Creating Value ...

Using Transit Locations for Pedestrian Safety Analysis

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St. Petersburg, Florida
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- Director of Planning for Michael Baker Jr., Inc. (Baker) New Jersey Operation
- 12 Years as a GIS Professional and manager for Baker
- 11 Years previously as an engineer and analyst for NJDOT
- GIS project manager for projects at NJDOT and New Jersey Transit
Outline

- Pedestrian Safety Management System
- ADA Curb Ramp Compliance
The New Jersey Department of Transportation (NJDOT) provides aid to local municipalities for bicycle and pedestrian enhancement projects.

Municipalities and counties submit applications for aid.

Review and prioritization of the requests was time consuming and subjective.

NJDOT desired a management system to identify and prioritize roadway locations for pedestrian improvements.

Requests for aid corresponding with the highly rated sections would receive priority in review and approval.
Baker has a Bicycle/Pedestrian Planning On-Call Task Order Agreement with NJDOT

As a task order under the agreement, Baker proposed a GIS application to prioritize and rank locations along the state road network.

The application performs spatial and linear analysis on several data sets, including transit locations to rank road segments.
The system utilizes multiple spatial data sets such as:

- Crash data
- Pedestrian Attractors (schools, bus stops, parks, rail stations, etc.)
- Roadway attributes (speed limits, traffic volumes, etc.)
- Asset locations (sidewalks, crosswalks, etc.)
- Socio-economic data from the US Census

Provides reports and mapping as output
Pedestrian Safety Management System

- Transit data included locations of rail stations and bus stops
- 200+ rail stations (Commuter and Light Rail)
- 20,000+ bus stops
- Transit locations are major generators of pedestrian traffic in NJ
- NJ Transit is source of all transit spatial and attribute data in New Jersey
Pedestrian Safety Management System

- The application performs proximity analyses and spatial overlays to rank road segments
- Criteria affecting pedestrian movements were identified and weighted
- Ranking can be adjusted to calibrate the ranking process

Analysis Filter: Municipality: Mercer – Hamilton Twp
SRI: 00000001 (0.00 – 64.879)

<table>
<thead>
<tr>
<th>Priority</th>
<th>Score</th>
<th>Roadway</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>70</td>
<td>US 1 (00000001) – mileposts 22.0 to 22.5</td>
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</table>

<table>
<thead>
<tr>
<th>Score</th>
<th>Count</th>
<th>Feature</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>10</td>
<td>1</td>
<td>Pedestrian Fatalities</td>
<td>1 pedestrian fatality in 3 years (0.02 miles)</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>Pedestrian Crashes</td>
<td>Over 5 pedestrian crashes in 3 years (0.06 miles)</td>
</tr>
<tr>
<td>9</td>
<td>2</td>
<td>Schools</td>
<td>St. Ann (0.23 miles), Steinert (0.12 miles)</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>Senior Citizen Center</td>
<td>Hamilton Twp, Senior Center (0.16 miles)</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>Bus Stops</td>
<td>601 – RS to Hamilton (0.15 miles), 409 – RS to Hamilton Square (0.22 miles), 600 – Lunch Loop (0.18 miles)</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>Sidewalk – Left</td>
<td>Facilities do not exist</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>Sidewalk – Right</td>
<td>Facilities in poor condition</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>Over 25% households without vehicle</td>
<td>32% households without vehicle</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>Over 25% non-English speaking households</td>
<td>39% non-English speaking households</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>Speed Limit</td>
<td>30 mph to 39 mph</td>
</tr>
</tbody>
</table>
Pedestrian Safety Management System

- Spatial buffers were converted into their corresponding linear extents along the road network.
- Once all data was reduced to a single dimension (length along the road centerline), the analyses was easier.
Pedestrian Safety Management System
Pedestrian Safety Management System

Buffer (distance) Analysis
Pedestrian Safety Management System

Linear Referencing and Buffer Analysis
Pedestrian Safety Management System
Pedestrian Safety Management System
Pedestrian Safety Management System

- A prototype of the system was rolled out in 2009
  - Data for Mercer County was compiled, validated and loaded to the database for on-site user testing

- Development of the full-scale statewide system is set to begin later this fall. Key tasks include:
  - Data development (gathering, formatting, and validating data from multiple sources)
  - System enhancements to reduce processing time
ADA Curb Ramp Compliance

- NJDOT is working to get its facilities in compliance with the American with Disabilities Act Accessibility Guidelines (ADAAG)
- Facilities include sidewalks and curb ramps along 2,300 miles of Interstate, US, and State Highways under NJDOT jurisdiction
- Particular emphasis was placed on installing curb ramps at intersections and crosswalk locations
- Curb ramps are especially needed in areas with a high percentage of the population that is elderly and/or disabled
- NJDOT had insufficient records to identify the number and locations of curb ramps to be installed
- NJDOT requested that Baker perform a curb ramp inventory and prioritize the locations for installations
- Baker performed the work under several task orders of the NJDOT Bicycle/Pedestrian On-Call Task Order Agreement
ADA Curb Ramp Compliance

- Baker utilized a recent video-based inventory of all state highways
- Curb ramps were identified in the images
- Locations and key attributes of intersections and curb ramps were recorded by a feature extraction process
- Collected attributes included:
  - Route Number and Milepost
  - Width
  - Has Landing Area
  - Detectable Warning Surfaces
  - Obstructions (poles, inlets, etc.)
  - Curb and gutter grade matching
  - Ramp within crosswalk
ADA Curb Ramp Compliance

- Ramps were tied to intersections
- Curb ramps were identified to be fully present, partially present, or missing from each intersection
- Full compliance with ADA standards could not be determined due to the limitations of the video images used for the inventory
  - Slopes could not be measured accurately with video
  - No field work was performed to save costs
- Results were summed by intersection and route
ADA Curb Ramp Compliance

