


Mechanisms for Improving Road Safety in India



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Accident Scenario in India and Key Challenges

India, unfortunately, ranks at the top with highest number of fatalities with 11% share in the world – *MoRTH (25th September 2019)*

Key Challenges:

- Poor access control
- Poor and no uniformity in designs
- Challenges from road users
- Challenges from local communities
- Poor condition of assets

'Driving in India is a real-life videogame'

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New Delhi: For Sunitha Dugar and her four companions who are part of a national "Safe Speed Challenge", driving on Indian roads is nothing less than "playing a video game" in real life and one doesn't know who will come from where on to the road.

"When you are driving on the road, you should be prepared for surprises. So, it's your responsibility to save yourself and save others. It's actually a real video game on the road risking many lives," said Sunita, an ent... from Chennai. The... en from different w...

Garima Avtar (left) and Neha Dua at the 'Safe Speed Challenge'

are participating in the challenge that was flagged off by defence minister Rajnath Singh and road transport minister Nitin Gadkari from Wagah to Kanyakumari.

Several factors, includ... have made Indian roads unsafe claiming 415 lives daily.

Speaking to **TOI**, Neha Dua from Noida said, "We lack safety culture. More than speeding, speed management is the biggest challenge. You hardly...

from Bengaluru, the challenges have been manoeuvring between trucks, rickshaws and cyclists etc. For Amritha Avind, another Bangalorean, the biggest challenge are people not following the traffic rules and confusing signals.

Garima Avtar, the first woman who has been driving professionally for Mercedes Benz Luxe Drive since 2016, the biggest challenge is the mechanism and procedures for issuing licences. "People who are not fit to drive and don't know the traffic guidelines properly are able to obtain driving li... is makes our roads ...," she said.

...port on www.toi.in

From TOI (25 January 2021)

Mechanisms to control accidents:

- Latest technologies can be and should be used to (i) monitor traffic, (ii) monitor road condition, and (iii) to understand accidents
- Improve training and process for issuance of driving license

Challenges from Road Users

1. No knowledge of traffic rules and poor driving skill
2. Wrong side driving
3. Over speeding and rash driving
4. Un-otherised stopping/parking
5. Overloaded/Oversized vehicles
6. Do not follow lanes
7. Fatigued drivers (particularly of taxies and goods vehicles)

Very little or no support from local administration to curb traffic violations and challenges from local communities

Pictures from web

Challenges from Local Communities

1. Encroachments
2. Illegal Median Cuts
3. Untheorized Sign Boards
4. Thefts – of Road Furniture
5. Dump garbage in ROW and Median
6. Damage to Assets
7. Stray cattle

Challenges from Poor Condition of Assets

Condition of assets is generally very poor – reactive maintenance, low O&M Budgets, in-accurate data, etc.

1. Poor riding quality,
2. Very less remaining life,
3. Poor ROW Maintenance,
4. Poor condition of structures,
5. Poor street furniture and Inadequate lighting, etc.

JMTL, at the time of takeover

JMTL, 2 months after PM …
(this road won Gold Award last year)

