Assessment of Key Road Operator Actions to Support Automated Vehicles

16 June 2017

Austroads

Today’s moderator

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About Austroads

The peak organisation of Australasian road transport and traffic agencies

- Roads and Maritime Services New South Wales
- Roads Corporation Victoria
- Department of Transport and Main Roads Queensland
- Main Roads Western Australia
- Department of Planning, Transport and Infrastructure South Australia
- Department of State Growth Tasmania
- Department of Transport Northern Territory
- Transport Canberra and City Services Directorate, Australian Capital Territory
- Commonwealth Department of Infrastructure and Regional Development
- Australian Local Government Association
- New Zealand Transport Agency

Housekeeping

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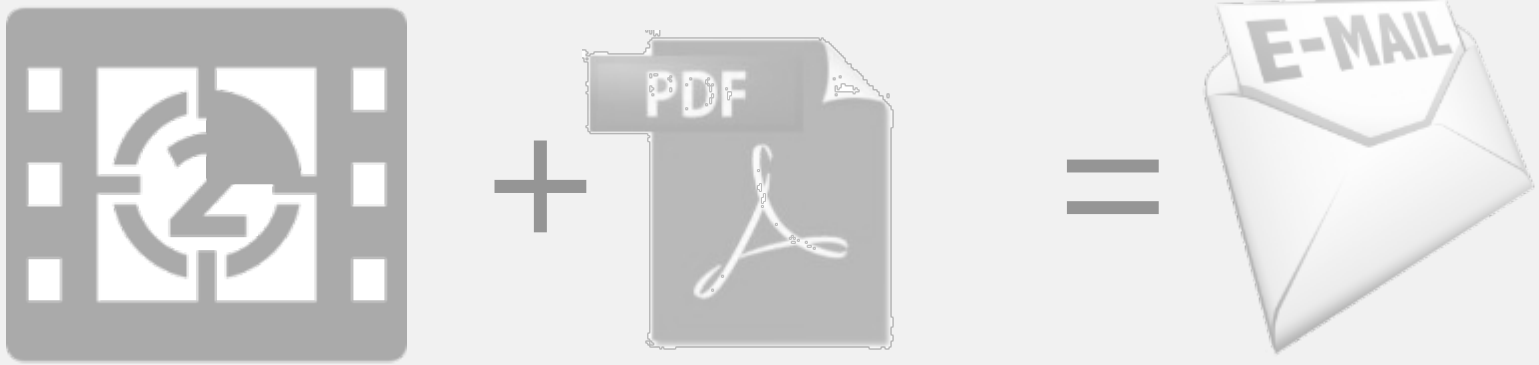
Presentations = 35 mins

Question time = 15 mins



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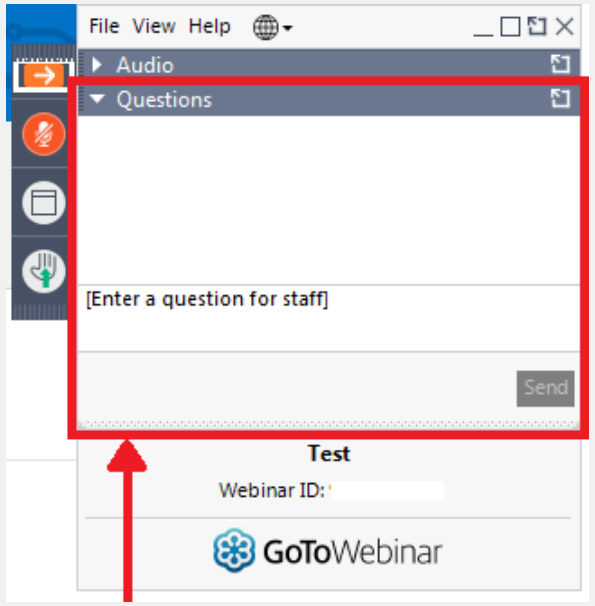
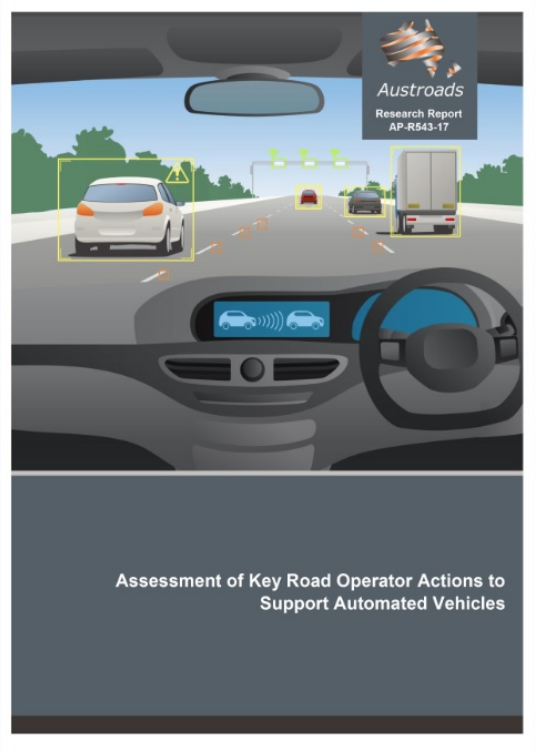


