Expert Perspectives into Automated Vehicle Motion Planning Aligned with Human Reasons

Lucas Elbert Suryana

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1 Introduction

The role of motion planning in automated vehicles stands as a critical component that governs their safe and efficient operation. Motion planning involves devising trajectories for vehicles to navigate through complex environments. Currently, this technology finds application in addressing the challenges posed by intricate urban traffic scenarios [1]. As the level of driving automation increases [2], the role of planning and initiating driving actions is now transferred from human drivers to automated systems.

However, this shift in driving responsibility can lead to a gap in accountability, referred to as the accountability gap. This gap arises due to the potential obscurity surrounding the roles of human agents in instances where automated systems are in control [3]. This, in turn, raises questions about identifying the accountable party in scenarios where the lines between human and machine responsibility are blurred. To bridge this gap, the notion of meaningful human control has emerged, advocating humans nor computer algorithms must always be responsible for every decision made by intelligent systems [4].

A crucial aspect of meaningful human control is the responsiveness of automated systems to relevant human reasons for action. Santoni de Sio [5] emphasizes that for systems to exhibit meaningful human control, they must be designed to understand and incorporate the factors that humans would consider in making decisions. While current motion planning algorithms have advanced from rule-based approaches to learning-based techniques, none explicitly address the need to align with these human reasons [6][7][8].

Designing a motion planning algorithm that aligns with human reasoning remains a significant challenge. In this research endeavor, our focus revolves around three primary objectives that will form the foundational framework to design the proposed motion planning algorithm: first, specifying the relevant human agents and delineating the associated reasons within specific traffic scenarios; second, evaluating how these factors exert influence on motion planning decisions. This assessment is imperative due to the inevitable clash between human reasons [9]. Lastly, our research involves quantifying the degree to which

automated vehicles incorporate human reasons into their motion path and position in time.

To achieve these objectives, we employ a questionnaire-based approach, inspired by the conditions that define meaningful human control. This questionnaire seeks expert opinions from individuals with substantial experience and expertise in the field of automated vehicles. The insights gathered from these experts will shed light on the human agents and reasons that should exert influence on automated vehicle motion planning.

The core contribution of this article lies in the development of a questionnaire framework that not only serves the immediate research goals but also presents a blueprint for conducting similar studies in diverse use cases. The subsequent sections of this paper are structured as follows: Part 1 introduces the research scope and objectives, Part 2 outlines the methodology adopted, Part 3 presents the analysis of the obtained data, Part 4 engages in a comprehensive discussion of the results, and finally, Part 5 provides the conclusion and outlines potential avenues for future research.

References

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