INTELLIGENT ROBOTICS END-SEMESTER EXAM

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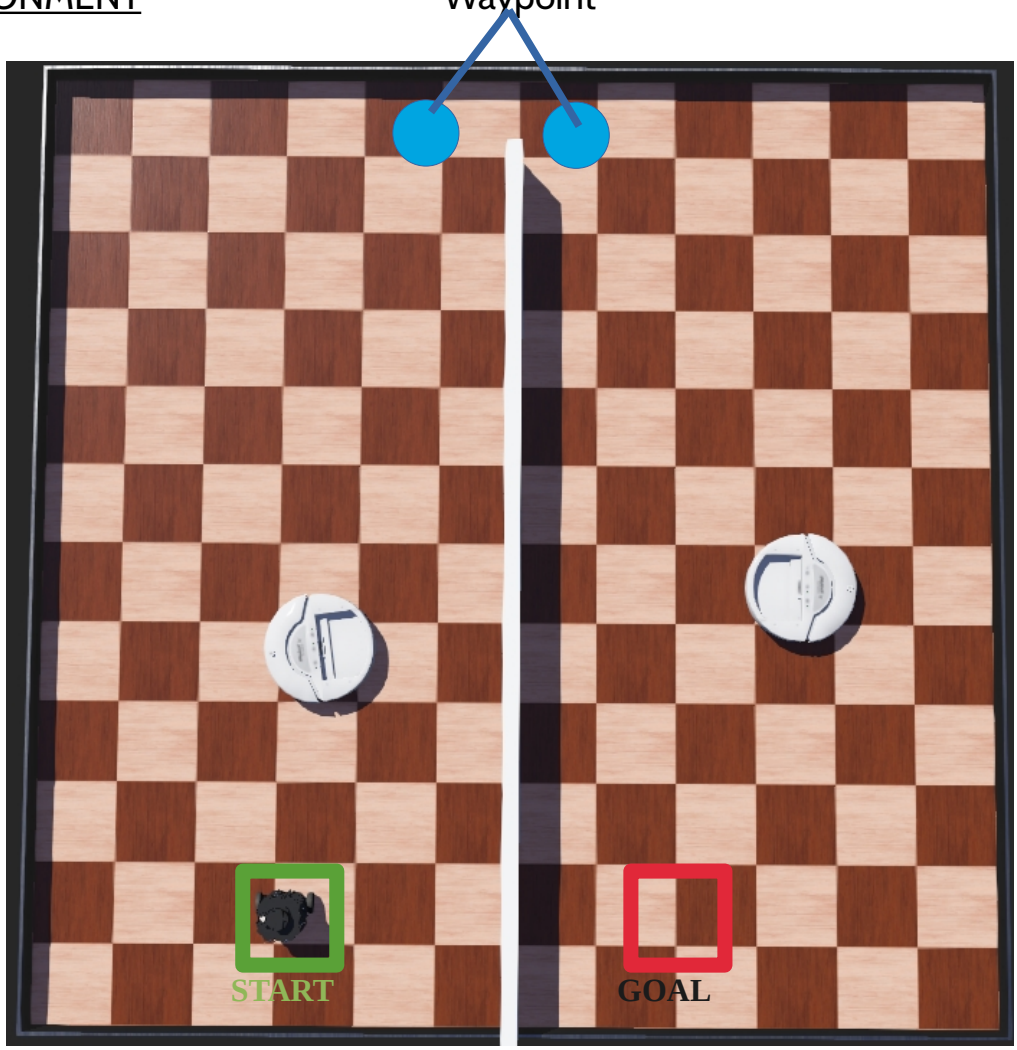
OVERVIEW

Implemented the given task on WeBots where a Turtlebot has to navigate through an environment with two randomly moving create robots. The bot should navigate without any collision with any of the objects such as create bot, wall, boundary and reach the predifined goal.

ENVIRONMENT



CONSTRAINTS

Velocity of Create robot = 16 (adjusted to scale)
Velocity if turtlebot3 = 6.67
Width of opening = 0.25

ALGORITHM USED

With the start and goal, two waypoints are generated in the planning which are close to the opening in the wall. The turtlebot priortizes the waypoints, considering their distance from the start. We employ **line following** from start to the first waypoint and then continue until the goal.

Thereby we can avoid dynamic objects upto a great extent. With a speed difference of more than double between turtlebot and create, it is very challenging to steer in order to avoid collision.

DETECTING OBJECTS

Even though the turtlebot3 has a 2D LiDAR, the create bot doesnot have the height coverage to detect the bot. Moreover the 2D LiDAR also cannot detect the boundaries as they too donot have the height clearence. Hence I used Supervisor package in WeBots to acquire the position and orientation of the objects and turtlebot.

OBSTACLE AVOIDANCE

While traversing to the waypoint, for obstacle avoidance we detect the robot in our enclosure. Knowing its position, orientation along with our position orientation, we compute both the lines and their intersecting point. We then **compute the time taken to reach the intersecting point for each robot and take decision based on it**. The robot moves with constant velocity while there is no object in its vicinity, If the substracted time falls below a threshold, the turtlebot stops and then moves in a direction to avoid collision.

PATH TRACING

The path traced by the turtlebot and create robot for an instance is shown below.