Please type your questions here

Austroads Report



Download from Austroads publication website:

https://www.onlinepublications.austroads.com.au/items/AP-R543-17

Today’s presenters

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Overview of the Austroads Connected and Automated Vehicles (CAV) Program

Stuart Ballingall

Austroads

Austroads CAV program

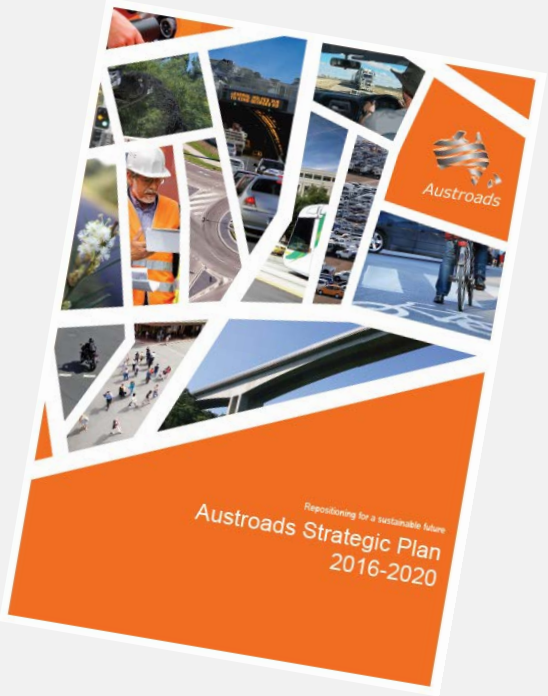
Austroads role and purpose:

- The peak organisation of Australasian road transport & traffic agencies
- Improve the safety, productivity & sustainability of Australasian road networks through research, collaboration & harmonisation

Austroads CAV program objectives:

- Support the local deployment & operation of CAVs
- Optimise the societal benefits of CAVs

Close collaboration with DIRD, NTC and jurisdictions



Collaborative national approach

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Commonwealth:

- National policy, national regulator

National Transport Commission (NTC):

- Regulatory review and reform

Austroads:

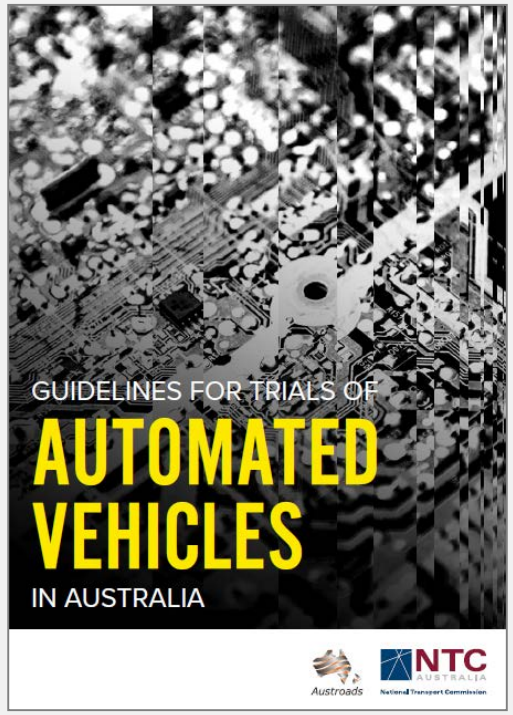
- Operational framework for roads, registration & licencing (R&L)

Jurisdictions:

- Jurisdictional policy, regulation, road and R&L operations, trials

National guidelines for AV trials

- Developed by NTC & Austroads
- Endorsed by Ministers, published in May 2017
- Key objectives of the Guidelines:
  - Provide a performance-based framework
  - Provide clarity to industry
  - Support national consistency, cross border trials
  - Basis for jurisdictions to assess trial applications
  - Basis to determine exemption & permit conditions



Operational frameworks

Operational functions of Austroads road agency members:

- Vehicle registration
- Driver licensing
- Road infrastructure design & maintenance
- Road operations

