ABSTRACT

This thesis aims to enhance passenger comfort during driving by integrating Data Analysis, Artificial Intelligence (AI), and Simulated Environments. The primary objective is to collect, analyze, and determine the personal comfort levels experienced by passengers, ultimately improving the overall passenger experience.

Through the use of diverse software and hardware solutions to gather data from various vehicle sensors, this research develops an AI system capable of predicting comfort levels during driving. These sensors capture a range of data, which is processed to identify trends in passenger comfort. The AI model analyzes these patterns and provides real-time predictions, offering insights for enhancing the driving experience.

Additionally, this solution includes an application that visualizes users' personal comfort levels, fostering new ideas in ride-sharing and autonomous driving systems. Integration with simulated environments, such as the CARLA Simulator, is crucial for testing the AI model in varied driving scenarios, ensuring its robustness and adaptability.

By introducing a novel approach to enhancing passenger comfort, this thesis offers methods to analyze, visualize, and understand the personal comfort levels of each individual. These contributions underscore the originality and potential impact of the research on improving passenger comfort in modern transportation design.

Chapter 1: Introduction

The introduction presents an overview of the thesis, emphasizing the importance of passenger comfort in dynamic driving environments. It outlines the primary goals, including data collection, analysis, and visualization aimed at improving passenger comfort.

Chapter 2: Vehicle Fundamentals

This chapter explores the key components of vehicle data transmission and the role of various sensors. It underscores the significance of understanding data flow and the functionality of Electronic Control Units (ECUs) in modern vehicles. The chapter also details the types of sensors used and their importance in gathering data for predicting passenger comfort.

Chapter 3: Neural Networks

An in-depth examination of Neural Networks and their application in this thesis is provided. The chapter discusses the architecture, activation functions, and optimizer functions employed to develop the AI model for predicting passenger comfort.

Chapter 4: Technologies

This chapter elucidates the technologies and tools utilized in the research, including VCDS software, Strava, Python, TensorFlow, and more. Each tool's role in data collection, analysis, and visualization is thoroughly explained.

Chapter 5: Related Works

A review of relevant studies on driving dynamics and comfort, highlighting the methodologies and findings that informed the current research. The chapter covers acceleration zones, driving styles, and comfort levels in various driving scenarios. This background research supports the thesis's novel approach to enhancing passenger comfort.

Chapter 6: Data Collection

An overview of the data collection process, including the types of sensors used, synchronization methods, and data storage formats. The chapter emphasizes the importance of accurate data collection for developing a reliable AI model.

Chapter 7: Solution Development

This chapter presents the development and validation of the AI model for predicting passenger comfort, as well as the solution developed to visualize and analyze comfort, and the integration with the CARLA Simulator. It also details the model architecture, training process, and results, showcasing the model's accuracy and effectiveness in real-world and simulated scenarios. The development of a user-friendly application for real-time predictions is also discussed.

Chapter 8: Conclusion

The conclusion summarizes the research findings, highlighting the contributions to the field of passenger comfort in driving. It also outlines potential future work, including the integration of the solution with ride-sharing platforms and autonomous driving systems. The innovative methods introduced for analyzing and visualizing personal comfort levels are emphasized as significant contributions to modern transportation design.

Contributions and Originality

This thesis makes several key contributions:

- Methods to analyze, visualize, and understand the personal comfort levels of each individual.
- Development of an AI system to predict passenger comfort based on data from vehicle sensors.
- Integration of real-time comfort level predictions with a user-friendly application.
- Validation of the AI model in simulated driving environments using the CARLA Simulator.

These contributions highlight the originality and potential impact of the research on improving passenger comfort in modern transportation.