Public Abstract
First Name:Boris
Middle Name:Raul
Last Name:Claros
Adviser's First Name:Carlos
Adviser's Last Name:Sun
Co-Adviser's First Name:
Co-Adviser's Last Name:
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Department:Civil Engineering
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Title:RED LIGHT RUNNING AT TRAFFIC CIRCLES: ESTIMATION AND EVALUATION OF COUNTERMEASURES EFFECTIVENESS

The complicated legacy design of traffic circles results in operational and safety deficiencies. This type of intersection design is commonly used at major roadways in Cochabamba, Bolivia. Traffic circles are intended to accommodate various types of vehicles and turning movements, and to store queues along the circulatory roadway, but the actual operational performance is poor.Field observations, undergraduate research experience, and a review of current literature helped to identify the most critical traffic circle performance issue as driver compliance. This research focuses on the main issue of traffic signal violation at traffic circles, and specifically red light running.The objective of this research is to analyze red light running at three intersections along the same corridor in Cochabamba, Bolivia. As a result of the analysis, different parameters are identified to verify the effectiveness of current local traffic management implementations, develop a red light running estimation model, and propose potential solutions.
Traffic data was collected over the summer of 2012. Video was recorded of traffic movements from main approaches and speeds at 200 meters upstream from the intersection to determine approach speeds. A video display along with the use of pre-defined keyboard keys is used to optimize the data processing. The data processing was performed by the author and four outstanding undergraduate civil engineering students. In order to produce uniform results, the students were trained on the same methodology before they processed the data. The analysis of the red-light-running data involved: traffic flow, approaching speed, traffic signal control features, and geometric characteristics. A comparison among the different scenarios was used to determine if improvements were significant. The results of this research were found to be statistically significant and were similar to previous studies. Initially, increase in red light running rates were found to relate to higher approaching speeds and higher traffic volumes. The implementation of count-down panels in the traffic signal control did reduce red light running, but on a short-time basis only. A geometric conversion from a traffic circle to a four-legged conventional intersection was found to be a poor countermeasure for safety and operational performance. Regarding the model for estimating red light running rates, the most significant variables included in the model were Y (yellow running rate), A (small vehicle traffic flow), and G (single unit truck traffic flow).
Four major recommendations resulted from this study. First of all, countdown panels are desirable despite losing effectiveness over time, since they have other benefits during congested scenarios. Second, an increase of the yellow signal interval would achieve significant reduction on red light running rates. Third, the implementation of an all red interval would contribute to the clearing of intersections and avoid potential incidents due to red light running. Finally, as a larger scale solution, it is desirable to separate the main roadway form the circulatory roadway by using an underpass to keep the traffic circle at ground level.