The development of the waypoint following logic using pure pursuit via ROS publish and subscribe system

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순수 추종 기반 로스 송신 및 센서 시스템 개발에 관한 연구 관한 연구

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Abstract

The waypoint following logic is developed and it is incorporated into ROS publish and subscribe block for 2 wheel mobile platform. Firstly, the waypoint follower in mobile robotics simulation toolbox in simulink is introduced. On the other side of research, platform can be moved through ROS connection. In this presentation, the development of waypoint following logic is experimented with the real mobile robot with ROS connection.
Index Terms—Waypoint following logic, ROS connection, Modified pure pursuit method, Coordinates change.

Ⅰ. Introduction

New models are often encountered in the agricultural, protection, and precision sectors. Computers, artificial intelligence, and big data technologies have been used to develop intelligent farming systems, particularly for farming robots [1]. A recursive technique was applied to the path-tracking problem of the differential-type model by composing a chained form of the system [2]. Pure pursuit is previously studied in [3]. This paper introduces a modified pure pursuit algorithm recently introduced by MathWorks. First of all, the ROS installed at Laptop 1 is connected into the mobile platform which results in the host laptop. Secondly, the MATLAB/Simulink installed at Laptop 2 is connected into the ROS laptop 2 which results in test node. Finally, the mobile platform is controlled by Laptop 2 through the paper.

Fig. 1. ROS (Laptop 1) and MATLAB Connection into 4 wheel mobile platform

Ⅱ. Method

The waypoint following logic is represented by the waypoint is set up on the Fig. 1. In the right side of MATLAB laptop in Fig. 1, the modified pure pursuit algorithm is designed to pursue the predetermined waypoints. In MATLAB laptop, the generated linear v(t) and angular w(t) is sent to the ROS publish block. The pure pursuit method is applied to our mobile robot given as Here,

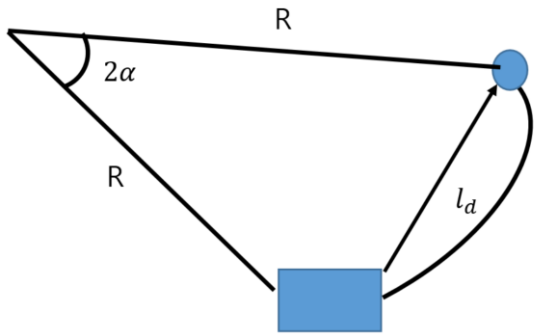

Fig. 2. Pure pursuit method description

we used that the distance between the rear wheel and the target point is ld. First of all, the experiment is conducted via pure pursuit method. Secondly, the revised input is generated through transfer estimation model. The experiment was implemented after scanning obstacles in the Chungbuk National University. We used the distance between the rear wheel and the target point, namely look ahead distance l_d, then we obtain

$$\frac{l_d}{sin(2\alpha)} = \frac{R}{sin(90-\alpha)} \quad (1)$$

The detailed calculated heading angle is described in [4].

The avoidance trajectory is plotted and pure pursuit was implemented by taking start point and end point of the map. Fig. 3 explains that the platform takes a path that avoids a setting obstacle.

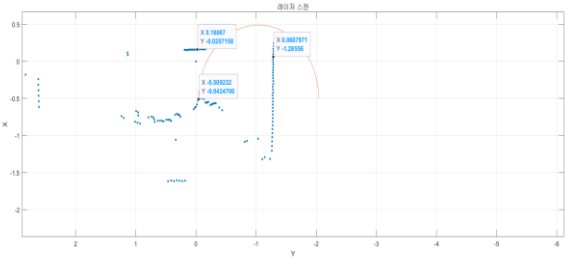

Fig. 3. Obstacle avoidance experiment within Lab in Chungbuk National University.

Ⅲ. Conclusion

In summary, this study demonstrated the successful implementation of a modified pure-pursuit waypoint following with ROS publish and subscribe block using MATLAB/Simulink. Firstly, the waypoint following logic is introduced. Based on the system design, ROS publish and subscribe block is incorporated into waypoint logic. In the future, the interface will be implemented for the 4 wheel independent steering system. Furthermore, the output feedback control is applied to the real experiment using open loop experiment by achieving angular velocity, input and heading angle output.

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