Vehicle registration and driver licensing

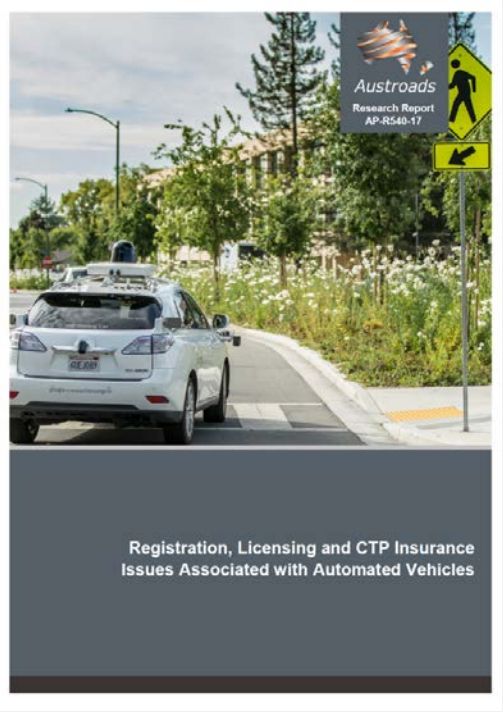
Austroads published research report in March 2017

Scope of investigations included:

- Vehicle registration
- Driver licensing
- Compulsory Third Party (CTP) insurance

Key follow on projects:

- Assessment of proposed safety assurance system



Road design, maintenance and operations

Austroads published research report in May 2017

Scope of investigations included:

- Physical infrastructure
- Digital infrastructure
- Road and traffic operations

Key follow on projects:

- Concept of Operations for AV use cases
- Speed sign recognition assessment

Overview of the Austroads Report

Scott Benjamin

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Key issues

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Key issues were captured in three broad categories:

Physical infrastructure:

- Physical attributes
- Road pavement and structures
- Signs and lines
- Roadworks
- AV certification

Digital infrastructure:

- Cellular coverage
- Augmentation Systems for absolute positioning
- Digital mapping

Road operations:

- Network management approaches
- Update standards, guidelines, and regulations
- Roadworks

Introduction to AV

Austroads

What it is, how do they behave, operator role in supporting?

Automated Vehicles (AVs) is a term used for vehicles that involve some automation of the primary driving controls (i.e. steering, acceleration, braking).

Partially automated vehicles can drive themselves but the driver is still responsible for monitoring and must be ready to take back control. Highly automated vehicles, in which an automated driving system can perform the entire dynamic driving task when the system is engaged.

AVs have the potential to change all aspects of mobility and many aspects of our communities. Examples of this include driver safety, insurance liability, and car ownership (potentially allied with on-demand mobility services).

Introduction to AV

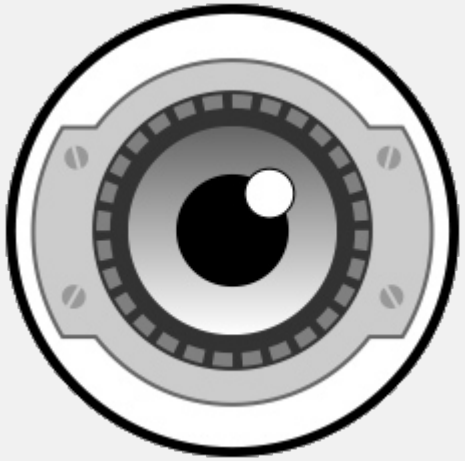
Austroads

What it is, how do they behave, operator role in supporting?

Selected AV manufacturers are seeking to employ some component of AI or machine learning into their AV systems to assist AVs with interpretation of the surrounding environment and improve driving safety performance.

Three key defining elements of AI:

