Public Abstract
First Name:Zhongyuan
Middle Name:
Last Name:Zhu
Adviser's First Name:Praveen
Adviser's Last Name:Edara
Co-Adviser's First Name:
Co-Adviser's Last Name:
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Transportation agencies faced with the challenge of enhancing safety on roadways are looking for alternative solutions to designing roads and signage. When deciding whether the alternative design is superior to the traditional one, decision makers need methods and quantitative data to evaluate these alternatives. This dissertation provides two accessible methods to compare the different alternative designs and illustrates them using case studies.

The first method involves using video cameras and radar guns to record vehicle speeds and volumes and statistically comparing the results of different designs. This method is more accurate when collecting speed data than automated video-based vehicle detection system which requires careful calibration of the system and stable video footage. As a case study, this method is then utilized to evaluate the effectiveness of an alternative merge sign in work zones. After collecting and processing video data, measures such as average speeds, speed differentials are calculated. A new concept called open lane occupancy is introduced to quantitively compare the two signs. The results indicate that the alternative sign encourages up to eleven percent more cars to be in the open lane immediately upstream of the merge sign. Passenger cars stayed in the closed lane longer than trucks.

The second method utilizes microscopic traffic simulation to evaluate alternative designs. This method is ideal for projects where video monitoring of the entire study of interest is not feasible. Evaluating alternative designs with crash data usually requires a long time span to build the facility and record crash data over at least one year after the facility has been open to traffic. In addition to that, new facility needs to be built or altered if other design features are to be tested. With microscopic simulation, the time cost for the study is greatly shortened and different design aspects can be tested in a risk-free environment. Two case studies are presented to illustrate this simulation method. The first case study involves a work zone while the second case study focuses on evaluating a J-turn intersection design. The spacing of the two U-turns and the inclusion of acceleration and deceleration lanes were evaluated, in the J-turn study. The results from the calibrated simulation model in the J-turn study recommended acceleration lane for all J-turn designs. It is also recommended to allow one thousand feet spacing between U-turns for low volume combinations and at least one thousand and five hundred feet for medium to high volumes.