Pedestrian Data Collection Issues & Techniques

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Overview

- Problem statement
- Data collection process
- State of the art and practice
- Prototype system
Pedestrian Data

• National data (2010)
  – 4,280 pedestrian fatalities
    • 13 % of total roadway related fatalities
    • 72% Urban environment
    • 69% Nighttime
Pedestrian Data

• Arizona (2012)
  – 1,565 pedestrians Crashes
    • 1,162 No Apparent Chemical Influence
    • 818 Daylight
  – 132 Pedestrians Killed (16% of all fatalities)
    • 34 No Apparent Chemical Influence
    • 75 Crossing Road
    • 101 Dark (lighted / not lighted / dark unknown)
Phoenix

Fatal Collisions by Mode of Transportation

- Single Motorcycle (7 crashes) 6%
- Vehicle - Bicycle (10 crashes) 9%
- Single Vehicle (13 crashes) 12%
- Vehicle - Motorcycle (18 crashes) 17%
- Vehicle - Pedestrian (34 crashes) 32%
- Vehicle - Vehicle (26 crashes) 24%
Case Example

• November 2009 - Flagstaff, Arizona
  – Male with young daughter hit by bus while crossing crosswalk (Nighttime)

• September 2010 – Phoenix, Arizona
  – Female hit by car (making left turn) while crossing in crosswalk (signalized intersection, nighttime)
What can be done to improve safety?

Vehicular Traffic

- Volume
- Speed
- Vehicle Classification
- Position

Data
Pedestrian Data

- Pedestrian traffic often understudied in favor of motorized modes of transportation
- Lack reliable data (volume, exposure – collision risk)
- Pedestrians data not widely available
  - Difficulties evaluating safety performance of new or existing pedestrian crossing facilities
  - Less efficient use of limited funds
- Lack standard methodology for conducting pedestrians counts
Pedestrian data collection systems

• The main methods are:
  – manual field observations,
  – manual observations from videos,
  – automated data collection / analysis.
Manual Data Collection

Limitations:
• Does not capture naturalistic pedestrian movement (?)
• Short-term data (1-4 hours) then extrapolation
• Time consuming
• Resource intensive
• Error-prone

Advantage:
Minimal equipment needs
Pedestrian data collection systems

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  – automated data collection / analysis.
Big S.T.E.V.E
Mini S.T.E.V.E
Video footage

40th St at Danbury
Phoenix

Indian School Rd at 30th St.
Phoenix
City of Phoenix
Manual Observation from Video

- Equipment acquisition and installation
- Maintenance costs
- Time consuming
Pedestrian data collection systems

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  – manual field observations,
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  – automated data collection/analysis.
Automated data collection/analysis

Radar

**Advantages**
- Detect and retain large quantities of information in a short time
- Operates in all weather
- Possible to link several sensors
- Data delivery evaluated at any time (online or from data base)
- Measurements highly reliable and accurate

**Disadvantages**
- Cost
- Battery
- Limited radius 15 m
New technology in pedestrian data collection

Video – Image processing

Advantages
• High quality
• High accuracy
• Software technology use for processing and grouping
• Real time detection

Disadvantages
• Complexity of pedestrian tracking
• Programming involved
Automated Video – Image processing system prototype

- Record real-life images of site (Video)
- Cover areas surrounding dedicated crosswalk and vehicular approach
- Easy to install with minimum modification to new / existing pedestrian facilities e.g. PHB
- Trigger event: pedestrian presence (even if pedestrian did not activate system)
- Flexible pedestrian detection zone
- Connect detection system with video system (different manufactory)
Automated Video – Image processing system prototype

Requirements

- @ trigger, captures images of pedestrians & vehicles within established area
- Record up to X seconds prior to pedestrian being detected
- Minimize amount of equipment
- IP transmission
- Storage data management and maintenance
- Develop open-ended system to allow image-data processing in future

Method

System Users
Automated Video – Image processing system prototype

- External storage location
- Semi – automated data analysis
  - Photogrammetry approach to evaluate vehicle approach speed
  - Aftermarket methodology
Automated Video – Image processing system prototype

- Automated pedestrian detection system
  - Use aftermarket detection system (e.g. SafeWalk or C-Walk, others)
- Video recording systems
  - Use aftermarket image capture system (CCTV, Autoscope, others)
    - Pedestrian recording
    - Vehicular movement recording
Arizona prototype for a low-cost pedestrian data collection system

- # of drivers who did and did not yield to pedestrians in crosswalks
- # of vehicle/pedestrian conflicts that involved evasive action taken by driver or pedestrian
- # of pedestrians trapped at centerline by drivers failing to yield
- % of drivers who yielded within an established range
Arizona prototype for a low-cost pedestrian data collection system

- # of drivers who passed or attempted to pass stopped vehicle
- # of drivers in following vehicles who engaged in hard braking behind stopped car
- # of pedestrians who did not activate the system
- Distance from selected crosswalk that pedestrians crossed (if not within the selected system)
- “Head-checks”
- Ped. characteristics
- Other data possible….
Questions ?