The opposition of master's thesis:

"Analysis of model-based decision support systems for traffic management"

Summary

The report contains a decision support system (DSS) research, which helps traffic operators choose the optimal way to improve traffic. The goal is to analyze traffic models that can be used to regulate traffic. Dynamic's potential as a decision-support system is also explored.

Traffic management, traffic control, decision support system, and incident detection articles were investigated to discover simulation software characteristics that match decision support systems. Most of the study focuses on simulation cases using Dynameq to answer questions 3 and 4 of the research questions.

The literature review concludes that the amount of data and its sources are the key element to better managing traffic aiming to enhance traffic efficiency. Using real data from Stockholm, an evaluation is carried out to determine whether or not Dynameq is capable of functioning as a DSS tool with using queue length and travel time as evaluation metrics. It has been discovered that the Dynameq software cannot manage real-time data in the manner required for traffic management. It provides the necessary functionality that, when paired with other critical functionality from other accessible tools, can create the requisite outputs for real-time active traffic management. At the same time, it is able to do this since it provides the functionality that is required.

The report suggests gathering a large amount of data in order to get a better comparison between the results that were observed and those that were simulated. In addition to this, providing additional information regarding the traffic incident and the responses of drivers. Both of those recommendations are put for further work studies in the future.

Introduction

Chapter 1: In the introduction, the significance of traffic management is clarified, as is the connection between predicting future states and the ability to maintain more effective control over traffic. In addition, it highlights the importance of data collection methods as they have a direct influence on the outcomes of estimation and prediction; data is the foundation of a decision support system (DSS). The reader is attracted in because the introduction provides an overview of the given subject, as well as the references are pertinent to the research topic.

The aim of the study is related to the two research questions, as the purpose of the study is to provide the requirements for traffic simulation tools for making decision-support systems, and that would be done by conducting analyses and evaluating the potential of using Dynameq software.

Regarding research questions, RQ1 & RQ2 align with what has been mentioned in the introduction. At the same time, it needs to be clarified for RQ3 & RQ4; Dynameq software does not appear in the introduction text.

Theoretical Frame

Chapter 2: The Traffic Management concept and definition are presented with details that give more information and knowledge when read through it. The chapter contains satisfying traffic management approaches, strategies to minimize capacity drop drawbacks, redirection of traffic and tolls, and traffic simulation, models. There is much additional information, but the presented literature is relevant to the thesis.

Chapter 3: The theory that is discussed in this chapter is relevant to the objective, also the research questions because it provides additional information regarding DSS as well as the structural component of DSS.

Chapter 4: Contains a variety of traffic simulation software and tools, as well as references to earlier research conducted in the field of DSS.

In general, Chapters 1 and 2 are packed with useful information that provides the reader with a comprehensive understanding of DSS and the role that it plays in traffic management.
On the other hand, organizing the flow of ideas would reduce the amount of writing that needs to be done and improve the reader's ability to follow along. If Chapter 4 were to concentrate on the Dynameq software and include previous analyses and studies carried out using other software, then it would be sufficient. This would make it clear that Dynameq is not the only tool for analyzing DSS.

Case Study

Chapter 5: The source and method of data collection were clearly stated. The data collection method and filtration procedure have been described with justification for each step; given the objective, the empirical description for selecting traffic incidents makes sense. However, L-t diagrams for incidents require clarification and additional illustration. Additionally, the incident definition section is anticipated to appear in the theory chapters.

In the section on case simulation, the chosen incidents were simulated. In the heatmap figures, both simulated and probe data output comparisons were presented. The comparison was made in terms of the incident's negative effects on traffic situations, such as queue length and travel time, which makes sense when monitoring the effects of incidents.

Discussion

Chapter 6: This chapter includes a discussion regarding the results and possible future studies. The findings are clearly presented and simple to understand. However, the literature discussion could be placed earlier in the report, so the reader follows better. Maybe move it somehow in chapter 2,3.

It is concluded that DSS depends on the environment and the data. Also, when it comes to active traffic management, Dynameq hardly qualifies as a model that runs in real-time. Additionally, it is not possible to simulate an incident with more details or adopt different traffic management strategies. However, it was found that the Dynameq software could partially duplicate the incident.

Conclusion

Chapter 7: In the conclusion, readers will find a summary of the study as well as answers to any questions raised by the research. The report comes to a satisfying and effective conclusion, and the information that is presented is credible and well-written. Efforts to enhance what has been accomplished so far are suggested, which, in terms of comprehension, makes perfect sense.

Question 1

In methodology, it is mentioned that to answer Q4, Dynameq, traffic management software, is used as a tool. Which type of traffic simulation model is used (microscopic, macroscopic, or mesoscopic)?

- Is it possible to use macroscopic traffic simulation to conduct this study?
- In that sense, can we say this study is an evaluation of using Dynameq software rather than the selected title as it focuses on Dynameq?

Question 2

On page 11: *Hierarchy information, it is mentioned that as the level increases, the data required for traffic management is reduced. At lower hierarchical levels there is more data and less information*"

- In a simple logic, whenever the covered area is big, the needed data and resources are needed! Could you tell us more about this figure?

Question 3

On page 39: the direct and indirect measurement methods are mentioned. The indirect is used in this thesis is for simulation incidents. Please explain them again and why you chose the indirect method.

- How did you simulate the incident? And based on what?

Question 4

On page 85, regarding speeds comparison: "*In the case of Dynameq, the speed starts at the value of free flow speed and slowly decreases over time as the morning peak appears. The speed is, however, lower than what was observed in the MCS data.*" And after you compared Incident 56230, on page 86, "*the bottleneck appeared further the stretch and approximately 15 minutes earlier than what the incident data say*"

You said:" This *could mean that the traffic breakdown was not caused by the incident itself but rather by some other circumstances*".

Can we trace the cause of the problem and say this is due to calibration??

Is it possible to conduct a hypothesis test or confidence interval to compare the speed results?

Question 5

The idea behind using many iterations is unclear; why, especially 40 iterations? Why not 20?

Question 6

What other metrics can be used in the comparison?

Question 7

It was mentioned that autonomous vehicles would help in the area of traffic management. Can we conduct this study data using Dynameq but with changing vehicle characteristics and behaviors to autonomous vehicles and predict the impact on traffic situations?

Question 8

On page 101"*Hence, Dynameq could be considered useful software for a decision support system within the implementation of other tools and software*".

Could you explain more about how did you come to this point?

- Is DSS needed to be for active or proactive traffic management? Also, which level (active or proactive) is Dynameq better to use?

Question 9

What was the most part that took the longest time to work on the thesis?

Question 10

Is there anything you would have changed or added if you had additional time to complete this project to make it better?

- For future studies "*More information about incidents is needed to draw more conclusions on the comparisons between simulated and observed traffic states*." Like what?