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## EXCELLENCE & INNOVATION

**NICHEGAN - AI Vision based ATCC, AVCC and VIDS Tools**

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## Introduction

MoRTH, Government of India, launched National Highway Development Project (NHDP) in 1998 with an aim to upgrade, rehabilitate and widen to National Highways to higher standard. It started with the up gradation of Golden Quadrilateral (which comprised of Highways connecting Delhi, Mumbai, Chennai and Kolkata) under Phase I.

Since then, approximately 40,000km of Highway Network has been developed under various phases of NHDP, and development of about 65,000km is in progress under various phases of NHDP, and Bharatmala and Sagarmala. These three road development programs put together are probably the largest road development program ever undertaken by any country.

Despite undertaking such a large-scale road development program, understanding of road traffic – for which the road network is being designed and developed - is actually very poor.

## Need for Traffic Flow Parameters

Speed, Flow (traffic volume) and Density (number of vehicles per unit space) are three essential traffic flow parameters that are required for road design, development, operations and maintenance.

| Flow Parameter | Use |
|---|---|
| Classified traffic volume | • For road design – lane configuration, pavement, etc.<br>• Revenue estimation<br>• Operations and Maintenance planning |
| Distribution of traffic across lanes | • Pavement design<br>• Maintenance planning |
| Temporal distribution of traffic (time & space headways) | • Toll plaza design<br>• Junction design<br>• Design of various facilities, like, lay byes, way side amenities, etc. |
| Speed | • Road safety design |

The above list of parameters and their use is simply indicative and by no means is exhaustive. Project reports were prepared, projects were implemented, and projects were financed without a clear understanding on the above listed and many more parameters related to traffic and road users. This could probably be one of the significant reasons for failure of BOT-Toll model in India.

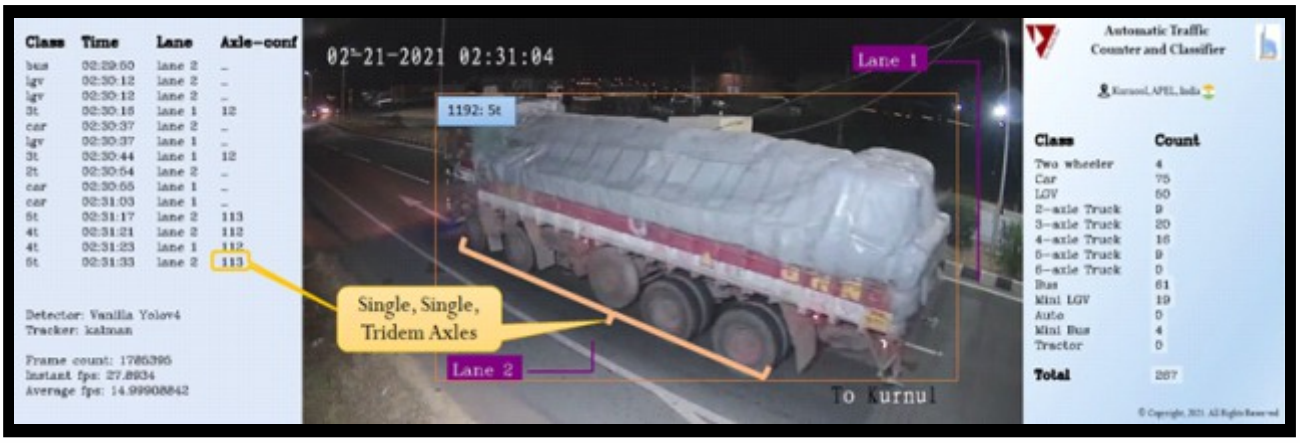
## Current Practice in India

Manual methods are mostly prevalent in India. These are highly prone to errors and manipulations, cannot be validated and therefore are not reliable and can only be used for short durations. Traffic counting tools based on pneumatic loops and piezo sensors, which are successful worldwide, do not work well in India due to mixed traffic and lack of lane discipline (i.e., vehicles do not follow lane driving). Infra-red sensor-based traffic loggers by CEOS Pty Ltd (TIRTL) and V R TECHNICHE Consultants Pvt Ltd (OHR) are by the best traffic loggers today for mixed traffic flow conditions in India. Video based traffic surveys currently in use are based on manual extraction of flow information. These are better than manual or other instrumentation-based methods because the videos can be used for validation of data at a later stage, if required.