Pictures from projects

General Condition of Pavement – Alligator Cracking






Pictures from projects

General Condition of Pavement – Rutting





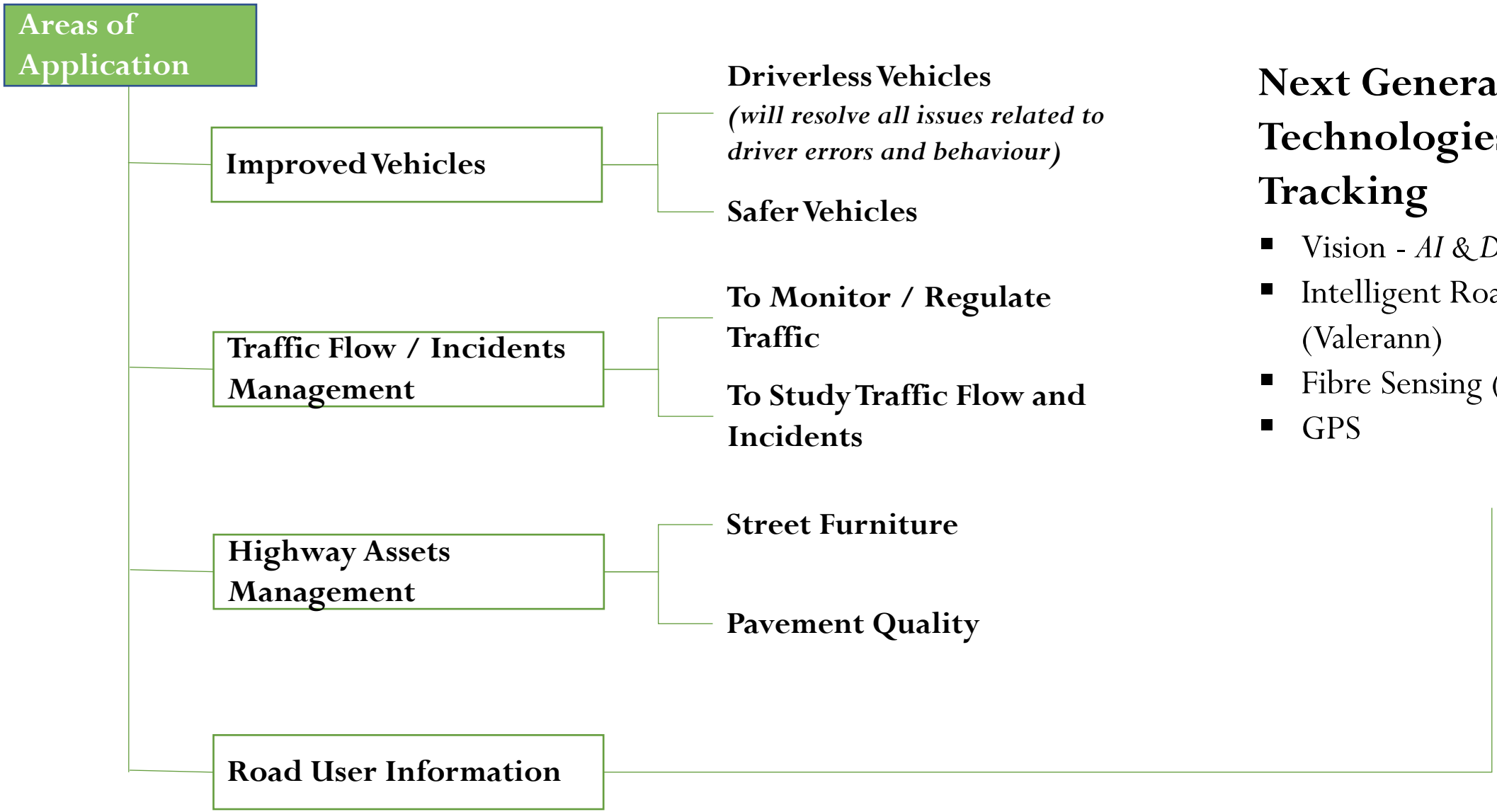

Pictures from projects

General Condition of Pavement – Peeling Off & Slippage






Mechanisms - Technology Application for Improving Road Safety



Next Generation Technologies – Vehicle Tracking

- Vision - *AI & Deep Learning*
- Intelligent Road Studs (Valerann)
- Fibre Sensing (SINTELA)
- GPS

ITS for Realtime Traffic Management

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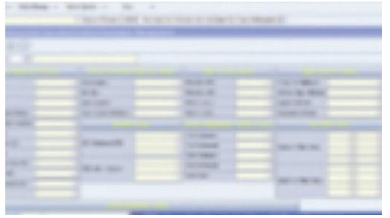
Data Collection

