Florida Department of Transportation Research

Development of the Optimization Model for Improving Safety at Rail Crossings in Florida

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Current Situation

Freight contributes to the Florida economy to the tune of hundreds of millions of tons and a value of more than $1 trillion per year. And these numbers are increasing. A significant portion of this freight is moved by rail, and the rising amount of this traffic increases the possibility of collisions with cars at the many highway-rail grade crossings in Florida. The Florida Department of Transportation (FDOT) is committed to upgrading crossings throughout the state, but crossings must be prioritized for upgrades and to understand what safety improvements will be most effective.

Proper signage at railway crossings can prevent disastrous collisions.

Research Objectives

Florida State University researchers created a standalone application to help FDOT personnel estimate the potential hazard values of highway-rail grade crossings, prioritize a crossing for upgrade, and choose an appropriate upgrade type.

Project Activities

Developing the application required extensive background research. The researchers reviewed existing methods for the tasks they expected the application to assist: hazard estimation, prioritization, and upgrade selection. They found six methods for collision prediction and 15 for hazard prediction in the literature, based on from three to twelve predictors. The methods were reviewed to examine their performance and challenges to implementation.

Next, data were identified to support hazard and collision calculations. These data were found in Federal Railroad Administration (FRA) databases that are based on required reports of collisions involving trains. The researchers developed an evaluation process to identify prediction methods that would be supported by the FRA data. This evaluation produced six candidate methods, which were subjected to in-depth statistical analysis, resulting in a recommended method.

Then, using the recommended method and the FRA data, the researchers developed the algorithms that would be the basis of the application. This required setting specific goals for the algorithms, and two were developed: one that minimizes the overall hazard at crossings and one that minimizes overall hazard severity. Further analysis of the algorithms was needed to determine the memory and computational demands of the application.

Finally, with this extensive groundwork completed, the researchers turned to programming the application, named “HRX Safety Improvement” – HRX refers to highway-rail crossings. The final application runs on a personal computer and is accompanied by a user guide. The application is operated through an easy-to-use user interface.

Project Benefits

The application developed in this project will direct maintenance services to the crossings most in need of updating, which is likely to have a direct impact on driver and train safety.

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