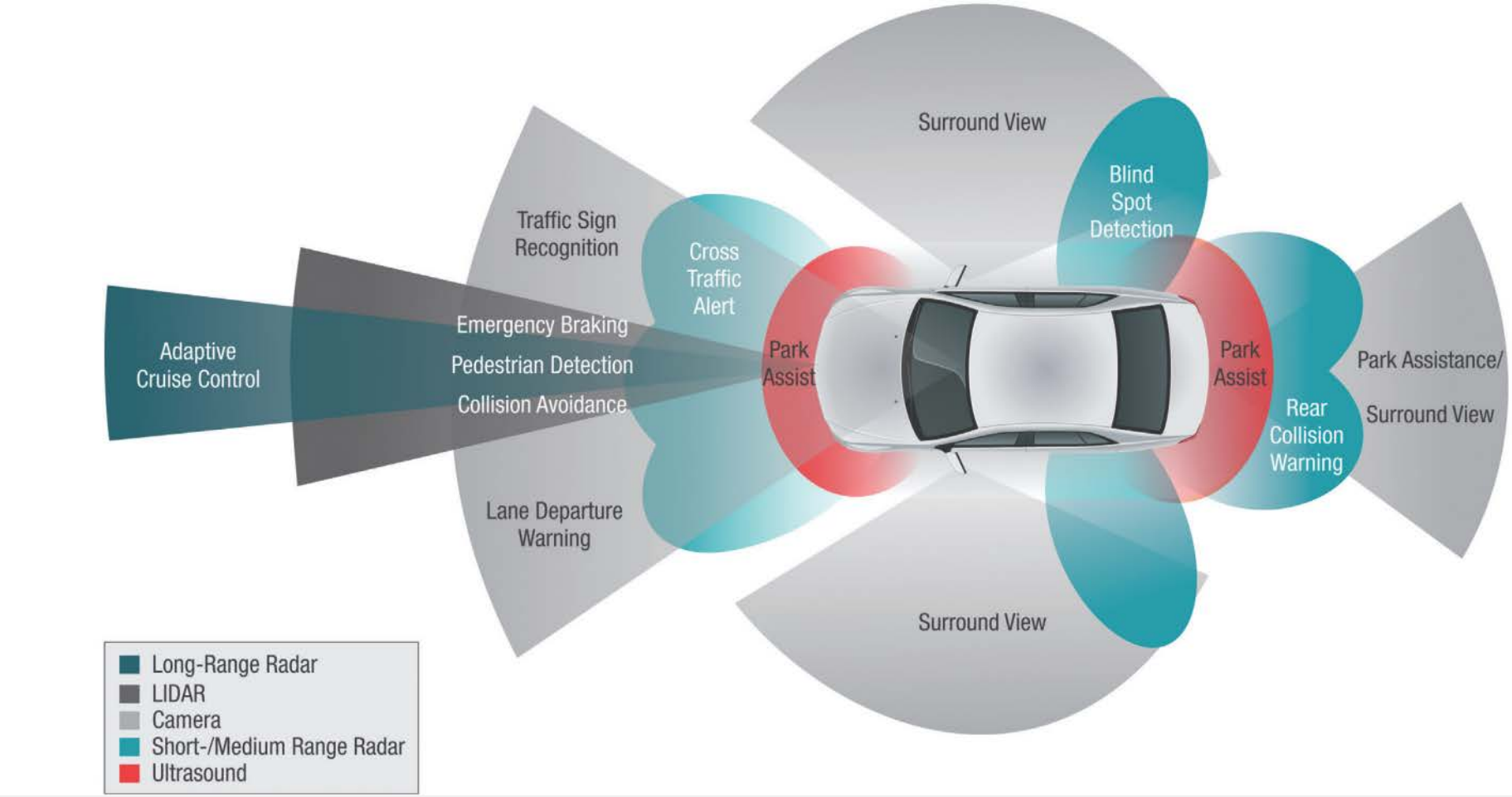
1. Biomimicry



2. Swarm intelligence

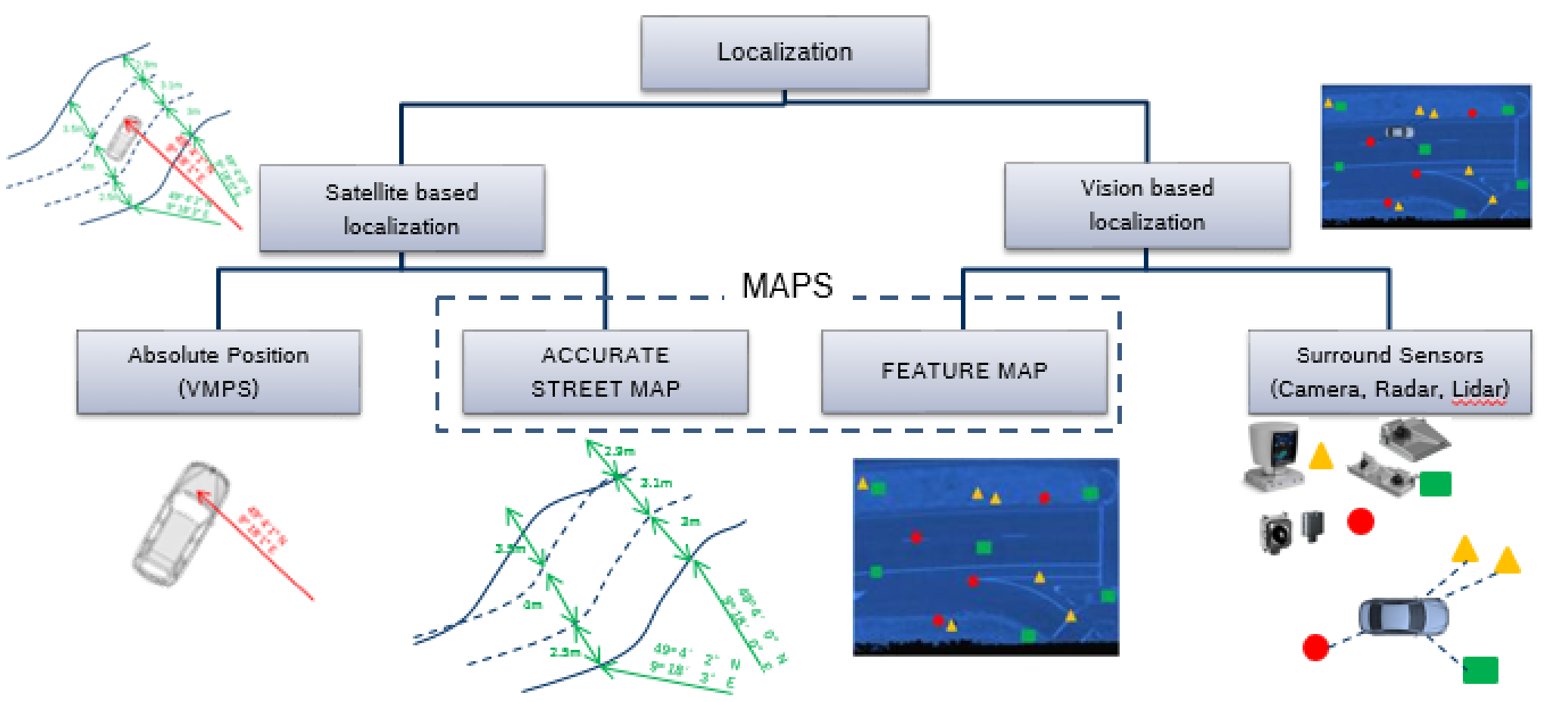
3. Machine learning

Sensors



Source: Texas Instruments 2015

Localisation



Source: Bosch 2015

Frameworks for AV Operation

A common framework, describing the form and function of automated driving, will allow road operators to consider potential impacts, opportunities and implications of increasing automation.

This framework should be applicable to all project types: planning, design, operation, maintenance and use of AVs on the road network.

A three-part framework:

1. The vehicle (level of driving automation)
2. Interaction with the Road Environment
3. Strategic Management of Road Use

