



Centralized Motion Planning for Autonomous Vehicles in a City Grid

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Introduction

- Over the coming decade, Autonomous Vehicles (AVs) are going to become increasingly predominant
- Traffic Management for AVs allows for coordinated control of the traffic
- This will help build faster, more efficient transportation systems, with better collision avoidance and traffic control.
- This project proposes to design a centralized motion planning unit, responsible for providing AVs with a global motion plan
- The goal of this central unit is to find optimal motion plans for the all the AVs in its jurisdiction, while considering priority vehicles such as emergency vehicles



Background

- There are motion planners for individual AVs that can plan trajectories from a start to end point
- There are collision detection and avoidance systems in place that perform local planning
- However, these are not sufficient or sophisticated enough to coordinate their motion when interacting with multiples AVs.
- This can lead to suboptimal trajectories, deadlocks, or mismanagement of Emergency vehicles
- We plan to design centralised system to control the motion planning.
- Instead of using red lights at intersections, we plan to vary the paths and velocities to avoid vehicles coming together



Methods

Desired Features:

- Optimal Motion Planning for multi-robot systems(AVs)
- Avoidance of deadlock situation and easy traffic flow through the city grid
- Prioritization for emergency vehicles.

Assumptions:

- All roads are unidirectional
- Vehicles have 5 discrete speed levels
- Vehicles have a limited fuel level, which reduces as per the length of the path



Scope

- Design and visualise 2-D City grid in python env.
- Design Centralised motion planner system for multi-robot systems in dynamic graph environment .
- Use of ROS for communication between multiple robots and Centralised motion planner system.



Thank You!

TL;DR: Cars go vroom; they no go boom