Describing plausible human-like traffic behavior in interactive traffic

Master‘s Thesis of Taras Hryhoruk

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This Master’s thesis aimed to develop an objective methodology (**Fig. 1**) for evaluating the human-likeness of artificially generated driving in its operational context. Various driving parameters were calculated for both artificial and real vehicles. Consequently, multiple driving scenarios were assigned to the vehicles. The driving parameters of artificial vehicles were compared to those of real vehicles operating in the similar driving contexts. The comparison results served as input for a developed quality function, which calculated a single human-like driving behavior score for a subject vehicle. A higher score indicates that the vehicle’s behavior closely resembles that of a real vehicle throughout its entire trajectory.

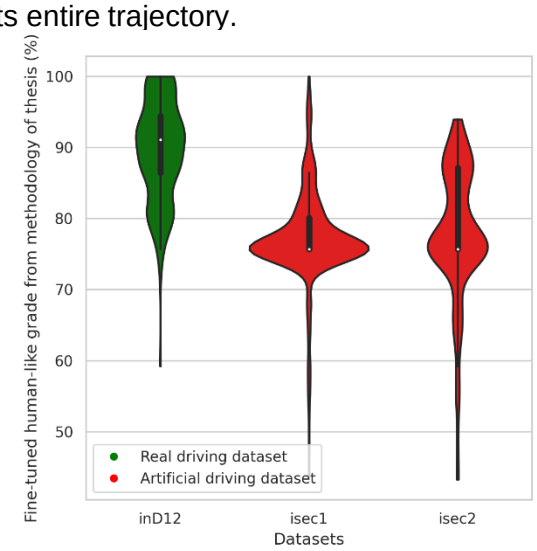

Fig 2. Human-like driving behavior grades for real and artificial driving datasets

The methodology enables the objective measurement of a human-like driving, facilitating adjustments to driving models. This can be used to fine-tune a driving model to ensure that simulated vehicles exhibit highly human-like driving behavior in their contexts. The methodology has potential applications in enhancing immersion in driving simulation and in developing Autonomous Vehicles (AVs) capable of human-like driving. Such human-like performance in AVs is expected to be crucial in future mixed-traffic situations where real and artificial drivers must coexist on the same roads.

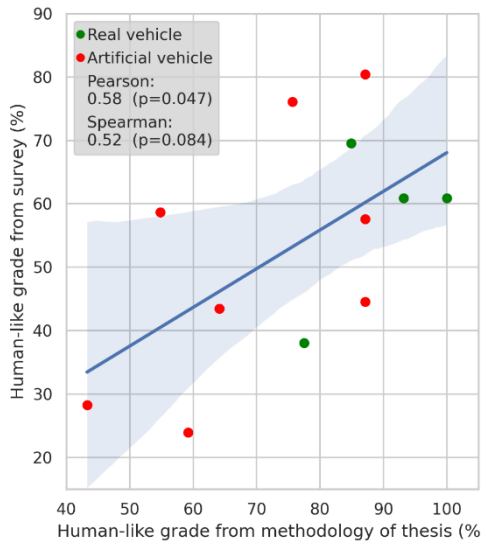

Fig 3. Correlation between the human-like driving behavior scores from the methodology and from the survey

