Cooperative localization between robots using vision and path planning algorithm

Charles Koduru

*Robotics and Mechatronics Engineering
Kennesaw State University
Marietta, GA, USA
ckoduru@students.kennesaw.edu*

M. Hassan Tanveer

*Robotics and Mechatronics Engineering
Kennesaw State University
Marietta, GA, USA
mtanveer@kennesaw.edu*

Abstract—The aim of this article is to provide a solution for obstacle avoidance in order to navigate a robot from an initial point to a final point. The considered robots are i) NAO Humanoid robot, and ii) Rosbot 2.0 a wheeled robot. The main focus of this article is to understand the collaboration between robots to reduce positioning errors. By integrating Inverse Perspective Mapping techniques (IPM) and the A-Star algorithm the image processing robot (NAO) would be able to instruct the wheeled bot (Rosbot) to navigate around obstacles more effectively. This method shows the capability to advance the collaboration between robots in order to diagnose different collisions and develop different path following techniques. Even though odometry is a widely used technique for calculating the position of robots, it has certain drawbacks in the long run. To combat this, we addressed solutions to these drawbacks by using Inverse Perspective Mapping and the A-Star algorithm. When IPM is applied, calculating the position of the obstacles relative to the wheeled robot makes the path network more accurate. Additionally, by applying the A-Star algorithm the path network can be analyzed to find the most direct route. The attractiveness of this methodology simplifies the navigation process by analyzing the data at a birds-eye view and computing decisions that will instruct the wheeled robot to take the shortest path. The performances of the proposed approach are analyzed by means of a series of experiments performed in a static environment.

Index Terms—Static Environment, Humanoid Robot, Inverse Perspective mapping, Path planning obstacle avoidance

Fig. 1: NAO Humanoid robot with wheeled robot and green color obstacles in the environment