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Trajectory Planning and Motion Control of Unmanned Forklift for Efficient Operation in Automated Warehouse

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***Abstract*—This paper presents a navigation strategy for an autonomous forklift used in automated warehouse. The linear segments parabolic blends-based trajectory planner and model predictive control-based motion controller are designed. The performance of the suggested method is demonstrated via Matlab simulations in a warehouse environment.**

***Index Terms*—Mecanum wheel robot, Linear segment parabolic blends, model predictive control**

I. Introduction

Recently, the demand for mobile platforms based on autonomous driving technology is explosively increasing. Among the various application fields of autonomous driving, autonomous mobile platforms are being used in production and manufacturing to improve productivity and secure industrial safety. In this study, navigation technology for an unmanned forklift that autonomously transports heavy parts or products in an automated warehouse is developed.

II. Navigation Algorithm

The navigation algorithm includes path planner, trajectory planner, and motion controller. Fig.1 (a) shows the structure of the navigation algorithm. In this paper, we focused in the last two aspects such as trajectory planner and motion controller.

A. Trajectory Planning via LSPB

The first part is trajectory planner, according to the working environment and task, the movement speed or rotational speed should be constrained. When these conditions are defined, the LSPB [1] designs trajectories for x, y and θ of the agent as a function of time and these trajectories are used as the reference for the motion control.

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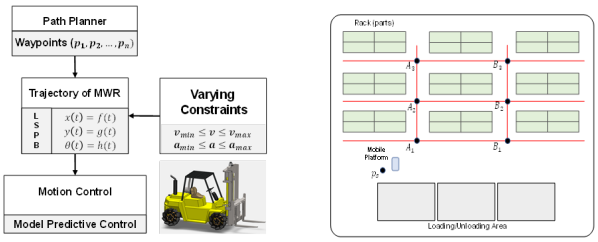

(a) Navigation algorithm (b) Automated warehouse

Fig. 1: Navigation algorithm and simulation environment

B. Model Predictive Control-based Motion Control

The trajectories are given, the MPC [2] is used to move the robot. Since the characteristics of MPC can apply constraints of inputs, safe and efficient motion control is possible by applying control conditions suitable for the working environment and working conditions.

III. Conclusion

In this research mecanum wheel based robot navigation algorithm under warehouse is discussed. As the future research, mecanum wheel robot hardware is developing and the filed test will be conducted.

References

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