Development of a Spatial Database for Roadway Intersections

Your hosts:
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Agenda

- Background
- Previous effort
- Literature search
- Methodology
- Conclusions
Background

- Approximately 35 percent of all traffic crashes in Kentucky occur at intersections
- There is a need to prioritize intersection crashes
- Kentucky’s Highway Safety Improvement Program ranks these intersections
- Crashes are not always properly located
  - Lat/long or Linear Reference System
Linking Crashes to Intersections

GPS  Mainline  Side Road
eCrash KYOPS

- MapIt
- Added October 1st 2007
- CRMP data linked to GPS
- Between/Intersect streets
- Searchable
- RT Unique: “034-US-0068 -000”
Crash Data Potted by Lat/Long

[Map showing crash data potted by lat/long coordinates]
Crash Data plotted by Lat/Long Showing County Check

Legend
CountyCheck Events
Plotted in Reported County?
- No
- Yes
Previous Effort

- Used ArcGIS to create an intersection list
- Completed in 2004
- Resulted in a point shapefiles with a varying buffer zone
- Only included state-maintained roads
- Route, MP, and AADT included for each approach (static)
Limitations to Previous Effort

- Not maintainable
- Segmentation was static
- Traffic volumes were static
- Updating crash data was a lengthy, painful process
- Excluded local roads
- After 10 years.... Enough is enough
The New Methodology

• Create a maintainable spatial intersection database
• Use with SafetyAnalyst and Safety Performance Functions
• Tied to KYTC’s node usage table (changes are propagated)
• Dynamically linked to traffic volumes and road geometry
• Other users: planning, maintenance, IT (not just safety)
• Includes all roads (state and local)
• Includes an area of influence
<table>
<thead>
<tr>
<th>HSM Chapter</th>
<th>Undivided Roadway Segments</th>
<th>Divided Roadway Segments</th>
<th>Stop Control on Minor Leg(s)</th>
<th>Signalized</th>
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<tbody>
<tr>
<td></td>
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<td>3-Leg</td>
<td>4-Leg</td>
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<td>10—Rural Two-Lane Roads</td>
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Literature Search

• List of attributes:
  • Intersection Type
  • Number of approaches
  • Pavement type
  • Intersection control (by approach)
  • Angle
  • Safety features
Methodology
Kentucky’s LRS

- County Route Mile point
  - County
  - Route Prefix
  - Route Number
  - Route Suffix
  - Section ID
Identifying T-shaped Intersections

• T-shaped: any intersection that converges on a single node.
• This is based on join counts between the node file and link file
• To ID multiple T-shaped formations a distance threshold will be used
• Divided highways use a different system
Identifying Triangle Shaped Intersections

- Triangle shaped: intersection that includes more than one node.
  - Loop each node individually
  - Select links that connect to a node
  - Select additional nodes that intersect these links
  - Search these nodes any additional shared links
  - If there are shared links, then these are candidates for a triangle intersection
Divided Highway

- Problem → Do not count nodes from undivided to divided highway
- Solution:
  - Run Frequency Tool with Summary Count on Field that contains First 13 characters of RT_Unique
  - Must be run on filtered table for Section IDs < 11
  - Do no include where Frequency = Summary Count on Section IDs < 11
Node Valency

- Node valency (degree) or number of segments per node can be determined through the Frequency Tool (=> 3)

Summary
Reads a table and a set of fields and creates a new table containing unique field values and the number of occurrences of each unique field value.

Usage
- The output table will contain the field Frequency and the specified frequency field(s) and summary field(s).
- The output table will contain the frequency calculation for each attribute value combination of the specified frequency field(s).
- If a summary field is specified, the unique attribute values of the frequency calculation are summarized by the numeric attribute values of each summary field.
- When using layers, only the currently selected features are used in calculations.
Node Valency

- Caveats
- Node Type “Distance Break”
  - Where nodes include “Distance Break” (0.95%)
    - Valence is over counted
  - Can we eliminate Knu_Rt_Type “D_B” from process?
Frequencies

- Node ID Frequency
- Node Route Frequency
- Node XY Frequency
- Node RT_Unique Frequency
Other Section IDs to Worry About?

- **11 - 19** Rest Areas, Weigh Stations, Scenic Views in conjunction with Interstates and Parkways
- **20 - 29** Y's
- **30 - 69** Crossovers
- **70 - 79** Connectors
- **80 - 99** Other: bays, cul-de-sacs, spurs, frontage roads, etc. plus any overflow from the above
- **111 - 999** Interchange ramp
Area of Influence?

- Controlled by Road Classification
- Auxiliary Lanes
- Primary Intersection Type
- Urban / Rural
Attribution?

• Typology
  • What to do about roundabouts? Traffic circles?
  • HSM Types
  • eCrash Audit
• Control
• Signal Timing
• Primary Node Identification
Intersection / Interchange Types

<table>
<thead>
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<th>KIL_INV_TYPE</th>
<th>KIL_VIEW_COL_NAME</th>
<th>KIL_ATTRIB_NAME</th>
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Thanks

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