



Belgisch **Wegen**congres Congrès belge de la **Route**

LEUVEN • 4-7.04.2022

CAV en verkeersveiligheid

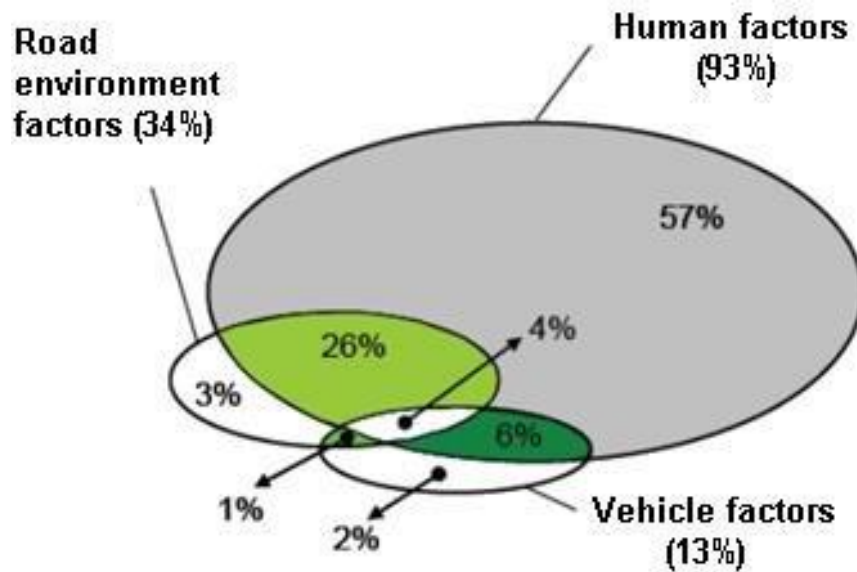
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Uitdagingen en potentieel



● VITESSE MAX 70 KM/H ●





[Traffic accidents as part of environmental assessment](#), Mariia Khrapova, CULS



BENEFITS OF SELF-DRIVING IN THE EU



Sources: EPRS, European Commission



SELF-DRIVING VEHICLES

Self-driving vehicles will have the ability to navigate independently.

DO NOT REQUIRE ANY DRIVER INPUT



HAVE A 360° VIEW AT ALL TIMES



Reduce the element of human error in driving, which is the cause in 90% of all accidents today.



However, self-driving vehicles are unlikely to be widely available before 2030.

AUTOMATED VEHICLES

Today, partially automated vehicles are able to perform an increasing number of driving tasks in specific scenarios.

AUTOMATIC PARKING



HIGHWAY PILOT



Advanced driver assistance systems (ADAS) take over safety-critical functions in dangerous situations.

STEERING



BRAKING



CONNECTED VEHICLES

Exchanging safety-critical information between vehicles and infrastructure makes it possible to drive down the number of accidents and casualties.



Using this information it is possible to:

IMPOSE VARIABLE SPEED LIMITS



HELP AVERT ACCIDENTS



OPEN OR CLOSE TRAFFIC LANES



FLAG HAZARDS ON THE ROAD AHEAD



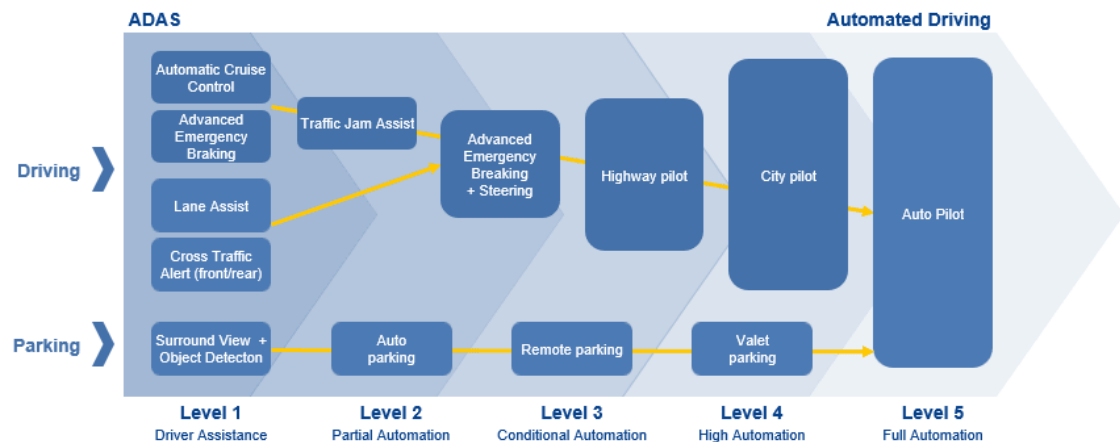
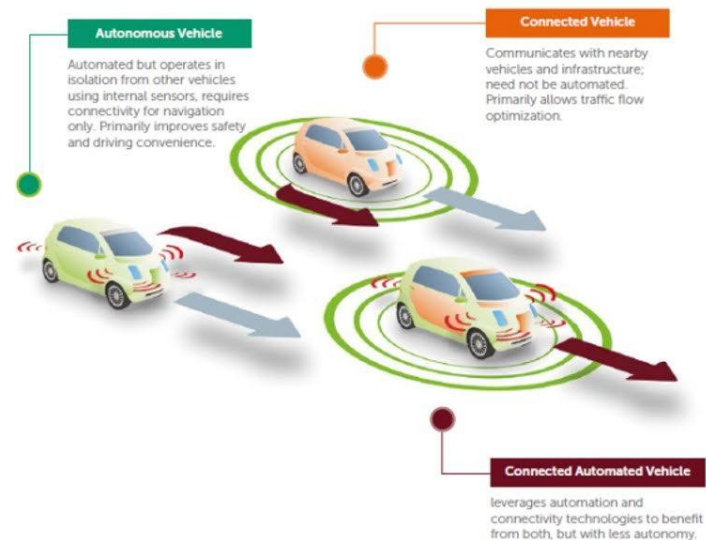


