Graduate School of Science and Technology Master's Thesis Abstract

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Thesis title	Enhancing Passenger Experience in Autonomous Personal Mobility Vehicles with Personality-Tuned Voice-based External Human-Machine Interface		

Abstract

Autonomous Personal Mobility Vehicles (APMVs) are increasingly recognized as viable solutions for efficient short-distance travel in mixed-traffic environments. Effective communication with pedestrians, typically through External Human-Machine Interfaces (eHMIs), is essential to convey driving intentions, enhance safety, and promote public acceptance. However, the open-body design of APMVs introduces a unique challenge: passengers are visibly and audibly present within the interaction loop between the vehicle and pedestrians. Consequently, the passenger experience also should be carefully considered. Related studies suggest that voice cues, provided by voice-based eHMI, can enhance passengers' understanding of APMV-pedestrian interactions, thereby improving overall user experience, but how to design the voice of the eHMI remains unclear. To solve this research gap, this study examines the personalization of voice-based eHMIs according to individual personality traits, as measured by the Big Five personality model. To explore this relationship, a series of on-vehicle experiments were conducted in this study to examine how different personality profiles of passengers influence their preferences for eHMI voice designs. Building on these findings, causal discovery was employed to uncover the underlying causal process and to estimate both direct and total causal effects among the influencing factors. In addition, a graph neural network-based recommendation model, augmented by insights from a causal discovery process, is proposed to recommend suitable voice-based eHMI designs tailored to individual passengers.