National Bicycle and Pedestrian Documentation Project

AUTOMATIC COUNT TECHNOLOGIES

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NATIONAL BICYCLE & PEDESTRIAN DOCUMENTATION PROJECT

AUTOMATIC COUNT TECHNOLOGY OVERVIEW

Bicycle and pedestrian counts can be conducted manually or with automatic count technologies; however automatic counters have certain advantages. Automatic count technologies are useful in conducting longer-term counts, establishing daily, weekly, or monthly variations and almost always require fewer person-hours. The most common technologies used for bicycle and pedestrian counts are:

- Passive infrared (detects a change in thermal contrast)
- Active infrared (detects an obstruction in the beam)
- Ultrasonic (emits ultrasonic wave and listens for an echo)
- Doppler radar (emits radio wave and listens for a change in frequency)
- Video Imagining (either analyzes pixel changes or data are played back in high speed and analyzed by a person)
- Piezometric (senses pressure on a material either tube or underground sensor)
- In-pavement magnetic loop (senses change in magnetic field as metal passes over it)

Most automated technologies work well for counting users that pass a specific point but most, with a few exceptions such as active infrared and video, cannot easily distinguish between bicyclists and pedestrians. A combination of technologies such as Eco-Counter's Eco-Multi, can also distinguish between types of users.

Which Equipment is Right for Your Count?

The most appropriate count technology is dependent on the count location and purpose. Passive infrared is best suited for screenline sidewalk counts, but not in places where pedestrians gather, such as in front of cafes or busy transit stops (Schneider et al. 2009). Active infrared can distinguish between bicyclists and pedestrians, and is therefore appropriate for shared use pathways. In-pavement magnetic loops are best for detecting bicyclists traveling along bike lanes or pathways. Video playback can provide information concerning user type, behavior, and demographics, in addition to count data. Another consideration is the physical installation of the counting device. Some infrared technology requires sensors to be installed on both sides of the pathway, while other devices can be effectively installed in locations with poles/street lights on just one side of the pathway or sidewalk, such as in an urban setting.

Error Factors

All automated count technologies have an error factor, with no-detection rates varying from 1% to 48%. A Portland, Oregon study tested the accuracy of three types of sensors: passive infrared, Doppler radar and ultrasonic. The sensors were tested under a variety of conditions, and were found to have varying error rates: passive infrared had a 0% close range and 1.5% long range no-detection rate, Doppler radar had a 7% no-detection rate, and ultrasonic had a 3% close range and 45% long range no-detection rate (Beckwith and Hunter-Zaworski 1997). A San Diego County study found a 12% to 48% no-detection rate for passive infrared counters and 15% to 21% no-detection rate for active infrared counters (Ragland et al. 2008). The infrared sensors tend to undercount pedestrians most likely because they do not detect pedestrians walking exactly side-by-side (Schneider et al. 2009). Comparing automated counts with manual counts allows researchers to correct for inherent error rates.

Technology Overview

The choice of an automatic count technology primarily depends on the type of data that is required to be collected, the project budget, and the number of people who can work on the project. All automatic count technologies require calibration. The following table outlines count technologies most adaptable to bicycle and pedestrian counts.

Automatic Count Technologies

Technology	How it Works	Differentiate between bikes and peds?	Where can it be used?	Can it be moved to other locations?	Other Considerations	Technology Cost
Passive infrared	Detects a change in thermal contrast	No	Sidewalk, path	Easily		$,2000-3,000
Active infrared	Detects an obstruction in the beam	Yes	Sidewalk, path	Easily		$800-$7,000
Video imaging	Analyzes pixel changes	Unknown	Intended for indoor use	Yes	Difficult detection outdoors, no bike/ped application yet	$1,200-$8,000
Video playback	Video analyzed by a person	Yes	Anywhere	Yes	Difficult detection at night and bad weather. Considerable staff time	$7,000
Piezometric Tube	Senses pressure on tube	No	Path, on-street	Easily	Bicycles only. Potential tripping hazard	$1,600
Piezometric Pad	Senses pressure	No	Sidewalk, path	No		$2,000-3,000
In-pavement magnetic loop detectors	Senses magnetic field change as metal passes	No	On-street	No	Bicycles only. Requires cutting into pavement to install	$2,000-3,000

Automatic Counter Manufacturers:

EcoCounter: www.eco-counter.com
Jamar Technologies: www.jamartech.com
Trailmaster: www.trailmaster.com

References

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