- VIDS
- CCTV
- PTZ

Data Processing/Traffic Management

Traffic Management Control Centre

Video Wall



Operation Terminal

Emergency, Incident, Weather

Congestion Management

Incident Management

Linked Systems

Traffic flow management

Route patrol and incident management

Other services & organizations

Police-Rescue Unit-Weather Station

Information Provision

- VMS
- Internet
- Mobile
- OBE

Connectivity modes

- ✓ *Optical Fiber Cable*
- ✓ *Radio communication*

Synergy with other Services

- ✓ *State Traffic Police*
- ✓ *Local administration*
- ✓ *Fire & Rescue department*

AI & Deep Learning

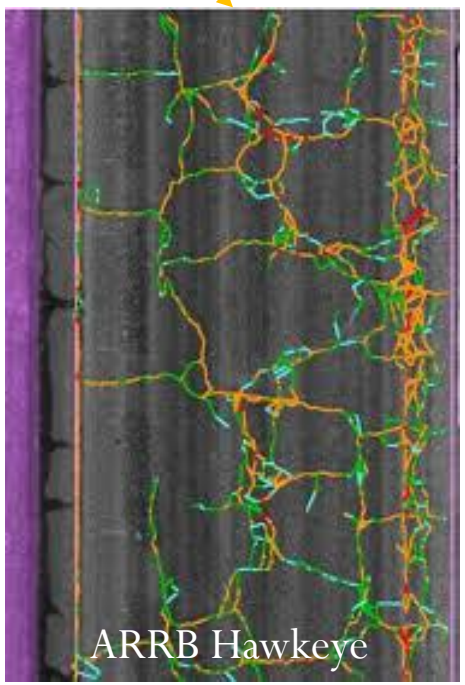
- Artificial Intelligence is being increasingly used in ITS to enhance quality of data and interpretation
- Due to developments in Convolutional Neural Networks (CNN), many vision-based AI applications are now possible
  - ✓ Vision-based ATCC/AVCC
  - ✓ VIDS
  - ✓ Automatic Pavement Distress Mapping
  - ✓ Automatic Highway Asset Quality Mapping

- **AI**
  - ANN / CNN
  - GA
  - Fuzzy Logic
  - Expert Systems

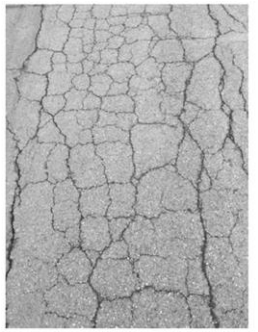
Automatic detection of incidents (VIDS)

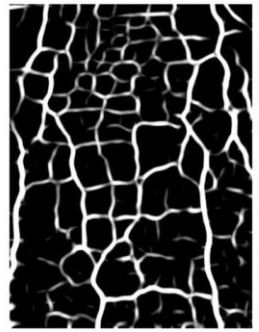
Automatic Vehicle Detection , Classification & Tracking

Automatic Pavement Distress Mapping



ARRB Hawkeye





VIDS

- Current generation ITS depends a great deal on VIDS for fast detection, verification and resolution of incidents
- VIDS consists of a network of intelligent cameras that automatically detect:
  - ✓ Wrong side driving
  - ✓ Over speeding and rash driving
  - ✓ Accidents
  - ✓ Oversized vehicles
  - ✓ Stooped, Parked and Breakdown vehicles
  - ✓ Fallen objects and dead animals
  - ✓ Any other abnormal traffic condition
- VIDS should cover at-least:
  - ✓ Major junctions
  - ✓ Potential traffic and pedestrian conflicting areas
  - ✓ Entry-exit points onto Highways (from Service Roads, Wayside Amenities, Fuel Stations, etc.)
  - ✓ Accident blackspots

Automatic Number Plate Reading must be a key component of VIDS.

