South Carolina DOT's Collision Diagramming Tool

Jennifer Oswalt-Rhoades  - South Carolina DOT
Bruce Aquila – Intergraph Corporation

Session  3.2 Safety Mapping Analysis

Tuesday  March 29, 2011
Introduction

- Historical overview
- Business drivers
- Functions
- Results
- Summary
Background

- SC DOT collects information and statistics on all collisions on state maintained roads
  - Statistics calculated and maintained in RIMS
  - High frequency locations identified using RIMS
  - Normal date range is previous four years
  - Locations normally fit into two categories:
    - Section locations (or spot locations)
    - Intersection locations

- Collision diagrams are primary tool used to identify patterns at high frequency locations
  - Diagrams currently done manually
  - Time consuming to generate
  - Vary greatly depending on engineer drawing diagram (symbols used, nomenclature, scale, orientation, details, etc.)

- Needed faster, more uniform way of creating collision diagrams (contacted Intergraph)
  - Major goal 1: Generate a more automated process
  - Major goal 2: Incorporate the system into current RIMS application
  - Major goal 3: Include storage and archive capacity so all diagrams are easily accessible

- Desired look and feel based on existing MicroStation templates
Business Drivers

- Increased number of collisions
- Time consuming to produce
- Rapid identification of collision trends
- Better evaluation of design features
- Better level of public safety
- Improve traffic flow
- Leverage existing system resources (RIMS)
- Reduce fatalities
- More efficient budgeting of improvements
- Easier access and dissemination of collision diagrams
Collision Diagram Overview

- **RIMS enhancements**
  - Button added to collision complex query/standard report to generate diagrams three ways:
    - From complex query of Crash Rank data
    - From complex query of Crash Location data
    - From Crash standard report
  - New tables created with road inventory data to generate diagrams

- **Interface**
  - Parameter setting for diagram creation
  - Edit collision data
  - Generate diagram
  - Retrieve existing diagrams

- **Collision diagram**
  - Title Block
  - Diagram type
  - Legend
  - Detail Summary
RIMS Enhancements - Collision diagram based on Crash Rank query results

- Allows user to generate collision diagrams from Crash Rank table.
- SCDOT's main resource to rank specific locations based on collision rate.
- Rankings calculated based on:
  - Type (rural or urban, single lane or multi-lane)
  - Category (section location or intersection location).
- Data results represent locations (not individual collisions).
- Diagram generated by selecting row.
RIMS Enhancements - Collision diagram based on Crash Location query results

- User generates collision diagram based on query results of Crash Location table.
- Table contains information about specific collisions.
- User chooses desired location (section or intersection)
  - Query for collisions at location from Crash Location table.
- Collision Diagram button enables and diagram can be generated.
RIMS Enhancements - **Collision diagram based on Crash Standard Report Query**

- This report generated using Crash Summary Standard Report.
- User-friendly version of complex query used to find collisions on both intersections and sections.
Interface

- Four tabs in Collision Diagram tool used to create final diagram:
  - Basic information – contains location information
  - Crash Data – where individual collisions are listed
  - Diagram Legend
  - Diagram Archives
Interface – Basic Information

- Contains the following:
  - User
  - Location and time frame for collisions
  - Intersection
    - Type
    - Supporting information
    - Street Name
    - AADT
  - Diagram filename
  - Link to Crash Rank record
Interface – Basic Information

4 Way

T/Y

Segment
Interface – Crash Data Tab

- Allows user to edit some crash data prior to generating collision diagram

- Crash data divided into 3 parts:
  - To be plotted
  - Cannot plot
  - Excluded from plot

- Save Changes/Cancel button
  - Saves edits when diagram generated

- Generate Diagram button
  - Processes changes
  - Plots collisions
  - Generates PDF image of diagram in new window
  - PDF can be saved, printed or e-mailed
Interface – Diagram Legend Tab

