PROJECT SUMMARY

Passive Pedestrian Detection Analysis

Project Location:
Minneapolis, MN

Start – Finish Date:
March 2021 – January 2023

Project Status:
Complete

Project Partners:
SRF Consulting Group

MnDOT Project Cost:
$135,000

Projects with Similar Characteristics:
Variable Pedestrian Clearance Interval

Project Description:

The Passive Pedestrian Detection Analysis project reviewed a variety of commercially available passive detection systems. Vendors that were selected for this study included:

- Flir, Miovision, Econolite, Gridsmart, and Iteris

After vendor selection, the project went through the following phases:

- Ground-truth Testing:
  - Verified the rate at which the systems accurately recognized a pedestrian at the intersection.
- Pushbutton Compliance Testing:
  - Determined the rate at which pedestrians activated the pushbuttons when they intended to cross the street.
  - Verified the accuracy of each system compared to pushbutton compliance.
- Vendor Result Summarization

Project Objective:

- Test and verify the accuracy of the selected passive detection systems.
- Provide MnDOT with a robust procedure for future testing.
- Provide an evaluation matrix comparing each tested vendor system.

Figure 1: Pedestrian Detection Test View

Project Accomplishments:

- Receiving a robust testing procedure to be applied to future technology installations.
- Gaining a better understanding on where detection technology stands on the spectrum of technology readiness.

Date Updated: 2024-11-14

Key Findings:

Ground-truth Testing

The system accuracies for detecting pedestrians at the intersections ranged from 23% to 83%.

Pushbutton Compliance Testing

Pushbutton compliance at study intersections ranged from 55% to 82%.
The system accuracies against pushbutton compliance ranged from 18% to 72%.

Vendor Re-Evaluation

After being able to make updates to their systems, the re-evaluation accuracy changes were inconsistent with some vendors seeing an increase in accuracy and others showing a decrease. Below is a vendor accuracy summary after re-evaluation.

System	Detection Accuracy	Direction Accuracy	Total Accuracy
Flir	21% (23%)	89% (67%)	19% (16%)
Iteris	72% (58%)	78% (61%)	56% (35%)
Autoscope Vision	69% (83%)	89% (94%)	62% (78%)
Miovision	18% (57%)	43% (82%)	8% (47%)
Gridsmart	32% (61%)	N/A	N/A

Figure 2: Phase 2 and Phase 3 Accuracy Summary

Lessons Learned:

- Installation of new systems require testing, recalibration, and updates throughout deployment to improve detection accuracy.
- Pedestrian detection systems have significant improvements to make before they can be counted on as reliable technology.
    - None of the vendors met the pass/fail thresholds even after making updates to their systems and re-evaluating results.
- Pedestrian detection has more challenges than vehicles due to being smaller in size, being unpredictable, and varying in appearances.

Potential Next Steps for MnDOT:

- Continue to test pedestrian detection systems as the market grows and evolves.
- Apply the created testing procedures to future technology installations to compare existing and new system accuracies.
- Explore potential applications for passive pedestrian detection, such as identifying Vulnerable Road Users (VRUs) in a V2I environment.
- Perform similar evaluation for passive vehicle detection and identification for use in a V2I environment.