# Truth-Aware Optimal Decision-Making Framework with Driver Preferences for V2V Communications



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Abstract

In Vehicle-to-Vehicle (V2V) communications, malicious actors may spread false information to undermine the safety and efficiency of the vehicular traffic stream. Thus, vehicles must determine how to respond to the contents of messages which maybe false even though they are authenticated in the sense that receivers can verify contents were not tampered with and originated from a verifiable transmitter. Existing solutions to find appropriate actions are inadequate since they separately address trust and decision, require the honest majority (more honest ones than malicious), and do not incorporate driver preferences in the decision-making process. In this work, we propose a novel trust-aware decision-making framework without requiring an honest majority. It securely determines the likelihood of reported road events despite the presence of false data, and consequently provides the optimal decision for the vehicles. The basic idea of our framework is to leverage the implied effect of the road event to verify the consistency between each vehicle's reported data and actual behavior, and determine the data trustworthiness and event belief by integrating the Bayes' rule and Dempster Shafer Theory. The resulting belief serves as inputs to a utility maximization framework focusing on both safety and efficiency. This framework considers the two basic necessities of the Intelligent Transportation System and also incorporates drivers' preferences to decide the optimal action. Simulation results show the robustness of our framework under the multiple-vehicle attack, and different balances between safety and efficiency can be achieved via selecting appropriate human preference factors based on the driver's risk-taking willingness.

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Accidents appropriate human preference factors Bayes rule collaboration data trustworthiness Decision Making decision-making process Dempster Shafer Theory event belief false data false information false trust incorporate driver preferences Intelligent Transportation System Intelligent Transportation Systems malicious actors multiple-vehicle attack optimal action policy-based governance pubcrawl reported road events resilience Resiliency Roads Safety Scalability sensors trust-aware decision-making framework Trusted Computing truth-aware optimal decision-making framework utility maximization framework V2V communications vehicle-to-vehicle communications vehicles vehicular ad hoc networks vehicular traffic stream verifiable transmitter