

JOINT TRANSPORTATION RESEARCH PROGRAM

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A Systematic Approach to Identifying Traffic Safety Needs and Intervention Programs for Indiana

Introduction

A systemic approach to identifying road locations that exhibit safety problems was provided by the Safety Needs Identification Program (SNIP) developed by the Purdue University Center for Road Safety (CRS) in 2011. That project aimed to prove the concept of a road network screening method by developing a working prototype tool. This report presents the results of a new JTRP project aimed to develop a next version—SNIP2. As does its predecessor, SNIP2 supports identification of roads that have excessive crashes of the types defined by the user. In addition, this tool is capable of selecting the best combination of high-crash roads and relevant safety interventions that maximizes the safety benefits and keeps the total cost within the budget and other user-defined constraints. SNIP2 can also estimate the cost and the safety effect of a given safety plan.

Findings

- The conceptual framework of the safety screening tool was developed in order to cope with the complexity of the data management and safety screening operations. There are two major components: (1) Data Renewal Process (DRP) and the user-end interface with a computational engine, and (2) a crash and roadway database.
- Unlike other studies considering the implementation time of safety projects, the optimization objective of SNIP2 is to identify an optimal combination of countermeasures renewable within a long time horizon. This simplification is accomplished by representing the projects through their annualized costs and benefits. It allows consideration of many projects in

large road networks and it makes the SNIP2 suitable for identification of safety focus areas within a realistic strategic safety plan.

- The optimizer—a new component of SNIP2—applies a greedy search to a heuristic approximation of a large-size mixed integer knapsack problem. The algorithm was extensively tested and evaluated using randomized solutions. The developed algorithm was found producing optimal or near-optimal solutions sufficient for the considered application domain. The algorithm is sufficiently flexible to easily incorporate needed constraints. The time-efficiency meets the user's specifications.
- One of the research results is a comprehensive catalog of countermeasures for Indiana—a list of countermeasure names, road and crash conditions for the countermeasure relevance, corresponding crash modification factors, and countermeasure costs. The developed catalog can be edited and then utilized for developing an Indiana strategic safety plan and for other purposes.
- The SNIP2 runs in the MS Windows XP/Vista/7/8 environment. It requires the MS .NET Framework 4.0, MS SQL Server, and Google Earth or ArcGIS Explorer.

Implementation

The SNIP2 is computer software developed with close collaboration of INDOT future users. It includes an updated crash and state road database. A user manual describes the necessary details of the software and various aspects of its use. Two example studies are also included in the manual to illustrate its use and to better presents the SNIP2 features.

The SNIP2 is a complex tool that requires a careful implementation plan. Its implementation to INDOT's practice includes three phases:

1. Intensive SNIP2 testing by a selected small group of INDOT users (several weeks).
2. One-day workshop organized by INDOT to demonstrate the software through hands-on practice and to identify potential SNIP users.
3. Organization-wide SNIP2 implementation with continuing feedback to the Center of Road Safety.

The Center for Road Safety is involved in all three phases of the SNIP2 implementation by providing requested help, collecting the users' feedback, and implementing the recommendations.

Recommended Citations

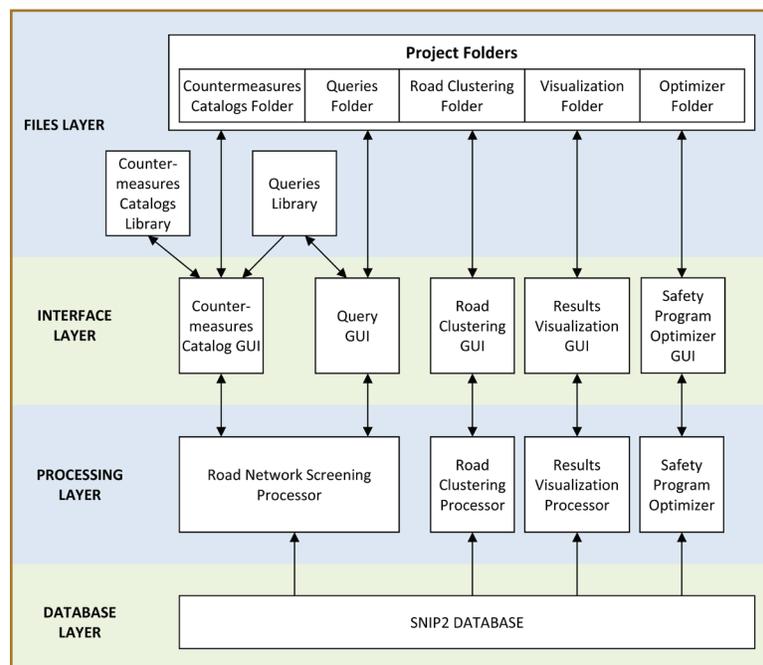
Tarko, A. P., Li, M., Romero, M., & Thomaz, J. (2014). *A systematic approach to identifying traffic safety*

needs and intervention programs for Indiana: Volume I—Research report (Joint Transportation Research Program Publication No. FHWA/IN/JTRP-2014/03). West Lafayette, IN: Purdue University. <http://dx.doi.org/10.5703/1288284315497>

Tarko, A. P., Li, M., Romero, M., & Thomaz, J. (2014). *A systematic approach to identifying traffic safety needs and intervention programs for Indiana: Volume II—SNIP2 user manual* (Joint Transportation Research Program Publication No. FHWA/IN/JTRP-2014/04). West Lafayette, IN: Purdue University. <http://dx.doi.org/10.5703/1288284315498>

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SNIP2 architecture.

