Pedestrian GIS Tools
What are they good for?

Pro Walk / Pro Bike 2006

Presentation Summary
- Why Use GIS for Ped Planning?
- What Tools are Most Useful?
- How Can They be Applied?
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Why Use GIS?
- Definition of GIS:
  - “Computerized systems for the storage, retrieval, manipulation, analysis, and display of geographically referenced data”
Why Use GIS: Arguments For

• Spatial Representation of Data
  • Mapping
    › Census JTW data, collision statistics
  • Policy areas
    › Networks, routes, proposed pathways
  • Analytical techniques (e.g. buffering)

GIS Mapping

• Walking Distance to Transit
Why Use GIS: Arguments For

- Flexibility in Collecting and Updating Data
- Modeling Applications
  - Use of multiple input factors
  - Complex calculations

Why Use GIS: Arguments Against

- Cost
  - Software
  - Data collection and translation
- Learning curve
  - Complex, requires training
- Time
  - Maintaining large amounts of data can be time consuming
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Tools vs. Techniques

• Techniques (Display of Data)
  • Mapping
  • Buffering
  • Queries

• Tools (Manipulation and Analysis of Data)
  • Combination of multiple factors
Techniques: Mapping
- Safety – Collision Analysis

Source: City of Oakland Pedestrian Master Plan

Techniques: Buffering
- Safety – School Zones

Source: City of Oakland Pedestrian Master Plan
**Techniques: Buffering**
- Transit Station Walksheds

**GIS Tools for Pedestrian Planning**
- Route and Slope Analysis
- Automated Data Collection
- Modeling
  - Pedestrian Demand Estimation
  - Demand/Deficiency Analysis
Routes and Slope Analysis
Routes and Slope Analysis

Automated Data Collection
- Handheld Devices
- GPS Equipped
- Programmable
Tools for Pedestrian Modeling: 3 Questions

1. Usage: How many?
2. Marginal Change in Usage: How many more would there be if...?
3. Deficiencies: Where are underserved areas?

Tools: Demand Estimation

- Could answer questions #1 and #2: (How many? How many more would there be if...?)
  - Many past efforts at measuring demand (both bike and ped)
    - Traditional 4-step models
    - Mode specific models
  - Complications due to complex nature of pedestrian demand
    - Has led to sketch planning level estimates of ped usage
Tools: Demand Estimation

- GIS offers ability to further develop demand tools
  - Research on factors influencing demand – land use element
  - Research on network topology – structural element
- Recent efforts
  - University of Maryland
  - UK

Tools: Demand Estimation

- Challenges
  - Intensive data collection
    - Derivation of rates by land use
    - Pedestrian counts for model calibration costly
  - Relationships contain unmeasured factors (e.g. history, culture)
  - Does not answer question #3: Where are there underserved areas?
    - An important question for bike/ped planners
Tools: Integrating Demand and Deficiencies

- Moves away from directly predicting demand
  - Relative vs. absolute values
  - Answers question #3
    - Where are there underserved areas?

Tools: Demand and Deficiencies

- Premise is that areas with high demand and few facilities are underserved
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GIS Modeling Applications
- Sacramento Pedestrian Master Plan: PedINDEX tool
Example Application: Sacramento PedINDEX GIS tool

- Based on EPA’s Smart Growth Index research
  - Demand: Identified factors correlated with the likelihood to walk
    - Related to “4D’s” research:
      - Density
      - Diversity
      - Design of neighborhood
      - Distance to transit
  - Deficiency: Based on city’s GIS system

Pedestrian Demand

- “The nature of a place that attracts pedestrians”
  - Demand influenced by:
    - Land use: mixes and intensities of uses
    - Public spaces and parks
    - Transit
Sacramento Pedestrian Demand

Measures of pedestrian demand (15 factors mapped in GIS):
- Population density
- Transit proximity
- Employment density
- Land use mix
- Proximity to Schools, parks, community centers, shopping areas
- Age / socio-economic factors

Pedestrian Deficiency
- “The ease, comfort, and safety of walking”
- Walkability depends on the condition of the infrastructure
- Low walkability means a deficient pedestrian infrastructure
High walkability

Low walkability
Sacramento Deficiencies

Measured infrastructure deficiencies (6 factors mapped in GIS):

- Sidewalks
- Street connectivity
- Street width
- Traffic signals
- Hazards / collisions
- Street lighting

Sacramento Improvement Needs

Highest Priority Areas: Putting facilities where they are needed the most
Sacramento Ped Master Plan
- Policy Areas
  - Ped Zones

Sidewalk Prioritization

BASIC
UPGRADED
PREMIUM
Sidewalk Improvement Projects

Street Crossing Candidate Improvements
Lessons Learned

• Variety of tools available
• GIS can be a particularly useful prioritization tool
  › But cannot ignore community input
• Readily available data sources
  › Demand data generally straightforward to compile (Census, City land use data)
  › Deficiencies data can use proxy variables
• Adaptability

Thank You!

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