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RA8 **Connected and Automated Transport**

Key Characteristics: : A novel method to derive critical pre-crash scenarios from historical car accident data was developed • A simulation and evaluation framework was developed to transfer the derived scenarios to a virtual environment • The safety performance of automated driving functions are evaluated by a combination of safety indicators •

PROVE-IT - Procedures for Virtual Testing of Automated Vehicles at Road Intersections

The proposed idea addresses the problem of road intersection safety with regard to a mixed population of automated vehicles and non-automated road users.

The project derives and evaluates safety-critical scenarios at road junctions, which pose a particular safety problem involving automated cars. A simulation framework is presented and demonstrated, which allows the safety performance of automated driving systems within these scenarios to be examined. Given the recent advancements in automated driving functions, one of the main challenges is safe and efficient operation in complex traffic situations such as road junctions. There is a need for comprehensive testing, either in virtual simulation environments or on real-world test tracks. Since it is unrealistic to cover all possible combinations of traffic situations and environment conditions, the challenge is to find the key driving situations to be evaluated at junctions.

Against this background, a novel method to derive critical pre-crash scenarios from historical car accident data is presented. It employs k-medoids to cluster historical junction crash data into distinct partitions and then applies the association rules algorithm to each cluster to specify the driving scenarios in more detail. The dataset used consists of 1056 junction crashes in the UK, which were exported from the in-depth "On-the-Spot" database. The study resulted in 13 crash clusters for T-junctions, and six crash clusters for crossroads. Association rules revealed common crash characteristics, which were the basis for the scenario descriptions. As a follow-up to the clustering study, a novel methodology to transfer the derived collision scenarios to a sub-microscopic traffic simulation environment was developed, where the safety performance of automated driving functions can be evaluated •