This is required for enforcement of traffic rules and imposing of penalties

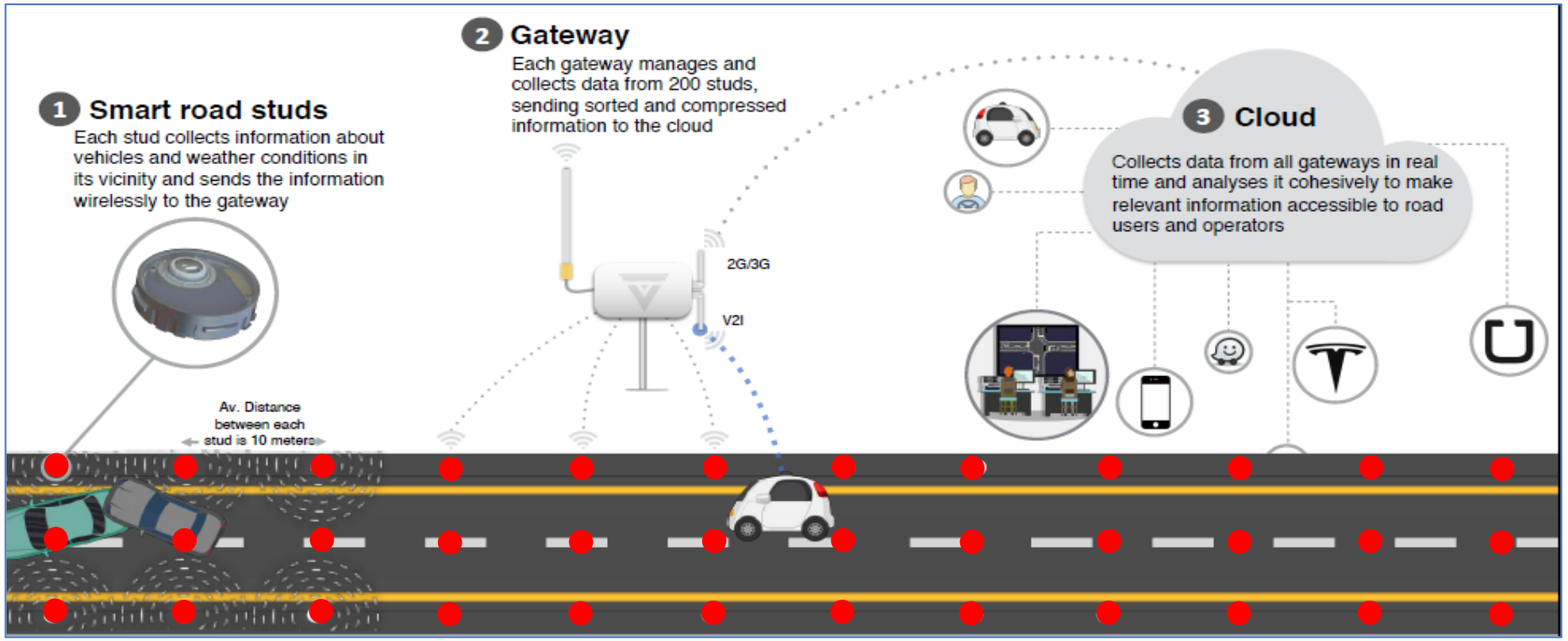
IDS Through Road Studs by Valerann

- N+1 rows of smart studs for N lanes, i.e., for a 2-lane undivided road 3 rows and for a 4-lane divided carriageway 6 rows
- Studs at a spacing of 10mm c/c, and One Gateway approximately for every 200 Studs
- Data upload-download from Studs to Gateway and Gateway to Cloud is wireless
- Backend post-processing of data through AI engines for data interpretation

Valerann Smart Road Stud contains a number of sensors - Acoustic (MIC), electro-magnetic sensors for presence detection, RADAR and sensors for temperature, rain and snow. Studs have provision for LED lights (RGB) for displaying various colours