SAE Taxonomy

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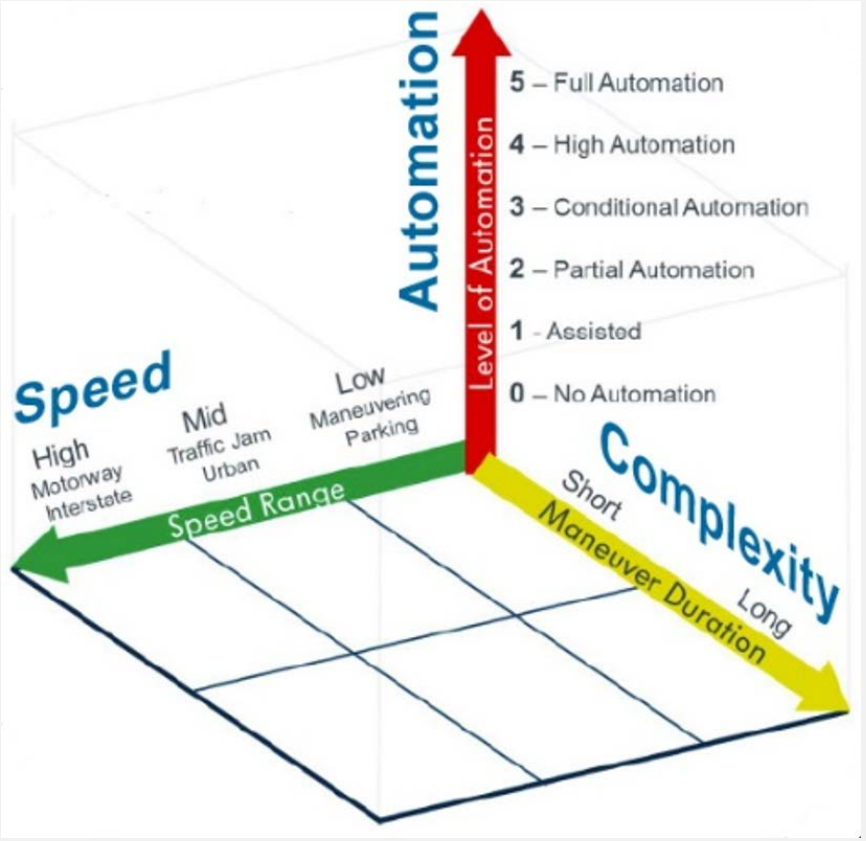
Level	Name	Narrative definition	DDT		DDT fallback	ODD
			Sustained lateral and longitudinal vehicle motion control	*OEDR*		
Driver* performs part or all of the *DDT						
0	**No Driving Automation**	The performance by the *driver* of the entire *DDT*, even when enhanced by *active safety systems*.	*Driver*	*Driver*	*Driver*	n/a
1	**Driver Assistance**	The *sustained* and *ODD*-specific execution by a *driving automation system* of either the *lateral* or the *longitudinal vehicle motion control* subtask of the DDT (but not both simultaneously) with the expectation that the *driver* performs the remainder of the *DDT*.	*Driver* and *System*	*Driver*	*Driver*	Limited
2	**Partial Driving Automation**	The *sustained* and *ODD*-specific execution by a *driving automation system* of both the *lateral* and *longitudinal vehicle motion control* subtasks of the *DDT* with the expectation that the *driver* completes the *OEDR* subtask and *supervises* the *driving automation system*.	***System***	*Driver*	*Driver*	Limited
***ADS* ("*System*") performs the entire *DDT* (while engaged)**						
3	**Conditional Driving Automation**	The *sustained* and *ODD*-specific performance by an *ADS* of the entire DDT with the expectation that the *DDT fallback-ready user* is *receptive* to *ADS*-issued *requests to intervene*, as well as to *DDT performance-relevant system failures* in other *vehicle* systems, and will respond appropriately.	*System*	***System***	*Fallback-ready user (becomes the driver during fallback)*	Limited
4	**High Driving Automation**	The *sustained* and *ODD*-specific performance by an *ADS* of the entire *DDT* and *DDT fallback* without any expectation that a *user* will respond to a *request to intervene*.	*System*	*System*	***System***	Limited
5	**Full Driving Automation**	The *sustained* and unconditional (i.e., not *ODD*-specific) performance by an *ADS* of the entire *DDT* and *DDT fallback* without any expectation that a *user* will respond to a *request to intervene*.	*System*	*System*	*System*	**Unlimited**

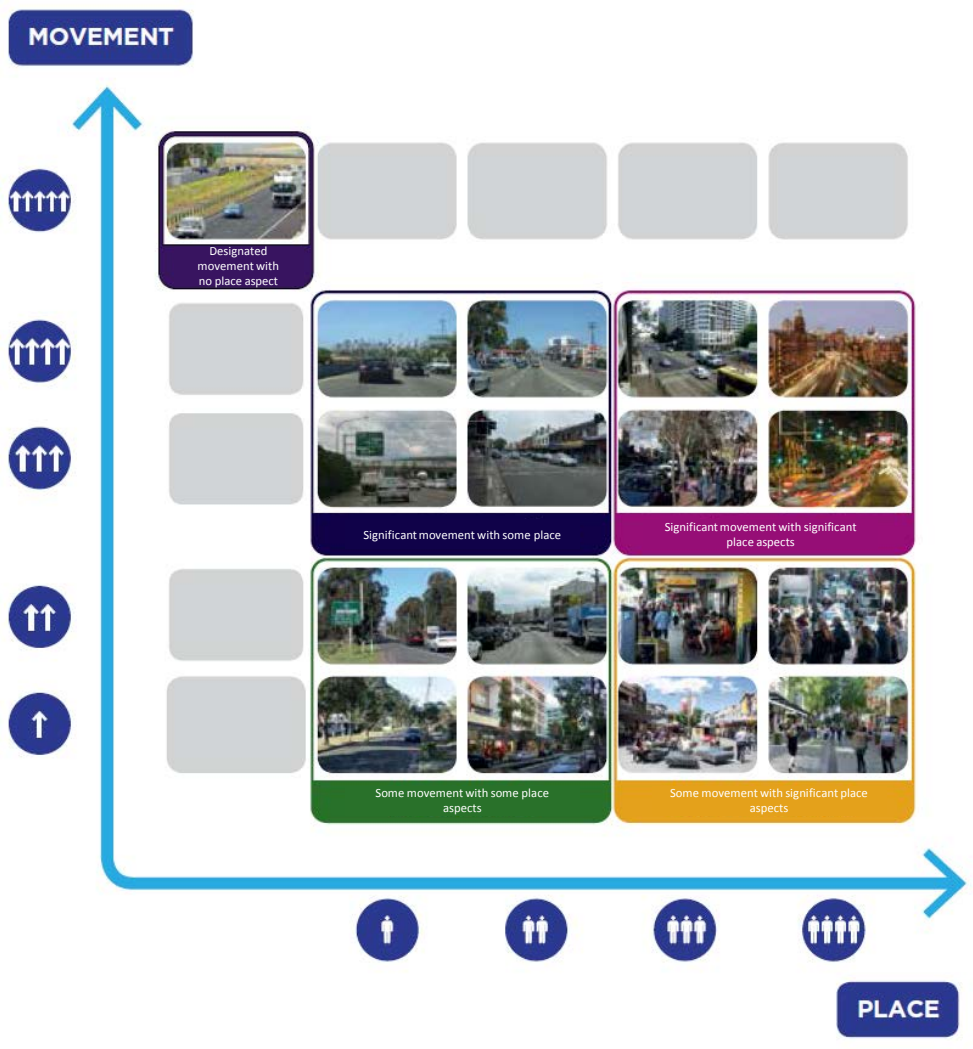
Source: SAE International Standard J3016