- Only 1,800 miles of NJDOT jurisdiction routes were analyzed
  - Freeways were excluded because they don’t have sidewalks
  - Highway entrance/exit ramps were also excluded

- 10,093 intersections were analyzed along those routes
  - 8,387 had all curb ramps (83%)
  - 825 had some curb ramps missing (8%)
  - 881 had no curb ramps present (9%)
ADA Curb Ramp Compliance

- 27,019 curb ramps were identified during the inventory
  - 24,072 curb ramps were present (89%)
  - 2,947 curb ramps were missing (11%)
- For a curb ramp to be categorized as “missing” there had to be a destination for someone leaving the sidewalk at that point
  - No “ramps to nowhere”
  - Not every corner needed
Once the inventory was complete, a prioritization process was performed similar to the process used in the Pedestrian Safety Management System

11 Criteria for prioritization of curb ramp installations were developed and weighted

Scores for each intersection with missing curb ramps were then calculated based on spatial analyses of the weighted criteria
ADA Curb Ramp Compliance

- **Criteria included:**
  - Intersection density
  - Locations of hospitals, nursing homes and senior centers
  - Transit rail facility proximity
  - Population age and disability percentages
  - Pedestrian crashes
  - Locations of park and ride lots
  - Locations of municipal buildings
  - Locations of resurfacing projects in the current NJDOT Capital Program

<table>
<thead>
<tr>
<th>Intersection Score</th>
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<tbody>
<tr>
<td>160+</td>
</tr>
<tr>
<td>115 - 160</td>
</tr>
<tr>
<td>70 - 115</td>
</tr>
<tr>
<td>35 - 70</td>
</tr>
<tr>
<td>0 - 35</td>
</tr>
</tbody>
</table>

- Rail Station
- Hospital
- Nursing Home
- Senior Center
- Municipal Building
- Park and Ride Facility
- Pedestrian Accident Age 65+
- FY ’11 Resurfacing Program
- Road
- County Boundary
- MPO Boundary
ADA Curb Ramp Compliance

- Transit data was obtained from New Jersey Transit
- Only rail locations (commuter and light) were used in the inventory
- Bus stops were excluded due to the vast number of stops
  - 20,000+ bus stops are distributed spatially across New Jersey to the same general extent of the intersections with missing curb ramps
  - No significant impact on curb ramp locations was determined from the bus stop distribution
ADA Curb Ramp Compliance

- **Score Calculation: Hospital Proximity**
  - The distance from the closest hospital to each candidate intersection was calculated in feet.
  - This distance was divided by 3,960 feet (3/4 mile)
  - The result was subtracted from 1 and multiplied by 100
  - Any hospital outside of a ¾ mile radius to a candidate intersection was discarded and a score of zero assigned

- This process allows a maximum possible score of 100 for the hospital proximity criteria. A higher score indicates a hospital is closer to an intersection.

- A similar process was followed for other point features such as nursing homes, senior centers, and transit stations.
ADA Curb Ramp Compliance

- All intersections were scored for each criteria
- Scores were multiplied by weighting to give a total score for each intersection

<table>
<thead>
<tr>
<th>Criteria Name</th>
<th>Initial Weighting</th>
</tr>
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<tbody>
<tr>
<td>Intersection Density</td>
<td>Medium</td>
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<tr>
<td>Percent Elderly</td>
<td>High</td>
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<tr>
<td>Percent Disabled</td>
<td>High</td>
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<tr>
<td>Proximity to Hospitals</td>
<td>Medium</td>
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<tr>
<td>Proximity to Nursing Homes</td>
<td>Medium</td>
</tr>
<tr>
<td>Proximity to Rail Stations</td>
<td>Low</td>
</tr>
<tr>
<td>Proximity to Senior Centers</td>
<td>Medium</td>
</tr>
<tr>
<td>Proximity to Municipal Buildings</td>
<td>Low</td>
</tr>
<tr>
<td>Proximity to Park and Ride Facilities</td>
<td>Low</td>
</tr>
<tr>
<td>Within Resurfacing Project</td>
<td>Critical</td>
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<tr>
<td>Proximity to Pedestrian Crashes</td>
<td>High</td>
</tr>
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</table>
Intersections were ranked by total score and aggregated by route

The maximum score possible using the project weightings is 950. The resulting weighted scores for this dataset range from 3.57 to 431.33 with a mean score of 105.49

<table>
<thead>
<tr>
<th>SRI</th>
<th>Number of Intersections</th>
<th>Average Weighted Score</th>
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<tbody>
<tr>
<td>00000206Z_</td>
<td>16</td>
<td>248.95</td>
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<tr>
<td>00000129__</td>
<td>3</td>
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<tr>
<td>00000182__</td>
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<td>234.15</td>
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<tr>
<td>00000139U_</td>
<td>8</td>
<td>215.64</td>
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<tr>
<td>00000093__</td>
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<tr>
<td>00000063__</td>
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<tr>
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<td>4</td>
<td>175.85</td>
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<table>
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<td>00000001B__</td>
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<td>100.19</td>
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<tr>
<td>00000009</td>
<td>80</td>
<td>80.22</td>
</tr>
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</table>
ADA Curb Ramp Compliance

- Maps were produced for the entire state as well as each region
  - Intersections were color coded to show weighted scores
  - Criteria were also displayed as point features (i.e. transit stations)
ADA Curb Ramp Compliance

Northern New Jersey
ADA Curb Ramp Compliance
ADA Curb Ramp Compliance

- NJDOT is currently working to identify intersections with missing curb ramps that can be inserted into projects in the Statewide Transportation Improvement Plan for construction
- Other intersections are scheduled to be handled with maintenance contracts
Additional Information

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