Difficulties

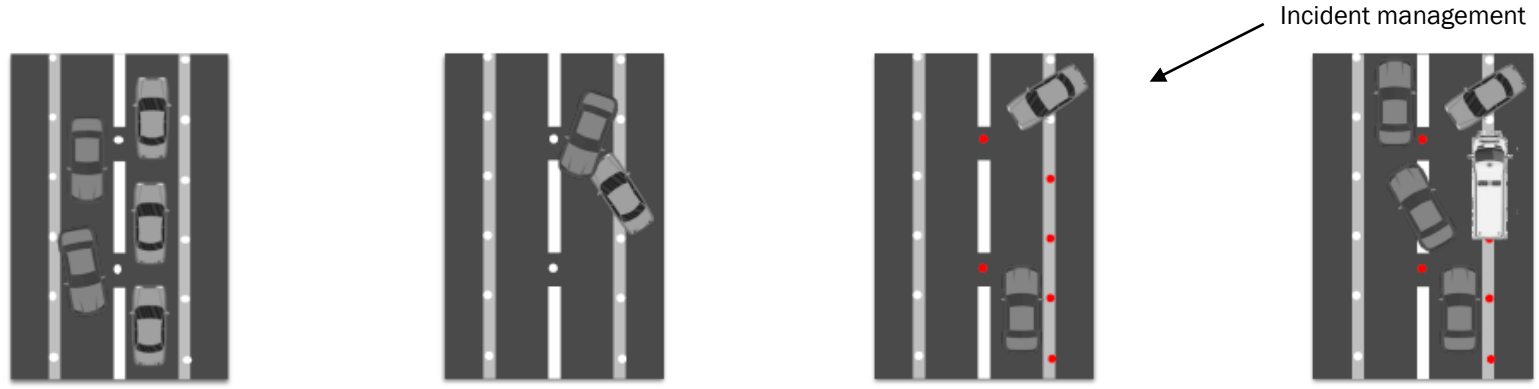
- Large number of Studs and Gateways on Multi-lane Roads
- Number of Studs and Gateways increases with number of lanes
- Configuration at Junctions and data interpretation could be very complicated and tedious

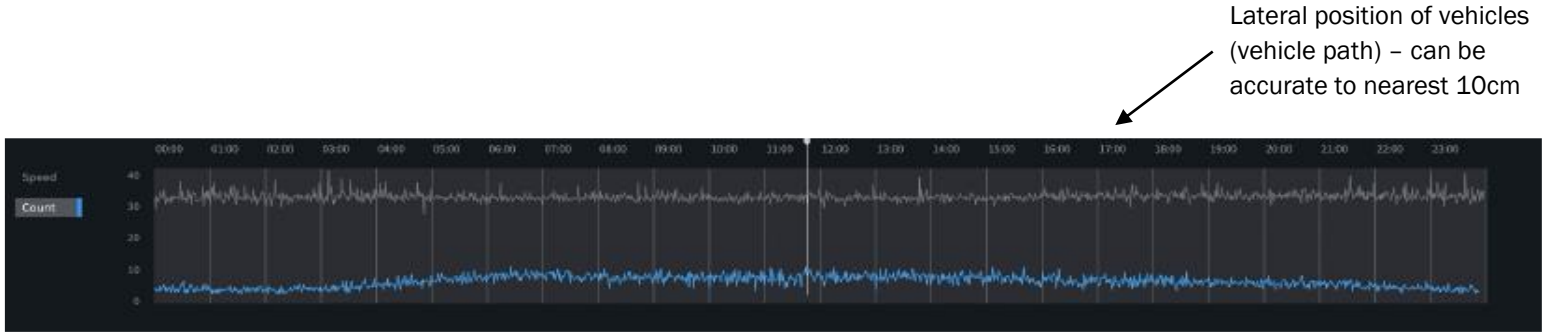


Capabilities of Valerann IDS

- Count classified traffic volume and measure headways (time and space)
- Monitor traffic to ensure smooth flow
- Detect incidents in real-time as they happen and prevent next incidents by providing information to road users and traffic regulators
  - ✓ Breakdown vehicles
  - ✓ Stooped/parked vehicles
  - ✓ Over speeding vehicles
  - ✓ Rash and erratic driving vehicles
  - ✓ Wrong side driving vehicles
- Predict congestion and provide real-time traffic management suggestions to ease traffic flow
- Provide a platform for guiding autonomous vehicles

