

ASSIGNMENT 1

BILAL UBAID

MOBILE ROBOTICS

REG. NO. 399675

PAPER:

Simulation of an Autonomous Mobile Robot for LiDAR-Based In-Field Phenotyping and Navigation (2020)

ROBOT USED:

The system modeled in this paper is an unmanned ground vehicle (UGV) called the Phenotron. The Phenotron is a 4-wheel rover that utilizes a skid steer drive system.

NAVIGATION ALGORITHM:

A simple navigation algorithm was implemented for use with the LiDAR based navigation strategy (Algorithm 1). The LiDAR based navigation strategy was designed to be able to move within crop rows despite occlusion and misaligned crop rows without any global positioning. However, for use in a crop field with multiple rows, additional intelligence is needed. An algorithm is proposed that switches between the LiDAR based navigation, which is robust in navigation between crop rows, and a GPS-based navigation strategy, which ensures that the robot is going to the correct user-defined crop row. The GPS guided navigation algorithm used is called the Pure Pursuit, which finds the linear and angular velocity needed to go to a specific point in space.

Result: Complete navigation of crop rows

d_{cr} = distance between crop rows;

d_{wp} = distance to next waypoint;

while *Not at last GPS waypoint* **do**

if $d_{wp} > d_{cr}$ **then**

 Perform LiDAR based navigation;

 Update d_{wp} ;

end

if $d_{wp} < d_{cr}$ **then**

 Perform Pure Pursuit navigation to next waypoint;

 Once waypoint is reached, next waypoint is updated;

end

end
