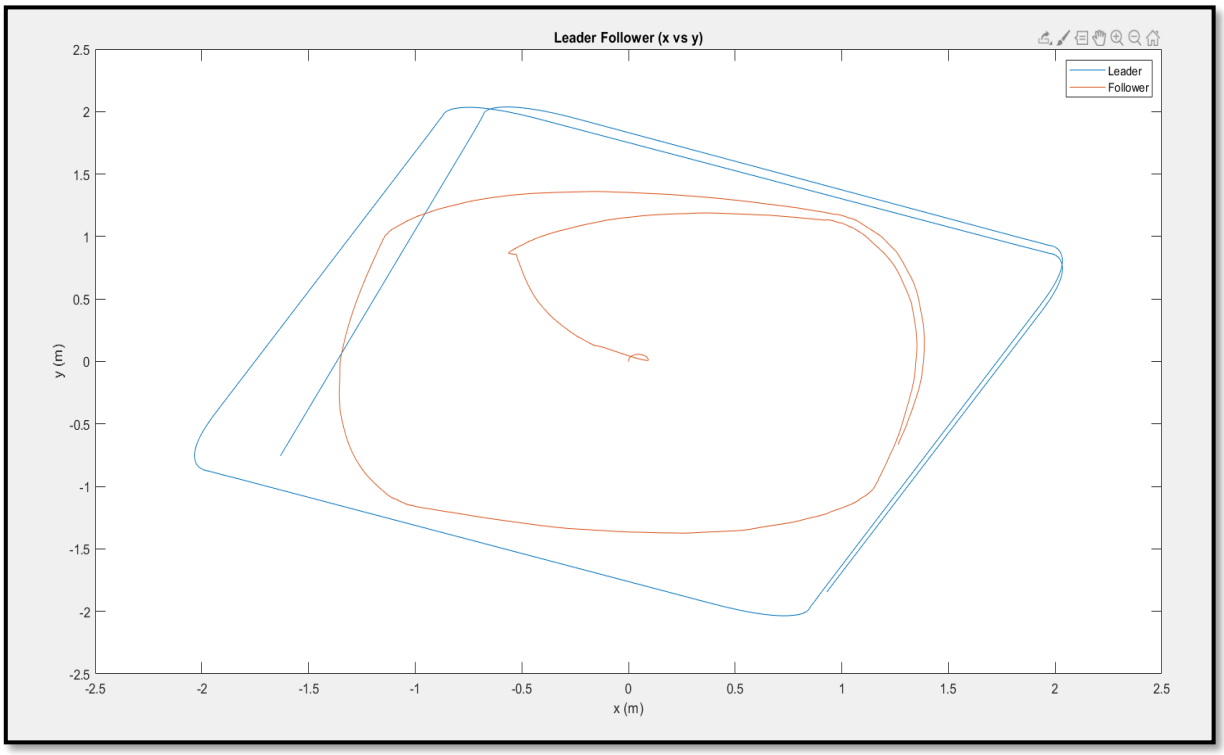

Fig 5: Position of Leader Follower in x and y axis

The following plot shows the robot's position in x and y axis (meter) with respect to time (sec).

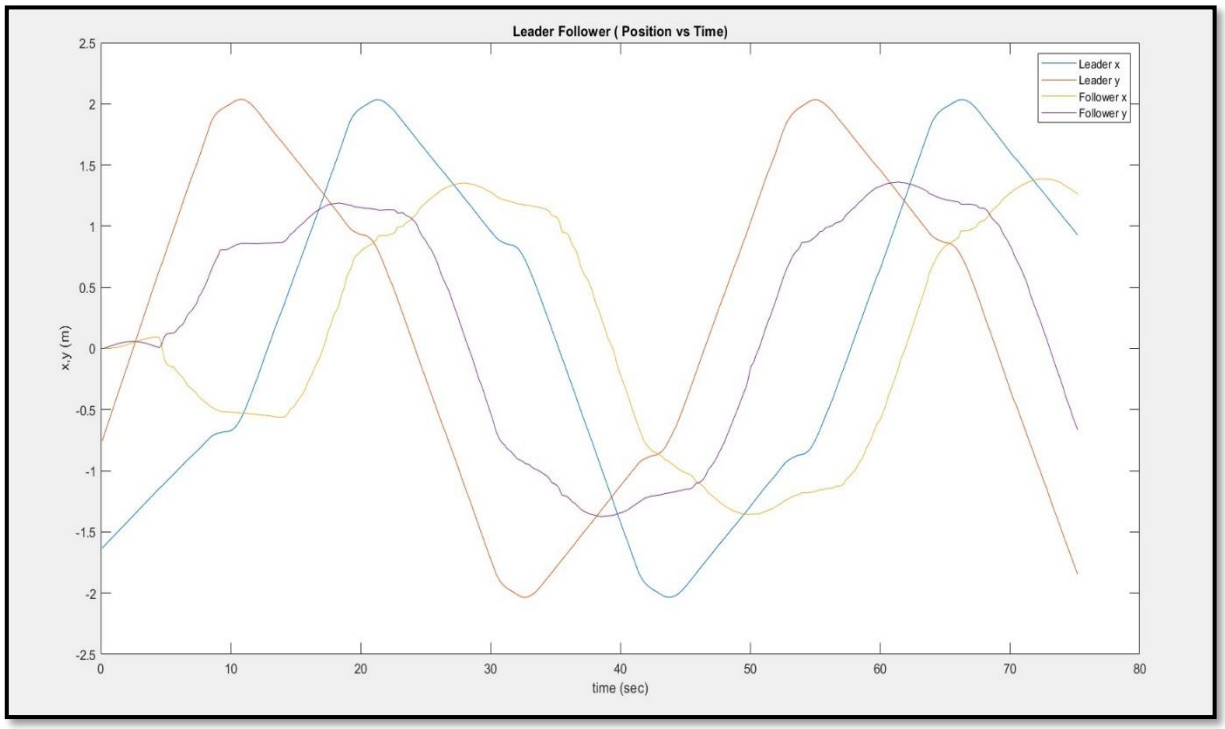

Fig 6: Position of Leader Follower with respect to time

REFERENCES:

1. https://www.intechopen.com/books/applications-of-mobile-robots/intelligent-robotic-perception-systems
2. http://correll.cs.colorado.edu/?p=974