Functional Safety



Source: AdaptIVe 2015

Movement and Place



Source: Austroads 2016a

Strategic View

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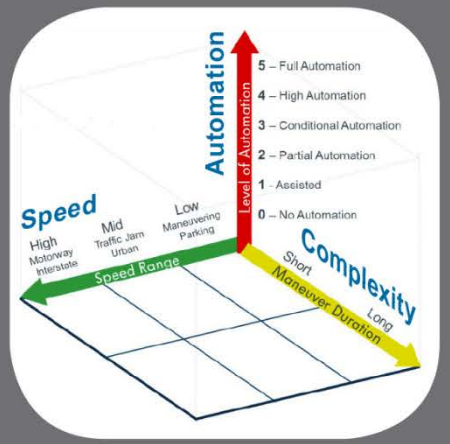
STRATEGIC HIERARCHY OF VEHICLE OPERATION AND LAND USE INTERACTION

Movement and Place

INTERACTION BETWEEN VEHICLE AND THE ENVIRONMENT

LEVEL OF DRIVER AUTOMATION SAE J3016



Network Operating Plans

Timescales for Introduction

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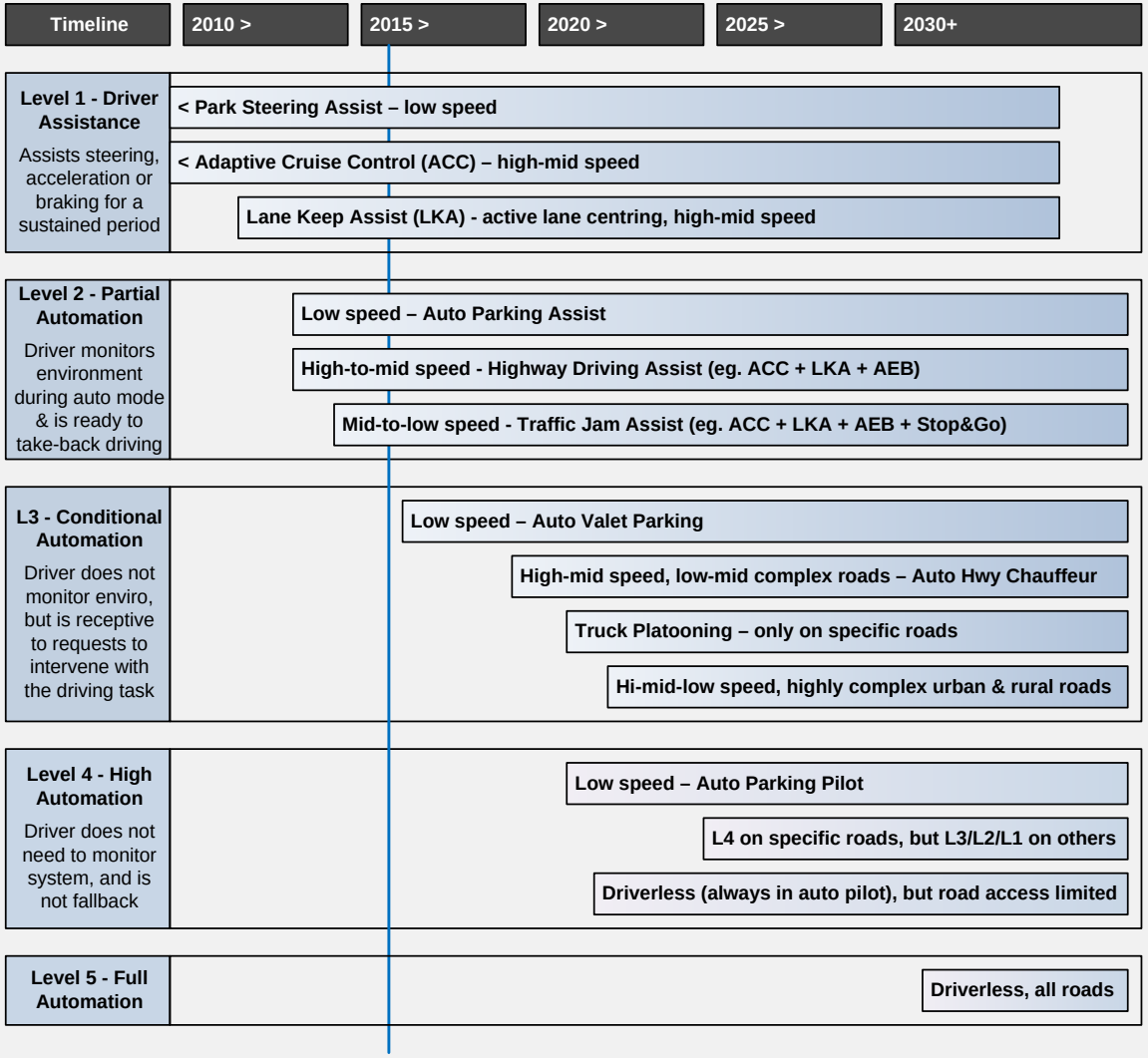
There are three major issues which will affect the widespread introduction of AV:

