CENTER FOR TRANSPORTATION RESEARCH

PROJECT SUMMARY

Texas Department of Transportation

0-7126: Synthesis of Automated Pedestrian Data Collecting Techniques and Applications in Transportation Planning, Design, and Management

Background

Cities in the United States have been experiencing a rise in pedestrian fatalities even as the intensity of pedestrian movement has grown. Additionally, as transportation planning and funding become more data-driven, agencies are required to justify their investments with robust quantitative measures. Thus, there is a critical need for accurate, reliable, and comprehensive information about pedestrian travel movements to support the planning, design, and management of infrastructure. Recent developments in video, thermal, and LiDAR imaging technologies and processing algorithms have provided new capabilities for gathering data for a variety of applications.

Traditionally, pedestrian volumes have been used as a baseline that informs planning and funding decisions as agencies aim to build safe, comfortable, and convenient walkable environments. Accurate and relevant pedestrian movement data can provide insights into mobility patterns and possible conflicts with motorized traffic, helping inform decisions regarding installing and operating traffic signals or beacons and determining the need for crosswalks, barriers, refuge islands, overpasses, or other facilities. Another important benefit of pedestrian data collection is that it facilitates risk analysis for safety-related purposes. Other applications include before-and-after analyses of infrastructure projects to better understand safety outcomes of investments like the installation of a midblock pedestrian crossing, and to promote design reforms for future facilities.

What the Researchers Did

In this project, researchers undertook a comprehensive literature review on the state-of-the-art and state-of-the-practice of manual and automated pedestrian data collection techniques. They assessed different automated data collection methods, including well-established and emerging AI- and sensor-based technologies, to evaluate their appropriateness and efficacy in different environments. The reporting analyzed these technologies based on a set of relevant decision-making variables.

The reporting was then followed by nationwide surveying and interviewing of agency practitioners to gather experiences and lessons around different technology types (video, infrared, and LiDAR), software algorithms, use cases, and customer satisfaction levels. The structure of the online survey and teleconference interviews was carefully designed from insights gained from the literature reviewing efforts. It was sent to 194 experts within related agencies, institutions, and companies, and 17 interviews were conducted.

Research Performed by: Center for Transportation Research

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Project Completed:
08-31-2022

What They Found

Researchers found that the bulk of new technologies relied upon video, but some opportunities were emerging for using infrared or LiDAR alone or in conjunction with video. Each technology had its own set of costs and risks in terms of reliability, expertise required for installation, and maintenance. Products that were ready to use "off the shelf, out of the box" became apparent, compared to those requiring a significant amount of additional work or "do-it-yourself" ingenuity to properly set up.

Interviews also revealed a great deal of information that was not found in products' marketing literature, including unique circumstances encountered in the field. One of the bottom lines for agencies in selecting equipment is understanding what the true cost of a technology is (in terms of installation, configuration, and maintenance), so that the proposed expense can be fully justified to stakeholders and aligned with planning roadmaps and application site requirements. Some technologies failed because of blind spots, sun glare, vandalism, and insufficient data bandwidth. Several agencies are conducting small-scale pilot studies on various products to gain experience that can guide major purchasing decisions. By gathering practitioner experiences and current product offerings, this project also helps in predicting the trajectory of technology, which often grows cheaper and more robust over the course of even a few months, and sometimes needs to be upgraded or replaced because of obsolescence. Finally, agencies continue to reconsider products' suitability as their policies evolve, such as those regarding equipment ownership, data governance, and privacy concerns around video images.

What This Means

Because of the complexity of the technologies available for pedestrian detection, agencies must consider multiple variables when selecting the most cost-effective yet efficient technology to deploy for pedestrian data collection at a certain site. This includes a variety of factors revealed in interviews with practitioners, such as intended application, desired features, acceptable costs, likelihood of failure cases, and more. Because of the importance of considering all of these factors, the researchers have produced a decision support framework that allows TxDOT to organize products and technologies according to key requirements. Through this decision support framework and the project's documentation, the research team has given TxDOT and its partners tools that allow them to make informed choices about technologies that significantly improve safety on the roadway and reduce overall costs.

For More Information

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Keyword: Research