- Diagram dependent on type selected on Basic Information tab
- Provides reference information to user regarding:
  - Meaning of collision types (MAC)
  - Collision symbols
  - Location terminology
Interface – Diagram Legend Tab

T/Y  Segment
Interface – Diagram Archive Tab

- Provides ability to retrieve existing collision diagrams
- Existing diagrams also accessible through queries of Crash Rank table
Collision Diagram

- Based on input defined on Basic Information and Crash Data tabs.
- Consists of:
  - Title Block
  - Diagram
  - Legend:
    - Collision Type
    - Contributing Factors
  - North Arrow
  - Detail table
  - Summaries
- Output is a .pdf file.
Title Block

- Location – Location title defined on Basic Information tab.
- City & County - Defined on Basic Information tab.
- Created by – User as defined on Basic Information tab.
- Created on – Date user created diagram.
- Collision dates – Dates defined on the Basic Information tab.

Traffic Engineering Division

Subject: Collision Diagram
Location: S-18 (N Cedar St) and S-186 (W 4th North St)
City: Summerville  County: Dorchester
Created by: John Q. SCDOT  Created on: 12/11/2009
Accident dates: 1/1/2005 – 12/31/2008
Diagram

- 3 different types:
  - 4 way,
  - T/Y,
  - and Segment.
- Diagram subdivided into location blocks (correspond to physical locations).
- In each location block are fixed location symbols.
- Each symbol associated with a query.
- Collisions plotted by milepoint.
### Legend and North Arrow

#### Legend – Contributing Factors

<table>
<thead>
<tr>
<th>Abbrev.</th>
<th>Contributing Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>DSS</td>
<td>Disregarded sign or signal</td>
</tr>
<tr>
<td>Inatt</td>
<td>Inattention</td>
</tr>
<tr>
<td>DTFFC</td>
<td>Driving too fast for conditions</td>
</tr>
<tr>
<td>FYRW</td>
<td>Failure to yield right of way</td>
</tr>
<tr>
<td>ROR</td>
<td>Ran off road</td>
</tr>
<tr>
<td>FTC</td>
<td>Followed too closely</td>
</tr>
<tr>
<td>AOV</td>
<td>Aggressive operation of vehicle</td>
</tr>
<tr>
<td>SAO</td>
<td>Swerving to avoid object</td>
</tr>
<tr>
<td>DUI</td>
<td>Under the influence</td>
</tr>
<tr>
<td>Imp LC</td>
<td>Improper lane change</td>
</tr>
</tbody>
</table>

