Synthesis on Automated Pedestrian Data Collecting Techniques and Applications in Transportation Planning, Design and Management (TxDOT 0-7026)

CENTER FOR TRANSPORTATION RESEARCH

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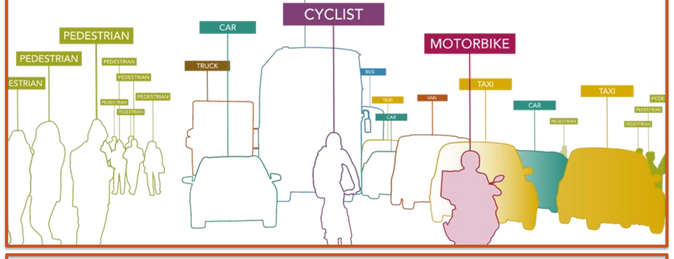
BACKGROUND

- Improved pedestrian data sources are needed to facilitate planning, designing, and operating pedestrian facilities.
- Automated technologies have been emerging, yet little is known on the potential risks and technical barriers.

Significance of automated pedestrian data collection

- Accommodate increasing active transportation rates
- Determine where investments are needed
- Draw conclusions about the impact of new facilities
- Assess changes over time
- Conduct exposure and risk analysis for safety-related purposes
- Ensure equitable pedestrian access
- Predict future pedestrian travel demand



OBJECTIVES

1. Develop a synthesis on automated pedestrian data collection strategies that reflects the state-of-the-art and state-of-the-practice.
2. Develop a decision support system that aids in evaluating the appropriateness and effectiveness of different automated technologies based on a set of relevant decision-making variables.
3. Provide TxDOT with the required information and insights regarding automated pedestrian sensing techniques to enhance its strategic planning efforts.

METHODOLOGY

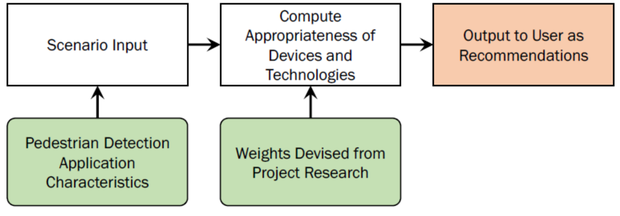
Background Research of Use Cases, Products, and Practices

- Pedestrian Master Plans
- Pedestrian Count Programs
- Academic Literature

Outreach for Current and Future Capabilities

- Conduct a Survey: Sent to more than 170 experts (qualtrics XM)
- Conduct Interviews: More than 15 telephone or videoconference Interviews with practitioners based on the survey results

Design a Decision Support Framework



AKNOWLEDGEMENTS

Texas Department of Transportation

We would also like to thank Tom Schwerdt, Phillip Hempel, and PMC members James Kuhr, Jianming Ma, and Samuel Norman

GOING FORWARD

- Process survey responses
- Conduct interviews
- Develop decision support framework

TRADITIONAL PEDESTRIAN DETECTION METHODS

Manual

- Most reliable
- Most common
- Used to validate other tech.
- Undercounting rate: 8-25%

Infrared

- Common automated method
- Undercounting rate: 9.5%
- Total deviation: 22.5%

Radio Beam

- Not widely used
- Undercounting rate: 3.6%
- Total deviation: 28.1%

Pressure/ Acoustic Pads

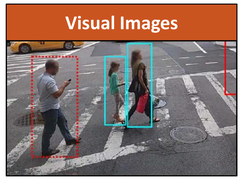
- Not widely used in urban settings
- Undercounting rate: 3%-6%

Signal Actuation Button

- Used as a proxy
- Prominent method but high errors
- No procedures have been established

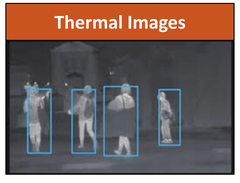
EMERGING PEDESTRIAN DETECTION METHODS

Visual Images



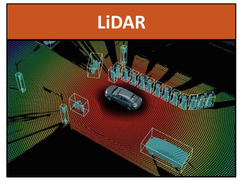
- **24+** products and solutions were identified: BoulderAI; Miovision; FLIR
- Case Studies:
  - Caltrans (in-house solution)
  - City of Pittsburg (full-implementation)
  - Massachusetts DOT (compared products)
  - North Carolina DOT (compared products)
  - Other (limited information)

Thermal Images



- Relatively **new** in the field
- **FLIR** is the main vendor in the market.
- A total of **3** vendors and **11** products were reported.
- Mostly for waiting at intersections
- **Conflicting conclusions**
  - Oregon DOT: thermal cameras failed in real-life intersections
  - Florida DOT: overall accuracy of 92% and only 2% false positives in detecting pedestrians.

LiDAR



- **Very limited** literature.
- **Velodyne** is the main manufacturer. A total of **3** vendors were reported.
- Most research has indicated that LiDAR should be **combined with visual video** for proper detection.
- **Nevada DOT performed the first of its kind roadside LiDAR study.**
  - Accuracy of crossing prediction was **97%** and non-crossing prediction was **84%.**
  - The near-crash identification method was successfully applied for extraction of near-crash events.