(Expected to play a key role in driverless vehicles)





- Currently system can classify vehicles into two classes only (cars and others) – further classification looks difficult
- System can detect lateral position of vehicles to nearest 10cm*
- System can detect acceleration and deceleration*

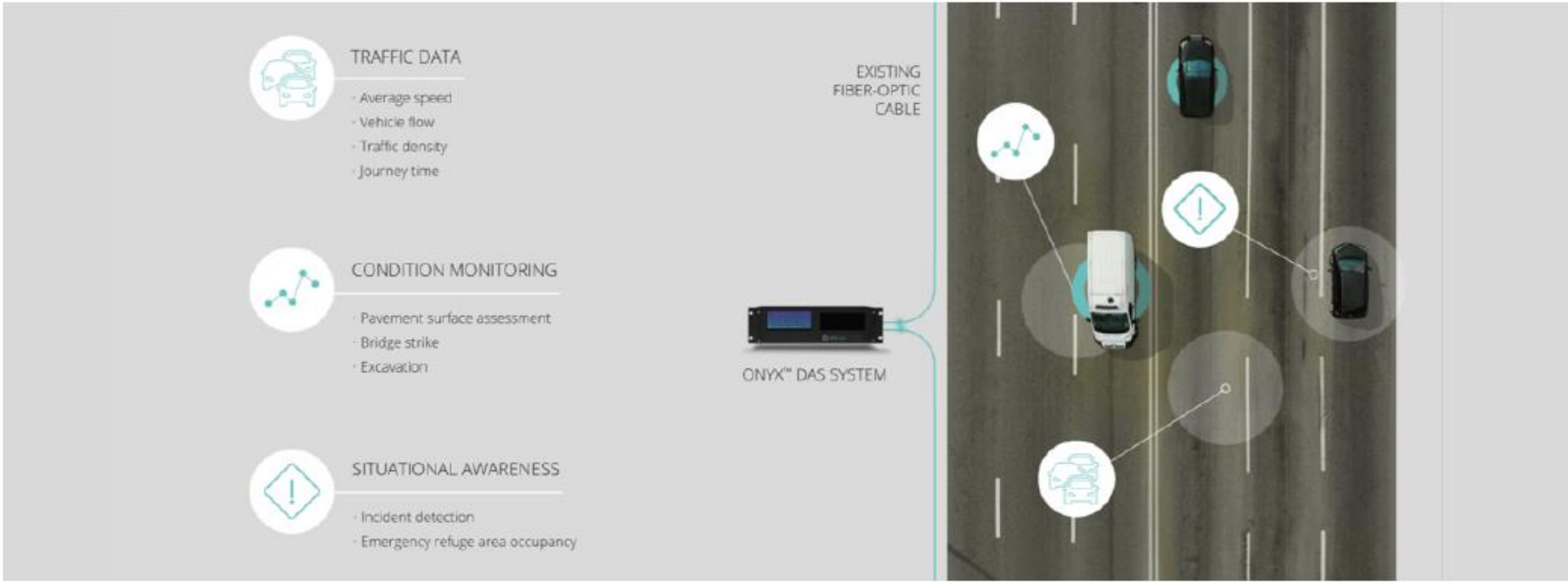
*These features are used to detect erratic and rash driving vehicles

IDS Through Fibre Sensors by SINTELA

SINTELA

Sintela Onyx measures multiple road & traffic attributes

The vibration data delivers many different data sets for traffic analysis/control and road condition monitoring



