Florida Department of Transportation Research

Assessment of Highway-Railroad Grade Crossing Strategies, Countermeasures, and Technologies to Improve Traffic Safety and Mobility in Florida

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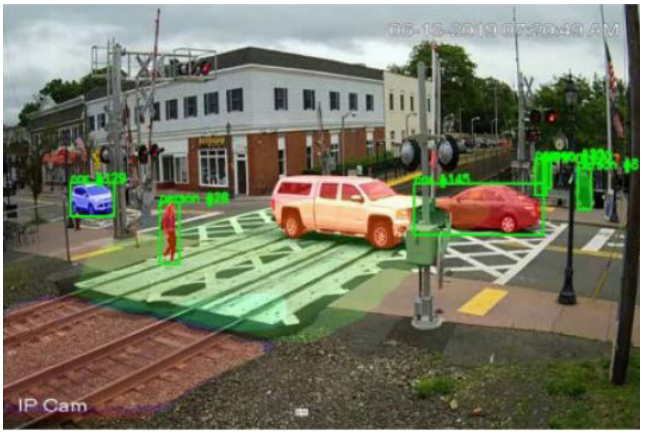
Project Manager
Edith Wong
State Traffic Engineering & Operations

Principal Investigator
Pei-Sung Lin, Ph. D., P.E., PTOE, FITE
CUTR - University of South Florida

Current Situation

Florida's 4,500 at-grade highway-rail grade crossings (HRGCs) are essential to providing mobility for both rail and vehicular traffic throughout the state. However, with these crossings having approximately 350 fatal and severe injury crashes every year, the Florida Department of Transportation (FDOT) is investigating the effectiveness of existing safety countermeasures and additional measures that can be taken to further improve safety at these crossings.



One of the most recent USDOT railway crossing automation projects focused on AI software applications, such as shown in the image above. This software automates the detection of grade crossing violations and trespass activities from static camera video feeds.

Research Objectives

The goal of this research was to evaluate the effectiveness of existing countermeasures including the recently implemented rail dynamic envelopes under Operation STRIDE, identify additional countermeasures that can be implemented by the department, and recommend priority locations for treatment to improve safety and mobility at HRGCs in Florida.

Project Activities

Following a comprehensive review of existing research to understand crash patterns and effective treatments at HRGCs, the Center for Urban Transportation Research-University of South Florida (CUTR-USF) research team conducted a crash analysis to identify contributing factors to crashes at HRGCs, such as human, infrastructure, and operational factors.

The research team then interviewed stakeholders and made site visits to gather insights and assess the real-world effectiveness of existing treatments and strategies. After evaluating and summarizing the research findings, the team produced project outcomes, including identifying contributing factors, effective traditional countermeasures, effective Intelligent Transportation Systems (ITS) and Transportation Systems Management and Operations (TSM&O) technologies, and best practices. The research team then prioritized specific treatments and made recommendations to improve safety and mobility at Florida HRGCs.

Project Conclusions and Benefits

The research identified several contributing factors to HRGC crashes, such as human behavior, infrastructure design, and operational challenges. It also highlighted effective countermeasures like signing and pavement markings, quadrant gates, delineators, fencing, geometric improvements, education, enforcement, and flashing beacons. Furthermore, it identified ITS and TSM&O technologies that can enhance both safety and mobility, such as preemption and pre-preemption, advanced sensor technologies, and other advanced technologies. The study provided best practices and reviewed 10 State Action Plans to develop prioritized recommendations for special treatments at specific HRGCs.

The research outcomes benefit FDOT by offering a comprehensive evaluation of HRGC's existing safety treatment effectiveness and will help FDOT further implement effective strategies to mitigate risks and enhance mobility, contributing to safer and more efficient travel through highway-rail crossings in Florida.

For more information, please see fdot.gov/research.