MAE & RSME Data Analysis

How Seattle evaluated multiple video detection systems.

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Getting you there. Smarter.

These companies now create one holistic solution
to alleviate congestion and keep all VRUs safe.

Trafficware

Hardware

- Nema Cabinets
- Model 33x Cabinets
- ATX Cabinet Models

Software

- Synchro Studio
- SynchroGreen Adaptive
- ATMS
- Scout
- SPMs
- TidalWave

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GRIDSMART

The GRIDSMART System

- The GRIDSMART Client
- SMARTMOUNT Bell Camera
- GS2 Processor

Why GRIDSMART?

One Camera

Infinite views see real intersection

Easy Installation

75% less installation and maintenance time

Quick to Learn

Intuitive UI, learn in 30 minutes

Data & Metrics

Industry-leading data and API

Background

The Seattle Department of Transportation (SDOT) is increasingly installing video detection at many traffic signals across the city.

- less costly than loop installation

- enables more flexibility in the placement of detection zones and detection configuration

Evaluation: Seattle asked 3 main questions.

1. How accurate?

Is video detection an accurate means of collecting traffic count data, especially in comparison to loops?

2. How feasible is video?

Is video detection a feasible alternative to loops for signal operations?

3. Is there a preferred vendor?

Is there a preferred video detection camera vendor that produces the needed result?

# Vendors to Test

FLIR
(FLIR Trafisense 2)

Iteris
(Vantage Vector)

GRIDSMART
(SMARTMOUNT Bell Camera)

Details of Process

- intersection has full loop detection for comparison to video

- mast-arms supported the installation of directional video detection cameras in optimal locations

- Each system was tested for 2 weeks

What: Evaluation of loop count data performed against manual counting for 4 detector locations - Eastbound Through (EBT) Stop Bar, Eastbound (EB) Advanced, Northbound Right Turn (NBRT) Stop Bar, and Northbound Left Turn (NBLT) Stop Bar.
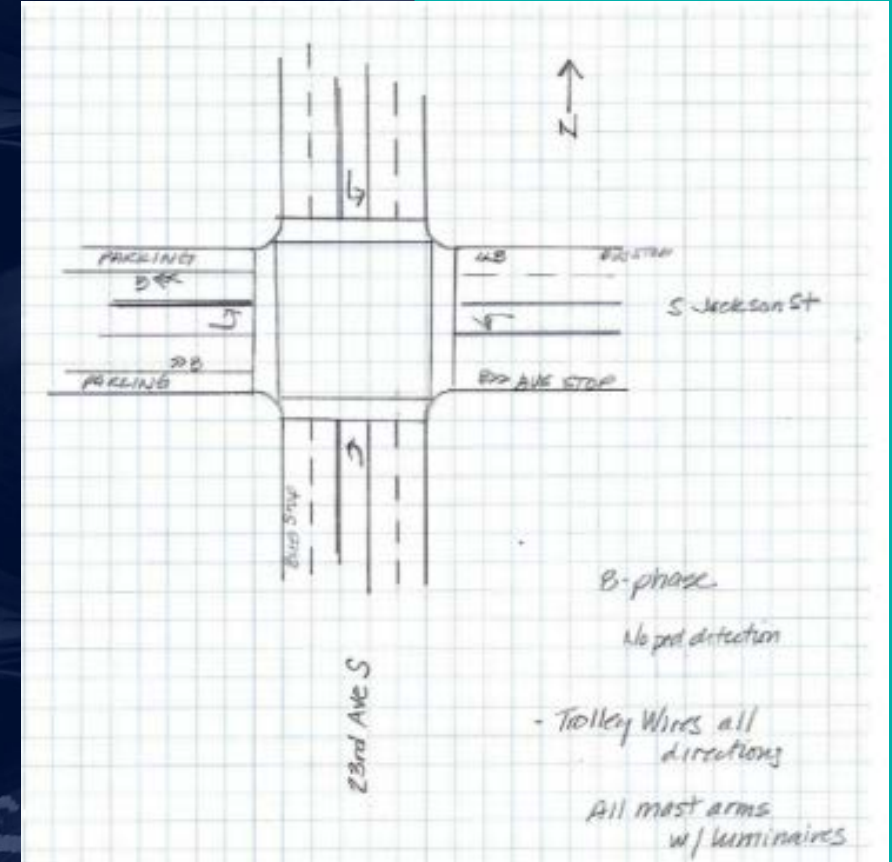
Definitions

Accuracy

Mean Absolute Error (MAE):

- compares data collected using video detection against same data collected using loops
- reports absolute difference in data , so overcounting & undercounting report as the same error.
- MAE of 0 means that counts matched

Variability

Root Mean Squared Error (RMSE):

- helps in understanding large deviations from the ground truth data
- The greater the RMSE, the greater the variance in the errors
- helps assess inconsistencies, which could be interpreted as unreliable

Loops confirmed accurate

How: All 4 loops were confirmed to be within 2% of ground truth (manual counts).
Each loop was compared to 4 hours of video:

- 2 hours of light traffic (<60 vehicles per hour) and two hours of heavy traffic (> 150 vehicles per hour).
- Loop data formed the basis for comparison of the different video systems.
- Occupancy was compared to loop-reported occupancy

Camera Test Errors:

Closely-spaced Vehicles

- with the camera unable to distinguish between the vehicles (e.g., two closely spaced vehicles were counted as a single vehicle).

Occlusion

- such as from a truck or bus impeding the camera view.

Location to Camera

- at locations further from the camera, as for advanced detection.

Summary of Results: Counts

- GRIDSMART camera performed the most consistently during the study period
- All MAE errors were below 2.3 (in a 5 min. count period, the result was 2.3 vehicles greater or less than loops in the same 5-minute period).
- RMSE was also low for all stop bar locations.

Summary of Results: Operations

- NOTE: Data collection of the loops was not complete as the central system was not consistently operational during the GRIDSMART testing
- Further assessment of the Gridsmart camera is recommend if occupancy is a concern.

Summary of decision:

The secret lies in reliable, easy-to-maintain & easy to install video detection.

- Seattle is not alone in recognizing as you scale across hundreds of intersections that 1 senor (or 2) versus 4 (or more) sensors make a significant difference in lowering total-cost-of-ownership and ongoing maintenance costs.

- With 1000+ signals, Seattle needed to choose a reliable and easy to maintain & easy to use video detection solution. With only 1 or 2 sensors (cameras) per signal, when that is scaled across 1000 signals, the decision was made to go with GRIDSMART.

Questions?

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