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Problem Chosen

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Summary Sheet

Nowadays, with the rapid development of autonomous driving technology, building a automatic driving system will no longer be a rediculous thought. In this system, connections can be built between the autonomous driving cars, the smart lampposts installed with sensors and communication units and the cloud server. So we need to carry out a plan which will make the transportation system easier and create an indicator system to evaluate the smart lamppost modification plans.

Smart Lamppost Deployment

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1 Introduction

1.1 Background

Nowadays, with the rapid development of autonomous driving technology, building a automatic driving system will no longer be a rediculous thought. Based on recent technology, autonomous driving technology has begun to move from partial drving at the L2 level to conditional driving automation at the L3 level.

According to the degree of automation of the vehicle[1], when the system cannot withstand the working conditions, the driver needs to take over the malfunctioning vehicle. After activating the automatic driving system, the vehicle itself can complete tasks such as steering, acceleration, deceleration, and reaction. The status detection and reaction are carried out under the operating conditions specified by the automatic driving system.

In order to facilitate vehicles which will better implement the L3 level autonomous driving tasks, using smart lampposts as the main representative of the smart roadside infrastructure. By refitting existing ordinary lampposts into smart lammposts equipped with sensors and communication units. They can collect road data through sensors and upload them onto the cloud server, and then download to the original lamppost or share it with other ones after the server completes the calculations. The autonomous driving cars can obtain the road data by communicating with neighboring smart lampposts.

1.2 Problem Restatement

In this model, we actually need to have some detailed information about the whole transportation system in the area. In addition, we need to konw about the driving pattern of the cars to make further dicoveries about the autonomous driving system.

So the problem is divided into 3 main parts:

- Build a framework for evaluating the smart lamppost modification plans based on cost and coverage of the road by the sensor and the WiFi communication.
- Give a plan for smart lamppost modification in an area of any city.
- Evaluate the lamppost modification plan based on our model and find the strengths and weaknesses of our model.

1.3 General Assumptions

- **All the cars have the same scale.**

  We assume that all the cars can be seen as a car which is 4.8m in length and 1.6m in width. This can flatten the neighborhood which we take into consideration.

- **The impact of buildings is not taken into consideration.**

  Since the distance between two roads is far from the detection zone, the buildings will not affect the detection of the road.

- **Vehicles drive on the left side according to the standard of HongKong.**

- **Neighborhood intersection is not taken into consideration.**

2 Evaluation Model

2.1 Problem Overview

In this model, we will establish an indicator framwork for the purpose of evaluating smart lamppost modification plans. We will mainly discuss the effectiveness of the plan when it comes to steering, acceleration and deceleration and find a better way of operating the plan.

2.2 Assumption

- **All the destinations can be detected and can be abstracted as a dot.**
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2.3 Notation

Symbol	Stands For	Unit
ω	Rotate Speed	π/s
a_{start}	Acceleration Speed	m/s^2
a_{stop}	Decleration Speed	m/s^2

2.4 Result

2.5 Verification

3 Strengths and Weaknesses

3.1 Strength

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3.2 Weaknesses

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Fig. The Map of Selected City Areas

Reference

[1] https://www.sae.org/standards/content/j3016_201806/