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ABSTRACT

Road safety has become the critical issue in transportation around the world. Safety specialists are continuously striving for improvement in this area. But the toughest part is determining the road features, the driver behavior, and the vehicular failure that unduly increases the risk of crash. One of the frequently used methods of safety improvement is investigating roads with an excessive number of crashes. However, the lack of standard techniques causes investigative teams to rely on their own experience and judgment. Moreover, the road safety investigation process includes various assumptions that are needed to deal with the lack of data and the inconsistency among expert opinions. Therefore, the simplest assumption is to neglect uncertainty. Unfortunately, this approach can lead to more issues and to a distortion of the findings.

The purpose of the research presented here is to establish and evaluate a selected technique to incorporate uncertainty considerations into the road safety investigation process. First, the knowledge base is developed and organized into the Bayesian Belief Network structure. The knowledge is acquired from multiple sources including NCHRP reports, safety guidelines, observation of experts during work, and road safety investigation reports. Next, the uncertainty is incorporated into the developed network. Then Bayesian inference is used to update the network probabilities. The method is evaluated by comparing the results obtained by the participating experts and non-experts using two methods: with and without uncertainty consideration applied to two road sites. The evaluation results show that taking into account uncertainty can bring about significant improvements in the findings and prevent the overlooking of important factors. Finally, a discussion of the research contribution and possible future improvements are presented.