## Artificial Intelligence (AI) based Traffic Loggers

V R TECHNICHE has developed an AI application Nichegan – ATCC for extracting several traffic flow parameters including classified traffic volume from a video. This application can count and classify traffic by lane across 13 vehicle categories, which can be increased to any number. Unlike other instruments AI based tools can be made to learn and eliminate errors, if any. It can also extract time and space headways, traffic speed, lane distribution of traffic and most importantly the axle configuration which is an essential input for pavement design and maintenance planning.

This application is about 98% accurate for daytime and 92 to 95% for nighttime; night accuracy can be improved by augmenting lighting.

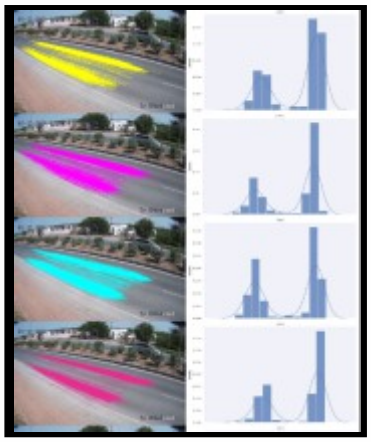



**Thumbnails of classified vehicles with axles traced; can be used for quick validation**

Classified traffic counts by AI application are not only accurate but are reliable because they can be audited. In addition to axle configuration-wise counts, Nichegan – ATCC also produces lane distribution results.

| Day | ATCC Count | Actual Count | Accuracy |
|---|---|---|---|
| Day 1 | 34211 | 34765 | 98.41% |
| Day 2 | 26390 | 26918 | 98.04% |
| Day 3 | 32876 | 33450 | 98.28% |
| Day 4 | 32803 | 33569 | 97.72% |
| Day 5 | 35021 | 35754 | 97.95% |
| Day 6 | 34791 | 35510 | 97.98% |
| Day 7 | 30607 | 31267 | 97.89% |
| **Total** | **200309** | **204315** | **98.04%** |

Accuracy of Nichegan ATCC



Lane Distribution

This tool, in addition to extracting traffic flow parameters, can also be expanded to automatic incident detection, like, identification of over speeding vehicles, wrong side driving, unauthorized parking, etc

While this tool can be used at various stages of project development, it will be highly relevant to lenders and investors at the time of financing a project (because it can provide accurate and reliable base traffic data). This can be also applied at toll plazas for real-time revenue validation and reconciliation.

V R TECHNICHE has also developed other AI applications like Nichegan – AVCC and VIDS. Like ATCC, AVCC and VIDS also show very promising results.

| AVC Class Accuracy Report | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| AVC Class | | Operator Class | | | | | | | |
| | | Car/Jeep | LGV | Truck | Bus | MAV | Tractor | Autoclass | Total AVC Class |
| Car/Jeep | Count | 10546 | 14 | 2 | 0 | 0 | 52 | 1 | 10884 |
| | % | 98.06 | 1.30 | 4.76 | 0.00 | 0.00 | 20.31 | 100.00 | 98.06 |
| LGV | Count | 123 | 1012 | 0 | 0 | 2 | 6 | 0 | 1152 |
| | % | 1.14 | 94.32 | 0.00 | 0.00 | 0.14 | 2.34 | 0.00 | 94.32 |
| Truck | Count | 44 | 16 | 40 | 0 | 0 | 9 | 0 | 115 |
| | % | 0.41 | 1.49 | 95.24 | 0.00 | 0.00 | 3.52 | 0.00 | 95.24 |
| Bus | Count | 28 | 24 | 0 | 1503 | 9 | 6 | 0 | 1572 |
| | % | 0.26 | 2.24 | 0.00 | 99.27 | 0.63 | 2.34 | 0.00 | 99.27 |
| MAV | Count | 13 | 7 | 0 | 11 | 1409 | 6 | 0 | 1448 |
| | % | 0.12 | 0.65 | 0.00 | 0.73 | 99.16 | 2.34 | 0.00 | 99.16 |
| Autoclass | Count | 1 | 0 | 0 | 0 | 1 | 177 | 0 | 881 |
| | % | 0.01 | 0.00 | 0.00 | 0.00 | 0.07 | 69.14 | 0.00 | 69.14 |
| Operator Class | | 10755 | 1073 | 42 | 1514 | 1421 | 256 | 1 | 16052 |
| Overall AVC Accuracy in Percentage: 98.01 | | | | | | | | | |

AVCC Accuracy Report

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