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| **Project Name:** | Railroad Grade Crossing Micro-Level Safety and Risk Analysis – Phase 2 |

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| **Project ID:** | NURail2013-UIUC-R07 | | **Funding Year:** | 2012 | 2013 | 2014 |
|  | Is this the continuation of a prior year project? | | | | YES | NO |
| **Project Type:** | Research | Education | | Tech Transfer | SDP | Other |

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| **Project Team:** |  |  |  |
| **Name** | **Role** | **Institution** | **Department** |
| Rahim Benekohal | Principal Investigator | UIUC | CEE |
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**Project Summary:** *(Include objectives, scope & method. 300 words maximum or 1/2 page)*

Railroad grade crossings are potential conflict points and pose a risk for all travelers. The degree of the risk depends on many factors such as volume train, volume of vehicles, speed of trains and vehicles, geometry of the crossing, etc. To assess the safety and risk of RR crossings, one may utilize aggregated data for the entire state or the country. Even though analysis of the aggregated data may be useful in establishing correlation among important variables, it might not be very useful for assessing the safety and risk for a given RR crossing. It is proposed to conduct a micro-level analysis to determine the risk of crashes at a given location (or a set of similar locations). The crash risk at a given crossing may depend on past crash history at that location, as well as the relation amount different elements that affect traffic safety at RR crossings. At the micro-level analysis one considers the uniqueness of each crossing and develops a risk factor for such crossings. Then, the safety and risk at system level is determined based on these individual safety and risk assessments.

Phase one of this study is near completion and phase two will focus on safety and risk of accident at railroad crossing.

. **Strategic Goals / Research or Educational Areas Addressed:**

*(Check at least one under both USDOT Strategic Goals and NURail Center Topic Areas)*

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| **U.S. DOT Strategic Goals** | **NURail Center Topic Areas** | |
| Safety | Infrastructure | Passenger/Public Transport |
| State of Good Repair | Rolling Stock / Equipment | Freight |
| Economic Competitiveness | Safety & Risk | Multimodal |
| Livable Communities | Operations | Institutional |
| Environmental Sustainability | Capacity | Education |
|  | Reliability | Workforce Development |
|  | Planning | Technology Transfer |
|  | Economics | Other |

**Detailed Scope of Work:** *(Include a description of the project, a list of tasks and associated deliverables and how students will be involved. 600 words maximum or 1 page)*

Railroad grade crossings are potential conflict points between train and highway vehicles, and train and pedestrians. The crossings pose a risk to all the travelers and the degree of risk depends on many factors such as volume train, volume of vehicles, presence and operation of traffic control devices (TCD), speed of trains and vehicles, geometry of the crossing, interaction with interconnected intersection, pedestrians, no of tracks, etc. To assess the safety and risk of RR crossing, one may utilize aggregated data for the entire state or the country. Analysis of the aggregated data may be useful in establishing correlation among variables that are important at system level (state or country), but might not be very useful for a given crossing. On the other hand, a micro-level analysis determines the risk of crash at a given location (or a set of similar locations). The crash risk at a given crossing will depend on past crash history at that location, as well as the relation amount different geometric design elements of roadway and railway, signing and sign distances, type of development in the surrounding area, type of travelers, characteristics of those who got involved in crashes, and other factors. At the micro-level one considers the uniqueness of each crossing and develops a risk factor for such crossings. Then, the safety and risk at system level can be determined based on these individual safety and risk assessments. To conduct the micro-level safety ad risk assessment, the following tasks will be done.

1. Literature review- Determine the state of the art on safety and risk assessment at RR crossings in the US.
2. Identify study corridors. One or preferably two rail corridor will be selected for this study, preferably an east-west and a north- south corridor in Illinois.
3. Gather data- Obtain computerized data on crash, traffic, and geometrics. For the corridors identified in Task 2 obtain data form government and industry sources.
4. Quality check on data- Check the consistency and accuracy of the data to make sure that it represents the real world conditions.
5. Analyze the crash data. The data for fatal, injury and property damage crashes will be analyzed with an emphasis on fatal crashes. The crash data will be analyzed to determine the potential contributing factors, when possible.
6. Determine Models and Risks- The relationship among traffic and geometric elements and TCD will be determined. The type of traffic control devices (TCD) used at a RR crossing depends on several factors. Among the TCD type used are two-gates and four-gate crossings. Illinois plans to implement quad-gate on all 220 crossings along Chicago-St Louis high speed route, but safety data for quad-gate will not available until a few years after its implementation. The goal of the analysis is to see how one can determine the safety and risk of crashes at each RR crossing location. The success of this step will largely depend on the quality of data available. Assessment will be made as to the potential risk at that location in the future due to changes in traffic and TCD.
7. Prepare a final report on the study.

This study will complement an on-going field evaluation of microwave detections sensors as a back-up system at a railroad crossing. The field evaluation study is sponsored by study with Illinois DOT and cooperation with Illinois Commerce Commission. It is the cost share project for this study.

In phase one of this study we addressed issues in tasks 1- 5. Part of Task 5 is completed. In phase two we will focus on Task 6 and remaining part of Task 5. A report for phase one is being completed. A separate report for phase two will be prepared.

**How Project Relates to U.S. DOT Strategic and NURail Center Goals:** *(Provide an explanation of how the stated goals will be addressed in the project. 300 words maximum or 1/2 page)*

Railroad Crossing Safety, Crash Risk at Railroad Highway Intersections, Safety of At-grade Railroad Crossing

This study directly supports the USDOT Strategic Goals on safety. The finding of the study will help to improve the safety at highway-railroad crossings. It also indirectly supports the USDOT Strategic Goals of Economic Competitiveness and Livable Communities by improving the safety and reducing delay for motor vehicles and train, as well as making the grade crossing areas safer for the people living in the area. The study supports the following NURail Center Topic Areas: Safety and Risk, Operations, Multimodal. Proper assessment and analysis of safety and risk at highway-railroad crossings is important not only for the safety of users, but also for efficiency of the operation. The operational efficiency impacts productivity of more than one mode. It impacts the users of highway (pedestrians, bikes, cars, buses, trucks, etc.) as well as the users of rail (rail passengers, shippers, railroad companies, etc.).

**Index Terms / Keywords:**

**Proposed Project Schedule:**

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| --- | --- | --- |
| **Project Start** | **Project Complete** | **Duration (months)** |
| July 1, 2014 | June 30, 2015 | 12 |

**Estimated Project Budget:** *(Note: Verify Cost Share requirements for Funding Year at Institutional Level)*

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| --- | --- | --- | --- |
| **Source** | **Status** | **Amount** | **% Total Cost** |
| **NURail Funds** | **Proposed** | **$65,000** | **50%** |
| **Cost Share:** |  |  |  |
| Source 1 | IDOT | $65,000 | 50% |
| Source 2 |  |  |  |
| Source 3 |  |  |  |
| **Subtotal Cost Share:** |  |  |  |
| **Total Estimated Project Cost:** |  |  |  |

**Estimated Number of Students Involved:** *(by academic level)*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Primary** | **Secondary** | **Bachelors** | **Masters** | **Doctoral** | **Post-Doc** | **Total** |
|  |  | 1 | 1 |  |  | 2 |

**Type of Student Involvement:** *(e.g. Research Assistant, Teaching Assistant, Other, etc.)*

It is planned to hire a masters Level Graduate Research Assistant (RA) to work on this project for 12 months. An undergraduate student hourly will also be hired to help the RA and PI.