Figure 1: Autonomous and Connected vehicles



[OEM guide to ADAS development \(Renesas electronics\)](#)

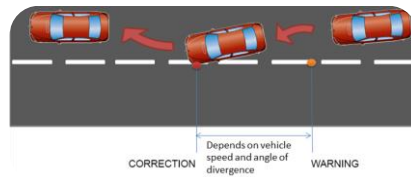
[iCAVE2: instrument for Connected and Autonomous Vehicle Evaluation and Experimentation](#)



REGULATIONS

REGULATION (EU) 2019/2144 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
of 27 November 2019

on type-approval requirements for motor vehicles and their trailers, and systems, components and separate technical units intended for such vehicles, as regards their general safety and the protection of vehicle occupants and vulnerable road users, amending Regulation (EU) 2018/858 of the European Parliament and of the Council and repealing Regulations (EC) No 78/2009, (EC) No 79/2009 and (EC) No 661/2009 of the European Parliament and of the Council and Commission Regulations (EC) No 631/2009, (EC) No 406/2010, (EU) No 672/2010, (EU) No 1003/2010, (EU) No 1065/2010, (EU) No 1008/2010, (EU) No 1009/2010, (EU) No 1010/2010, (EU) No 1095/2011, (EU) No 458/2012, (EU) No 675/2012, (EU) No 130/2012, (EU) No 347/2012, (EU) No 351/2012, (EU) No 1230/2012 and (EU) 2015/1666



COMMISSION DELEGATED REGULATION (EU) 2015/962
of 18 December 2014

supplementing Directive 2010/40/EU of the European Parliament and of the Council with regard to the provision of EU-wide real-time traffic information services





Road Surveying business – new tools with upcoming autonomous vehicles, Calgary 2022, XenomatiX

Table 4: **Assessment of sensor performance across driving tasks**

Performance aspect	Human	Automated Vehicle			Connected vehicle	Connected, automated vehicle
	Eyes	Radar	Lidar	Camera	DSRC	Radar, Lidar, Camera and DSRC
Object detection	Good	Good	Good	Fair	n/a	Good
Object classification	Good	Poor	Fair	Good	n/a	Good
Distance estimation	Fair	Good	Good	Fair	Good	Good
Edge detection	Good	Poor	Good	Good	n/a	Good
Lane tracking	Good	Poor	Poor	Good	n/a	Good
Visibility range	Good	Good	Fair	Fair	Good	Good
Poor weather performance	Fair	Good	Fair	Poor	Good	Good
Dark or low illumination performance	Poor	Good	Good	Fair	n/a	Good
Ability to communicate with other traffic or infrastructure	Poor	n/a	n/a	n/a	Good	Good

Source: (Shoettle, 2017)



Table 2: **Summary of Fitts List of strengths and weaknesses across various aspects of function allocation between humans and hardware/software systems**

Automated vehicle

Aspect	Human	Hardware/Software system
Speed	Relatively slow.	Fast.
Power output	Relatively weak, variable control.	High power, smooth and accurate control.
Consistency	Variable, fatigue plays a role, especially for highly repetitive and routine tasks.	Highly consistent and repeatable, especially for tasks requiring constant vigilance.
Information processing	Generally single channel.	Multichannel, simultaneous operations.

Human operator

Memory	Best for recalling/understanding principles and strategies, with flexibility and creativity when needed, high long-term memory capacity.	Best for precise, formal information recall, and for information requiring restricted access, high short-term memory capacity, ability to erase information after use.
Reasoning	Inductive and handles ambiguity well, relatively easy to teach, slow but accurate results, with good error correction ability.	Deductive and does not handle ambiguity well, potentially difficult or slow to program, fast and accurate results, with poor error correction ability.
Sensing	Large, dynamic ranges for each sense, multifunction, able to apply judgement, especially to complex or ambiguous patterns.	Superior at measuring or quantifying signals, poor pattern recognition (especially for complex and/or ambiguous patterns), able to detect stimuli beyond human sensing abilities (e.g., infrared).
Perception	Better at handling high variability or alternative interpretations, ³ vulnerable to effects of signal noise or clutter.	Worse at handling high variability or alternative interpretations, ³ also vulnerable to effects of signal noise or clutter.