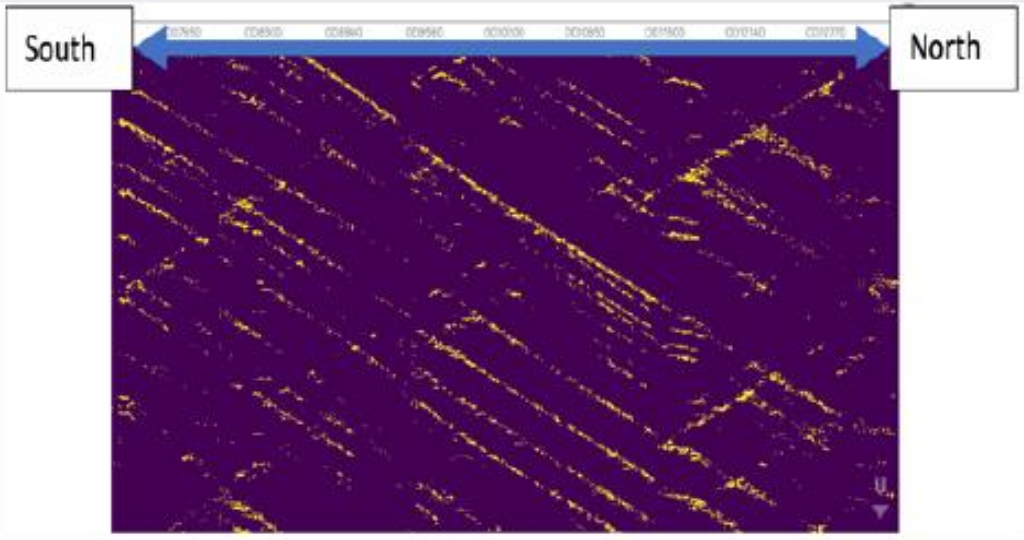
SINTELA

Sintela Onyx Vehicle Incident Detection System
Incident detection from Ohio I-71 Highway

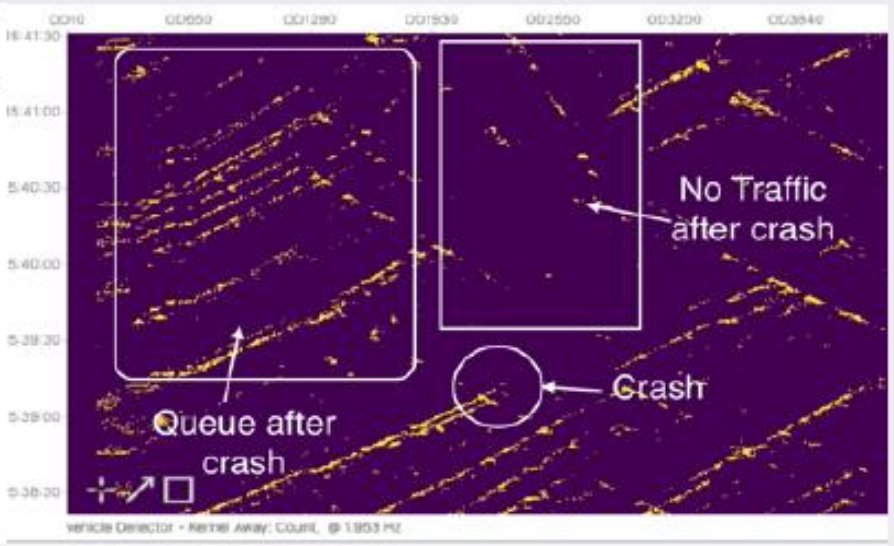
Observations

- Incident occurred outside the field of view of cameras
- Incident detected in real time