1. Availability of AV technology at an affordable price.
2. Appropriate legislation and regulation to ensure safe introduction and use of AV technologies.
3. Societal acceptance of the benefits of AVs and other changes to transportation and technology which could change the use of and turnover of the vehicle fleet.

Possible Timescales



Source: Developed by Austroads following a wide range of discussions with vehicle manufacturers and wider industry (2016)

Guidance - Physical Infrastructure

Issue
Line marking and delineation • Design - Consistency • Asset management - Maintenance hierarchy and intervention levels, Removal of old line markings
Road signs (static) • Design – Consistency , Minimum standards be applied, Difficult to interpret signs
Electronic signs, incl. Variable Message Signs (VMS) • Design and asset management - Some cameras cannot clearly read some signs, Information from sign to the vehicle (I2V) is possible • Asset management - Timeliness to install and confirm sign placement, Readability of signs, Positioning of signs
Traffic systems • Design and asset management – Consistency, Consider for specific use cases
Structures pavements, bridges, tunnels and barriers to protect critical infrastructure • Design and asset management - Change infrastructure

Guidance - Digital Infrastructure

Issue
Asset data • Make key data available: Speed limit, Speed zone, road closure and lane availability, Clearways, New and changed roads
Road asset condition data • Systems to support real time and historic
Privacy • Relevant privacy and data surveillance legislation and guidelines
Data ownership • Road operators will be an authoritative source of some information
Business models • Consider opportunities and challenges
Cellular communication coverage • Support coverage for all carriers
Other wireless communication • Potential need for non-cellular V2I and I2V Communication
Positioning services • Need for positioning services with high accuracy and integrity to support AV operation

Guidance - Road Operation

Issue
Strategic framework for AV operation • Need for single point of reference for many use cases
Detailed guidance for AV operation • Risk Assessment for individual use cases
Detailed information about road works and closures • Consider the implication of this data for the concept of “road certification” noted above
Monitoring of AV • Monitoring characteristics which are proven to be vital to AV operation
Suitability of roads for individual AV use cases • Need for assessment program
Maintenance intervention levels • Needed for effective operation
Consistency in road operations • Roads rules (NTC) , consistency, guidance and guidelines
Consider unique AV operational requirements • Consider AV needs eg Road Works Specific
Impact of AV use on roads • Micro, macro and strategic
Impacts on community • Local and global

Final Conclusions

1. Automated vehicles can be view as another type of road user
2. A single framework to consider a wide scale of AV interactions is beneficial
3. Guidance has been provided regarding short, medium and long term considerations and actions for road operators in relation to:
   - Physical Infrastructure
   - Digital Infrastructure
   - Road Operations

Questions?

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