基於指數分佈模型的車輛碰撞風險評估改進與應用

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摘要

近年來，自駕車被期望能解決道路安全上的問題。然而在目前的實際道路測試中，自駕車過於保守的駕駛行為，反而導致與人類駕駛發生碰撞機率上升。在過渡時期，若無法解決自駕車與人類駕駛行為上的差異，將無法保證道路安全，甚而影響自駕車發展。因此，本研究模擬數種不同的駕駛行為，以進行不同駕駛風格的分析。在道路駕駛中，無論是自駕系統或人類駕駛，常會因為環境及其他用路人行為而有不同的決策。此決策會依駕駛風格而異。更進一步，影響駕駛風格的主要因素之一，便是對於碰撞風險的承受度。因為容易被量化且直觀，評估此風險的方法眾多。當中被廣泛使用的策略為機率風險法，它是透過機率分佈計算車輛發生碰撞的可能性。而指數分佈模型便是在此方法中評估碰撞機率風險的重要手段。此模型是透過駕駛與障礙物距離呈指數關係來評估風險。因此，本研究便是使用指數分佈模型分析駕駛碰撞風險，並以最佳化模擬駕駛基於碰撞風險進行決策的行為。

關鍵詞：駕駛風格、指數分佈模型、碰撞風險評估、駕駛行為分析

Improvement and Application of Vehicle Crash Risk Assessment Based on Exponential Distribution Model

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Abstract

In recent years, autonomous vehicles have been expected to address road safety issues. However, during actual road tests, the overly cautious driving behavior of autonomous vehicles has led to an increased probability of collisions with human drivers. During the transitional period, if the differences in driving behavior between autonomous vehicles and human drivers cannot be resolved, road safety cannot be guaranteed, potentially hindering the development of autonomous vehicles. Therefore, this study simulates various driving behaviors to analyze different driving styles. In road driving scenarios, whether the driver is an autonomous system or a human, decisions are often made based on the environment and the behavior of other road users, which can vary depending on the driving style. One of the key factors influencing driving style is the driver's tolerance for collision risk. Since this risk is intuitive and easily quantifiable, there are many methods for its assessment. A widely used approach is probabilistic risk assessment, which calculates the likelihood of vehicle collisions based on probability distributions. The exponential distribution model is a key method in this approach for evaluating collision risk, as it assesses risk based on the exponential relationship between the distance of the vehicle and obstacles. Therefore, this study uses the exponential distribution model to analyze drivers' collision risk and simulates risk-based driving decisions through optimization

Keywords: Introduction, Mechanism, Machine, Design