Normal Traffic Flow



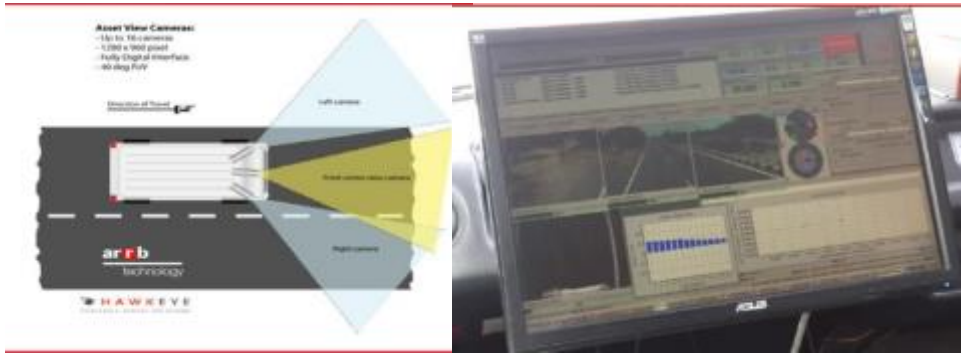
Incident and resulting traffic flow

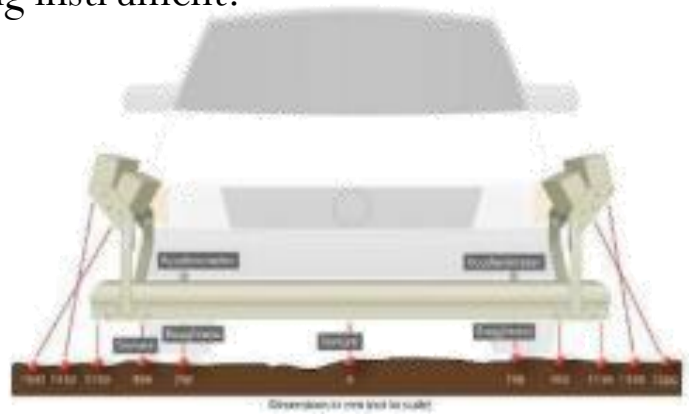


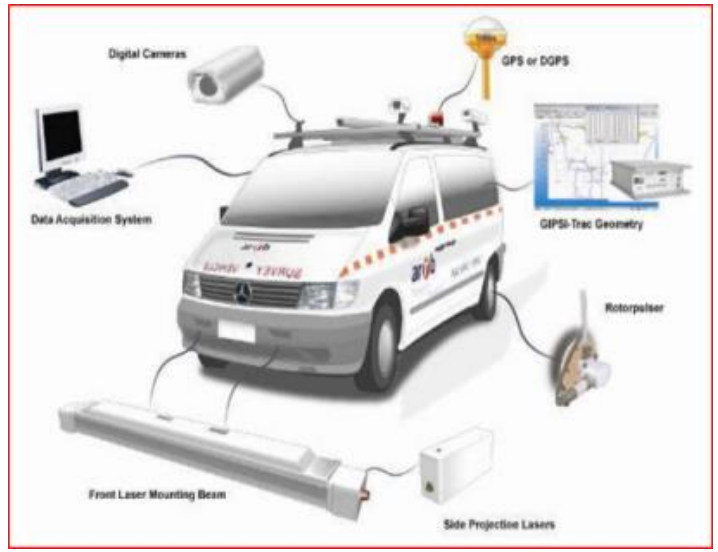
NSV for Functional Evaluation of Pavements

Asset Inventory and Determination of Functional Properties

- Network Survey Vehicle (NSV) equipped with a fully integrated Hawkeye 2000 data collection system
- Consists of multi-laser profiler, digital imaging system and Gipsi-Track unit
- Outputs linked via a highly accurate distance measuring instrument.







Digital Laser Profiler (DLP) integrated into the NSV and consists of eleven lasers. The profiler is capable of measuring:

- Pavement roughness (one laser in each wheel path and center)
- Rutting (full transverse pavement measurement)
- Macro Texture (outer and inner wheel paths)

FWD for Structural Condition of Pavements

Determination of Structural Condition of Pavement

- Falling Weight Deflectometer (FWD) used to measure the vertical deflection response of a surface to an impulse load.
- A set of weights dropped onto a platform with springs (rubber buffers) and the impact load transferred to the pavement through a loading plate
- Load used on pavements 40-150 kilo newton generally depending on the pavements operating in the roads/airports
- When subjected to the traffic load, the pavement bends creating a deflection bowl. The FWD simulates the wheel load and creates a deflection bowl
- The sensors record the deflections at various distances from the center of loading and a load cell located above the foot system records the loading

Falling Weight Deflectometer

Thank You

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