Space Time Crash Analysis Case Study

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Annual United States Road Crash Statistics

- Over 37,000 people die in road crashes each year
- An additional 2.35 million are injured or disabled
- Over 1,600 children under 15 years of age die each year
- Nearly 8,000 people are killed in crashes involving drivers ages 16-20
- Road crashes cost the U.S. $230.6 billion per year, or an average of $820 per person
- Road crashes are the single greatest annual cause of death of healthy U.S. citizens traveling abroad

Source: Association for Safety International Road Travel
Number of Car Crashes (2010-2015) in Brevard County, Florida
Car Crashes (2010-2015) in Brevard County, Florida

- It is difficult to discern any kind of pattern from the point locations alone.
- It seems that the whole county got into troubles.
Why Space and Time?

- Crashes occurred at different time even at the same location
- Crash patterns vary by time, e.g., peak hour or non peak hour
Space and Time Pattern Analysis

• New Hot Spots are locations that have had a large number of crashes during the final four months of 2015.

• Consecutive Hot Spots are locations that have consistently had a large number of crashes over the last year or two.

• Sporadic Hot Spots are locations that sometimes have a high number of crashes and sometimes don’t.
Space and Time Pattern Analysis (Continued)
Space and Time Pattern Analysis Limitation

- The spatial analysis used to assess hot and cold spot areas is based on Euclidean distance rather than the actual road network.

- The analysis does not consider important temporal cycles such as the workweek rush hour.
Street Network and Euclidean Distances

Street Network Distance: 4.5 miles
Euclidean Distance: 0.33 miles
Street Network and Euclidean Distances (Continued)

Street Network Distance: 4.0 miles
Euclidean Distance: 0.04 miles
How Street Network and Euclidean Distances Affect Analysis

Legend

- Analysis Location
- Crashes within 2-mile Street Network
- 2-mile Street Network
- Crash Locations

837 crashes within 2-mile Street Network Distance
How Street Network and Euclidean Distances Affect Analysis (Continued)

1998 crashes within 2-mile Euclidean Distance

Legend

- Analysis Location
- Crashes within 2-mile Radius
- Spatial Circle

2-mile Radius Spatial Circle
- Crash Locations
Hot Spot Analysis

- **Weights Matrix File:** Network Spatial Weights file for accounting for street network
Generate Network Spatial Weights

- Impedance Attribute: Street Segment Length
- Impedance Cutoff: Threshold Distance for Spatial Relationship
### Impedance Cutoff Value Selection

#### Access Management Standards From Rule 14-97

<table>
<thead>
<tr>
<th>Class</th>
<th>Medians</th>
<th>Median Openings</th>
<th>Signal</th>
<th>Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Full</td>
<td>Directional</td>
<td>More than 45 mph</td>
</tr>
<tr>
<td>2</td>
<td>Restrictive w/Service Roads</td>
<td>2,640</td>
<td>1,320</td>
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<tr>
<td>3</td>
<td>Restrictive</td>
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<td>1,320</td>
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<tr>
<td>4</td>
<td>Non-Restrictive</td>
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<td>660</td>
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<tr>
<td>5</td>
<td>Restrictive at greater than 45 mph</td>
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<td>660</td>
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<td></td>
<td>At 45 mph or less Posted Speed</td>
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<td>Non-Restrictive</td>
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<td>440</td>
<td>245</td>
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<tr>
<td>7</td>
<td>Both Median Types</td>
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<td>330</td>
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</tr>
</tbody>
</table>

Class 5 represents the most common streets. Connection column is for driveway spacing for different posted speeds. A value between 245 ft and 440 ft can be selected as the Impedance Cutoff based on the local condition.

Florida Administrative Rule Chapter 14-97
Traffic Accidents by Day of Week

The number of traffic accidents is highest during the work week between 3:00 PM and 5:00 PM.
Crash Rate Hot Spots Comparison

All day and times

Afternoon work week between 3:00 PM and 5:00 PM
Crash Rate Trends for Work Week between 3:00 PM to 5:00 PM

Stacking road segment crash hot spots for each year showing crash trends in space and time.
Case Study Information

- Story Map: http://arcg.is/2j7NLTn
Questions