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Tech Brief

Automatic Pedestrian Counter

Need a solution?
Think Jersey DOT

FHWA-NJ-2010-001 February 2010

BACKGROUND

- The need to understand pedestrian behavior and to accommodate pedestrians in the transportation system is an issue that has been growing in prominence at the federal, state, and local levels.
- Emerging sensor technologies accelerated the shift toward automatic pedestrian counting methods to acquire reliable long-term data for transportation design, planning, and safety studies.
- Although a number of commercial pedestrian sensors are available, their accuracy under different pedestrian traffic flow conditions is still questionable.
- It is difficult to assess the suitability of different sensors for different locations. Some sensors that are claimed to be more accurate are substantially more expensive. Ease of deployment, power requirements, and long-term deployment issues all play an important role in the selection of sensors.

HERE'S THE PROBLEM

- Pedestrian counts are essential for decision making in pedestrian facility planning, signal timing, and pedestrian safety modeling. However, it remains difficult to obtain high-quality pedestrian counts
- Data related to pedestrians are lacking in most areas. Even where data exist, they are not always useful. Many pedestrian data sources still rely on conventional methods such as manual counting and video recording. These methods are labor intensive and expensive, and they do not always guarantee economic, sufficient, and accurate pedestrian data.
- The advance in new technologies now makes it possible to automatically count pedestrians for long periods of time. However, the feasibility of using these automated pedestrian technologies on a larger scale still needs to be investigated.

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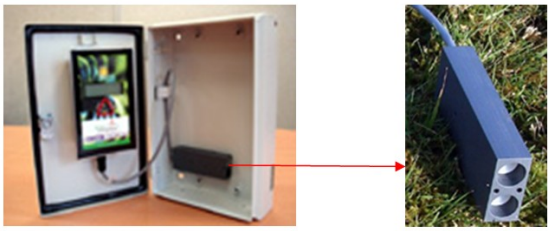
THESE ARE OBJECTIVES…

The primary goal of this project is to identify the functionalities and evaluate the effectiveness and accuracy of commercially available pedestrian counters for pedestrian data collection. This project goal is supported by the following objectives:

- Identify potential automatic counters for pedestrian data collection.
- Develop an evaluation plan to test the automatic counters.
- Conduct rigorous field tests/comparisons to assess the performance of the selected counters.
- Develop guidelines for NJDOT for deploying automatic pedestrian counters.

HERE IS WHAT WE DID…

- Interviews were conducted with a list of key informants, including the NJDOT staff who conduct pedestrian counts, section chiefs of other units at the NJDOT that requested pedestrian counts in the past, consultants who have conducted pedestrian counts for the NJDOT, and personnel from other state DOTs who have experience with pedestrian counting.
- These interviews give insight into the state of the practice of collecting pedestrian data in New Jersey and a few other states and reveal the officials' opinions about various pedestrian data collection methods.



- Two commercially available automatic pedestrian sensors—namely, a passive infrared counter by EcoCounter (figure above) and a thermal sensor (passive infrared counter with imaging) by TrafSys (figure below) were selected based on various criteria that include, but are not limited to, availability, capability, ease of deployment, reliability, and cost-effectiveness.

- Accuracy and reliability of the selected counters were deployed and tested at five sites in New Jersey. Three sites were high-volume locations and two were low-volume trails.
- Selection of the test sites was based on considerations: (1) pedestrian volume; (2) availability of mounting facility and space to install counters; (3) location accessibility; and (4) the recommendation of the NJDOT

Site	City	Facility Type	Test Date	Test Period	Volume(ped)	Flow(ped/hour)
1	Piscataway	Trail	10/08/2009	9 am-11pm	270	19
2	Piscataway	Trail	04/10/2009	10:30am-10:30pm	3103	259
3	New Brunswick	Crosswalk	08/13/2009	1 pm-7 pm	1273	212
4	Trenton	Crosswalk	05/22/2009	9 am-5 pm	1359	170
5	Trenton	Ped. bridge	08/19/2009	12 pm-6 pm	21	4

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- EcoCounter performs best at trails and sidewalks as recommended by its manufacturer, because its performance is sensitive to pedestrian arrival patterns. For example, it undercounts if pedestrians are walking side by side. Therefore, EcoCounter performs well at trail settings where pedestrians usually arrive individually.
- Deployment of EcoCounter at high volume sites are not recommended by its manufacturer. Results of our field tests also showed that EcoCounter clearly undercounts pedestrians at high-volume sites with an overall error rate ranging between -5.26 percent and -27.9 percent.
- The results at the lower-volume sites show that EcoCounter performs much better, with the mean absolute percent error (MAPE) being below 14 percent.
- Thermal sensor has an overall error rate ranging between -14.61 percent and 1.3 percent. The largest overall error rate of -14.61 percent occurred at a crosswalk in New Brunswick where pedestrians stop at the detection area waiting for the traffic light.
- The results show that the MAPEs of EcoCounter are 1.5 to 2.0 times larger than those of the thermal sensor if they were both deployed at high-volume sites.

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A final report is available online at:
http://www.state.nj.us/transportation/refdata/research/

If you would like a copy of the full report, please FAX the NJDOT, Bureau of Research, Technology Transfer Group at (609) 530-3722 or send an email to Research.Bureau@dot.state.nj.us and ask for:

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