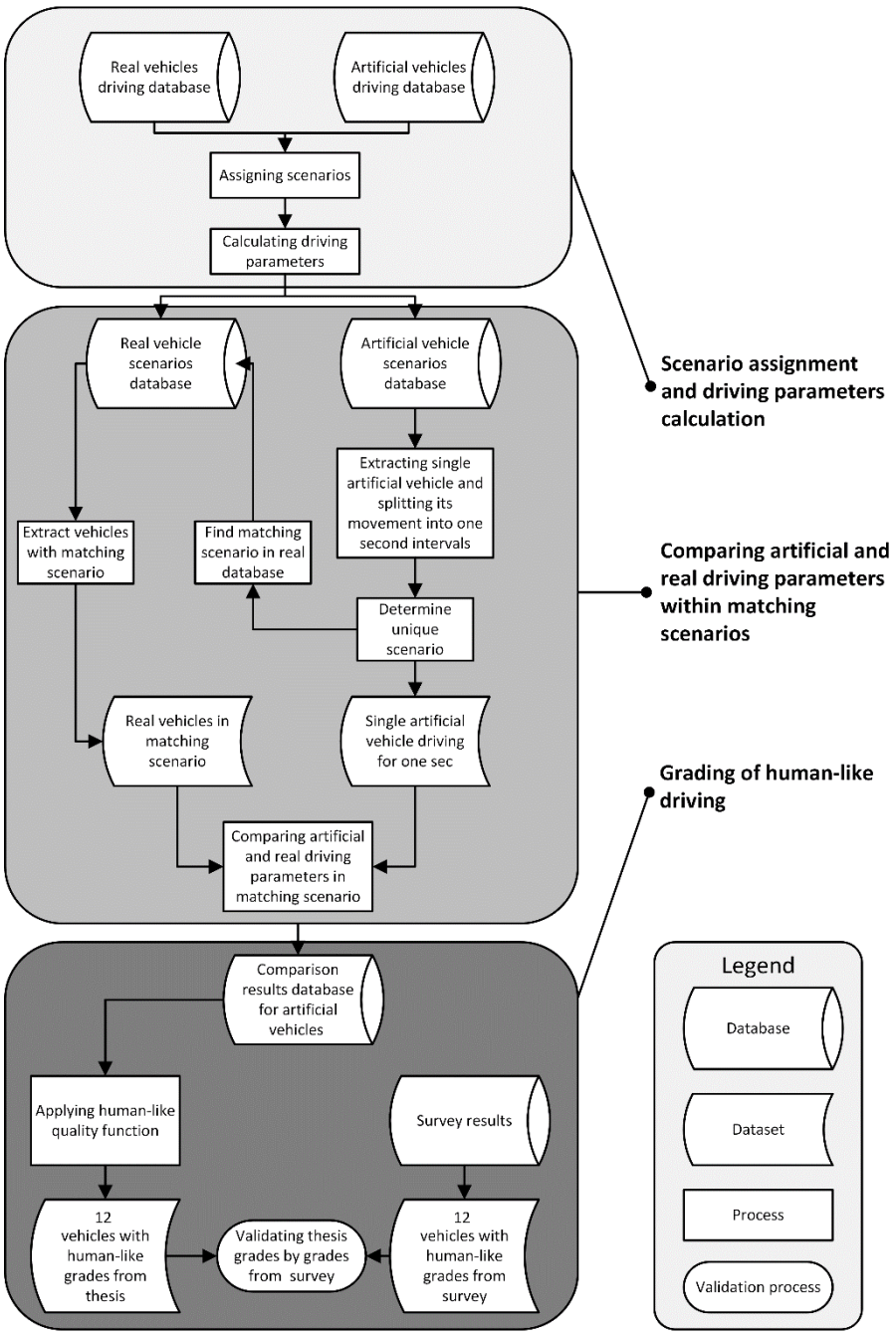

Fig 1. Concept of measuring human-like driving behavior

The thresholds of the developed methodology were fine-tuned to the limits, which artificial vehicles tend to exceed more frequently than real ones (**Fig 2**). Consequently, real vehicles tend to receive statistically higher human-like score than the artificial ones. Additionally, a validation survey was conducted to both refine and validate the methodology. Based on the survey results, weights were derived to quantify parameters’ influence on the perception of a subject vehicle’s human-like driving behavior. A statistically significant linear relationship was found between the human-like scores generated by the methodology of this thesis and from the survey (**Fig.3**). With these findings, this Master’s thesis contributes to a better understanding of human-like driving behavior. It provides a foundation for future approaches aimed at objectively measuring a vehicle’s human-like driving behavior within its operational driving context.