Research Project Brief

Report 26-R53: Developing A Standardized Acceptance Framework for Traffic Count Devices

VTRC Virginia Transportation Research Council

Background

Accurate traffic volume and vehicle classification data are essential for VDOT's planning, design, operations, and federal reporting activities. To ensure consistent evaluation of emerging traffic count devices, VDOT requires a standardized and statistically defensible acceptance procedure. This procedure provides a uniform method for assessing products needing VDOT approval and ensures that only devices meeting a defined accuracy standard are integrated into the traffic monitoring program.

Research Objectives

- Develop a comprehensive, statistically defensible Traffic Count Device Acceptance Framework.
- Establish a standardized, reproducible procedure that can be applied to evaluate the volumetric and classification accuracy of all future traffic count devices needing approval for VDOT use.

Approach

- Reviewed national guidance, standards, and peer state practices and conducted a VDOT user needs survey to identify accuracy requirements and evaluation priorities.
- Established a statistically defensible baseline by calibrating a continuous count station (CCS) against human-verified ground truth.
- Developed an eight-step Traffic Count Device Acceptance Framework to evaluate volumetric and classification accuracy under varying operating conditions.

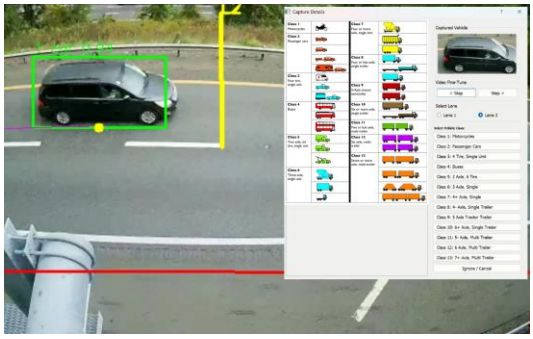
Outcomes

- Produced an eight-step, "fail-fast" Device Acceptance Framework. Under this approach, devices that fail early baseline checks are removed from further testing, reducing unnecessary effort and resource use. Devices that meet initial criteria progress to increasingly rigorous volumetric, classification, and environmental evaluations.

Research Benefits

- The acceptance framework reduces evaluation cost and effort by using CCS baseline data instead of manual ground truth video processing, avoiding an estimated $321,300 in processing costs per device.
- The fail-fast structure further limits resource use by terminating underperforming devices early.
- The framework's clear, standardized criteria reduce the time and cost associated with trial-and-error deployments and establish a consistent, level playing field for all devices.

Ground Truth Data Collection



Semi-Automated Vehicle Tracking and Classification System Developed by this Research

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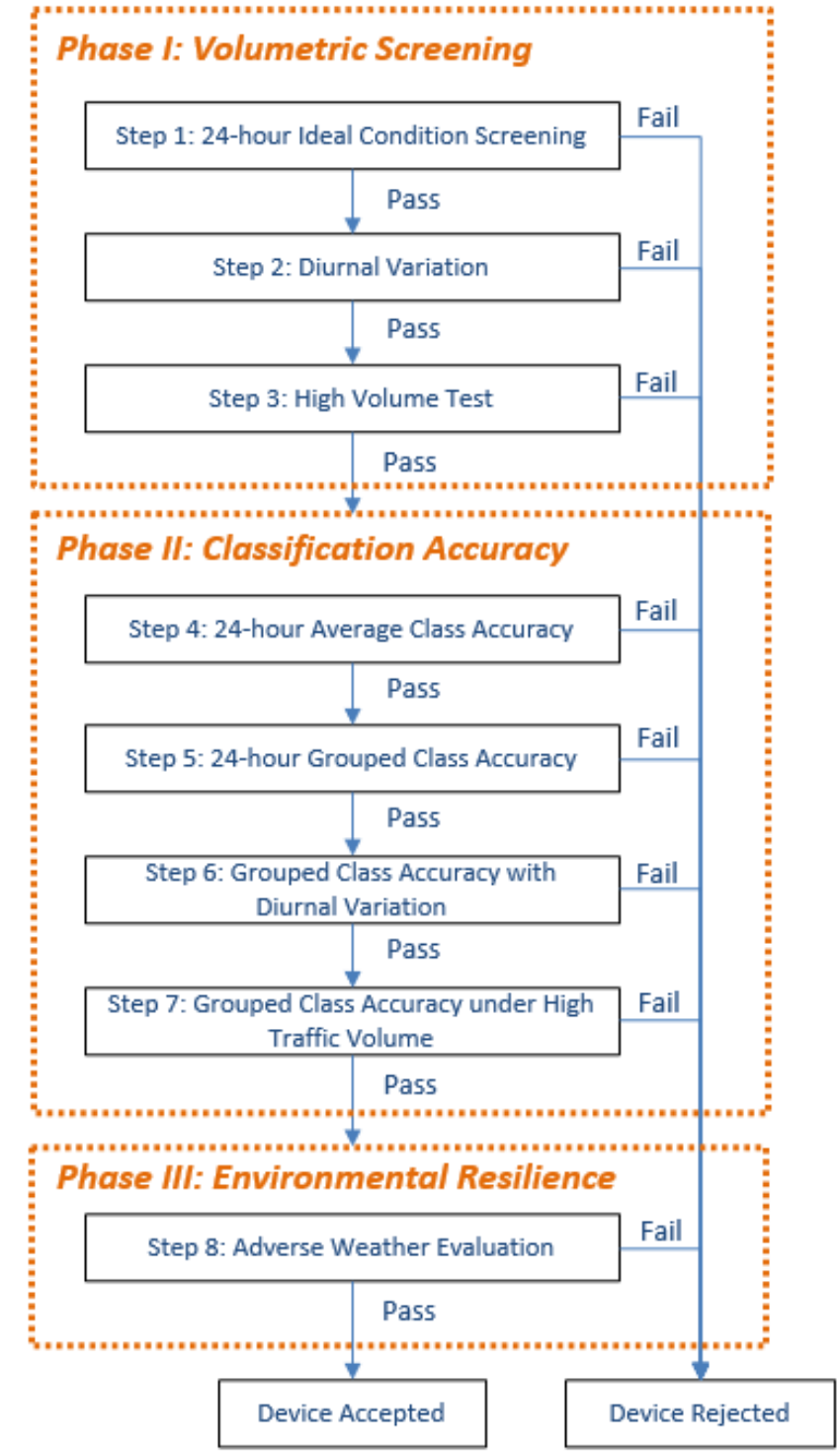
Research Findings

Three-Phase "Fail-Fast" Framework



5% Accuracy Threshold

Based on the literature, user needs survey, and stakeholder input, a 5% error threshold was established to balance VDOT's need for precise engineering data with the practical limitations of field testing.

Pilot Demonstration

A field demonstration with a video-based detection system was used to validate the framework's practical application.

The device successfully passed the volumetric and classification protocols in Phases I and II. However, Phase III testing exposed vulnerabilities during nighttime snow events.