

Unnamed MPC Project Report

Jonas Wagner

Abstract—Insert Abstract

I. INTRODUCTION

II. PROBLEM DEFINITION

A. Model Definition

B. Path Planning

The objective is to create high-fidelity MPC controller to produce an optimal trajectory to reach a waypoint given the occupancy map of the environment. This controller will then be used to generate training data for a neural network which will be able to perform an approximation of this controller in real-time.

From the perception stack, the current vehicle states (local and global) will be known to some uncertainty and the surrounding environment will be processed into a predicted occupancy map. This occupancy map will be assumed to already have weights corresponding to where it is safe/ideal for the vehicle to be in the future.

III. PROBLEM SOLUTION

The MPC Controller for path planning is formulated with the current state and model update equations as hard constraints, an objective to minimize the time and distance to reach the future waypoint, and introducing the occupancy map as soft-constraints within the objective function.

A. Model Constraints

B. Cost Function

IV. SIMULATION AND RESULTS

V. CONCLUSION

TODO: add something here...

[1]

REFERENCES

- [1] S. Cheng, L. Li, X. Chen, J. Wu, and H.-d. Wang, "Model-predictive-control-based path tracking controller of autonomous vehicle considering parametric uncertainties and velocity-varying," *IEEE Transactions on Industrial Electronics*, vol. 68, no. 9, pp. 8698–8707, 2021.

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