#### North Arrow
### Diagram Detail Table

<table>
<thead>
<tr>
<th>MAC</th>
<th>Loc.</th>
<th>Date</th>
<th>Time</th>
<th>Day/Night</th>
<th>Dry/Wet</th>
<th>Contr. Factor</th>
<th>Severity</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROR</td>
<td>D2</td>
<td>1/5/08</td>
<td>7:30am</td>
<td>Day</td>
<td>Dry</td>
<td>Inatt</td>
<td>PDO</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2/9/08</td>
<td>9:05am</td>
<td>Day</td>
<td>Dry</td>
<td>AOV</td>
<td>Inj. 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2/20/08</td>
<td>8:15pm</td>
<td>Night</td>
<td>Dry</td>
<td>DUI</td>
<td>Fatal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4/3/08</td>
<td>2:15pm</td>
<td>Day</td>
<td>Dry</td>
<td>Inatt</td>
<td>Inj. 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6/1/08</td>
<td>2:30pm</td>
<td>Day</td>
<td>Wet</td>
<td>Inatt</td>
<td>PDO</td>
</tr>
<tr>
<td>HA</td>
<td>F2</td>
<td>1/5/08</td>
<td>10:10am</td>
<td>Day</td>
<td>Dry</td>
<td>Inatt</td>
<td>PDO</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2/9/08</td>
<td>9:45am</td>
<td>Day</td>
<td>Dry</td>
<td>AOV</td>
<td>Inj. 1</td>
</tr>
<tr>
<td>HB</td>
<td>A2</td>
<td>2/20/08</td>
<td>3:00am</td>
<td>Night</td>
<td>Dry</td>
<td>DUI</td>
<td>Fatal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4/3/08</td>
<td>2:15pm</td>
<td>Day</td>
<td>Dry</td>
<td>Inatt</td>
<td>Inj. 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6/1/08</td>
<td>7:30am</td>
<td>Day</td>
<td>Dry</td>
<td>Inatt</td>
<td>PDO</td>
</tr>
<tr>
<td>HP</td>
<td>Int2</td>
<td>1/5/08</td>
<td>9:05am</td>
<td>Day</td>
<td>Dry</td>
<td>Inatt</td>
<td>PDO</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2/9/08</td>
<td>8:15pm</td>
<td>Day</td>
<td>Dry</td>
<td>AOV</td>
<td>Inj. 1</td>
</tr>
<tr>
<td>HP</td>
<td>C1</td>
<td>2/20/08</td>
<td>12:15am</td>
<td>Night</td>
<td>Dry</td>
<td>DUI</td>
<td>Fatal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4/3/08</td>
<td>2:30pm</td>
<td>Day</td>
<td>Dry</td>
<td>Inatt</td>
<td>Inj. 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6/1/08</td>
<td>10:10am</td>
<td>Day</td>
<td>Wet</td>
<td>Inatt</td>
<td>PDO</td>
</tr>
<tr>
<td>HOB</td>
<td>Int1</td>
<td>1/5/08</td>
<td>9:45am</td>
<td>Day</td>
<td>Dry</td>
<td>Inatt</td>
<td>PDO</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2/9/08</td>
<td>3:00pm</td>
<td>Day</td>
<td>Dry</td>
<td>AOV</td>
<td>Inj. 1</td>
</tr>
<tr>
<td>RE</td>
<td>Int3</td>
<td>2/20/08</td>
<td>2:15am</td>
<td>Night</td>
<td>Dry</td>
<td>DUI</td>
<td>Fatal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4/3/08</td>
<td>7:30am</td>
<td>Day</td>
<td>Dry</td>
<td>Inatt</td>
<td>Inj. 2</td>
</tr>
</tbody>
</table>
Diagram Summary

Crash Types

<table>
<thead>
<tr>
<th>Year</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>RA</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>17</td>
</tr>
<tr>
<td>RE</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>SS</td>
<td>1</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>HO</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>OC</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>HA</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Oth</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>7</td>
<td>5</td>
<td>7</td>
<td>3</td>
<td>22</td>
</tr>
</tbody>
</table>

Environment

Night 0
Day 22
Wet 3
Dry 19

Statistics

<table>
<thead>
<tr>
<th>Statistics</th>
<th>22</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>AADT</td>
<td>11,640</td>
</tr>
<tr>
<td>Years</td>
<td>3.71</td>
</tr>
<tr>
<td>1/1/05</td>
<td>9/15/08</td>
</tr>
<tr>
<td>AR</td>
<td>1.396</td>
</tr>
<tr>
<td>SI</td>
<td>2.157</td>
</tr>
</tbody>
</table>

Severity

PDO 16
Inj. 1 5
Inj. 2 1
Inj. 3 0
Fatal 0
Benefits

- Faster processing of collision information
- More accurate graphic depiction of collision locations
- Better assessment of collision locations
- Better archiving tool for existing diagrams
- Assists in site remediation strategies
- Aides in identifying/ranking sites for safety improvements
- Helps formulate budgeting strategies
- Analyze success of mitigation strategies
Summary

- Design of Collision Diagram tool didn’t happen overnight
  - SCDOT participated in 3 day design meeting with Intergraph to process ideas and goals for project.
  - Required close contact between SCDOT and Intergraph for questions, problems and solution ideas throughout design process.

- Overall SCDOT excited about the new diagramming tool and is looking forward to deploying throughout the Traffic Safety Office
  - Intergraph provides training for users

- Currently still refining the tool