Master Project

Experimental Comparison of Autonomous Vehicles Routing Optimization Algorithms

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Abstract

Your abstract.

Contents

1 Introduction

General problem: two types of services, on-demand and fixed-line => explain why we focus on fixed line (all constraints of the platform) Fixed line because now roads are not made for more complex systems

2 Related Literature

The scope of vehicle scheduling problems related to our specific case study can range from fixed-line bus services to on-demand systems. In fact, electric shuttles' routes and stops are predefined but timetables can be flexible to respond to the known real-time demand. The set of constraints differs from traditional bus transportation, for example workforce regulations can be eliminated as the shuttles are not human driven but a battery management component needs to be introduced into the planning process. As we will see in this chapter, current research often concentrates on one specific aspect of the scheduling strategy, simplifying some constraints, assessing the system's performance using various types of metrics and considering different inputs. In what follows, we describe in section 2.1 some techniques used in the traditional public transport industry to guarantee a good quality of service. In section 2.2 we describe the concept of Demand-Adaptive Transit Systems. Finally, we detail in section 2.3 an approach proposed by the Urban Transport Systems Laboratory (LUTS), EPFL, for scheduling autonomous vehicles activities.

2.1 Public Transport

There are two possible fixed line bus transportation services:

1. **Fixed schedule**: buses are supposed to arrive at predefined times and respect their timetables.
2. **Constant Headway**: a desirable headway has to be achieved to satisfy the demand, which means that the time between two consecutive bus arrivals should be constant at each stop.

However, both Well suited for strong transportation demand and many buses with high capacity.

2.2 Demand-Adaptive Transit Systems

2.3

3 Problem Formulation

3.1 Input

3.1.1 Vehicles

they cannot take over other vehicles, need to follow the loop unless when they go to charge they don't compute the headway and go max speed

3.1.2 Bookings

3.1.3 Graph

s

4 Methodology

4.1 Simulation Framework

graph explaining framework

4.1.1 Simulated Vehicles

start: spread on the line

4.1.2 Reported Metrics

Logs fetched from database - vehicle logs - journey logs output graph

4.2 Scheduling

Why we don't follow exactly luts: adapt the vehicles on the fly on one fixed route

4.2.1 Vehicles' Activities Schedule

when they arrive at station, if they can they pick up the booking (based on booking size) they drop off bookings that finish here they wait based on headway computation *battery* check if it is under threshold finish to drop off everybody and go to charging station

4.2.2 Headway

compute headway based on fleetorchestrationservice

4.2.3 Dynamic Fleet Size

how choose vehicles to send to charge and which ones to activate

5 Numerical Experiments

Real environment

5.1

5.2 Simulation Settings

speed

5.3 Graph

Unless stated, charging locations at same place

5.4 Optimal Headway

5.5

5.6 Simulated Demand

5.7

6 Conclusion