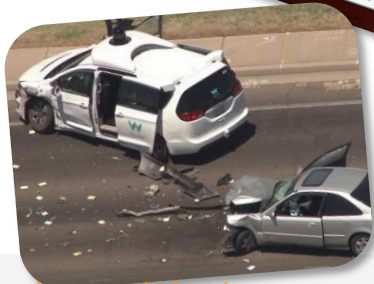
Source: (Schoettler, 2017) adapted from (Cummins, 2014; de Winter and Dodou, 2014)



Illustration: Bryan Christie Design

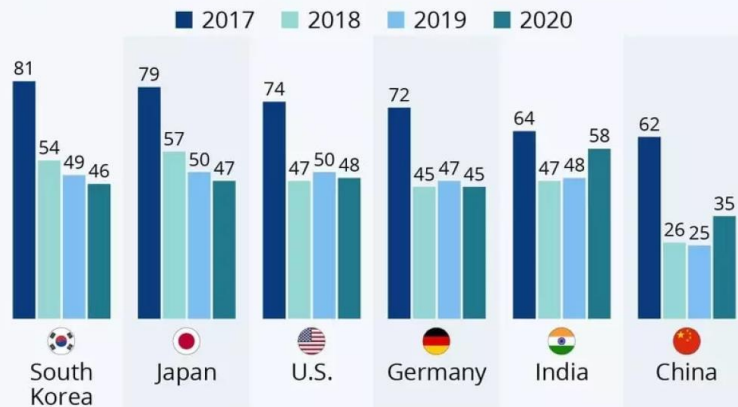
Reading Body Language

can a self-driving car tell
what a human driver could
take in at a glance?

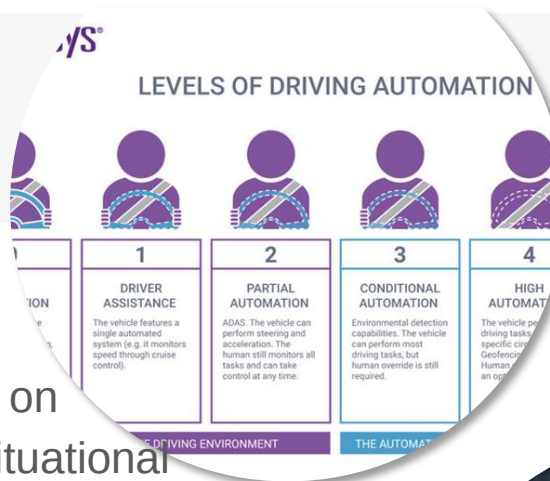


Where People Are Warming up to Self-Driving Cars

Percentage of consumers who think self-driving vehicles will not be safe



Deloitte



'nieuwe' uitdagingen

- autonomous vehicles ?
- tot SAE L3: mens nog nodig - hands on
- deskilling (automation addiction) & situational awareness (L3)
- overgangperiode & mix voertuigen / nog decennia
- interactie met andere weggebruikers (wagens, VRU, micro-mobiliteit, ..)
- soft- en hardware-errors
- cybersecurity



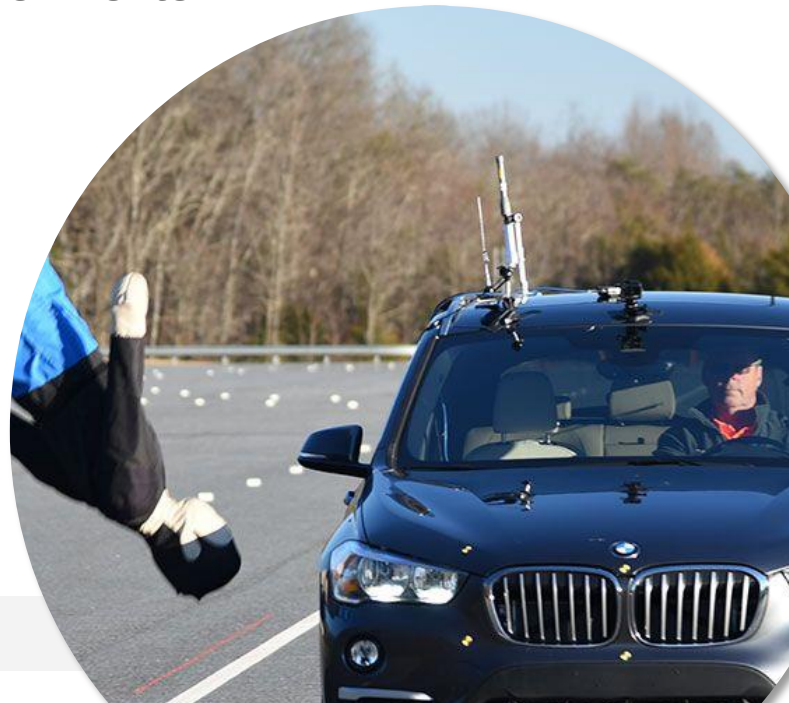


- complex
- veiligheidsclaims gebaseerd op beperkte experimenten
- veiligheidswinst moeilijk aantoonbaar

California, US

- ... accident en disengagement reports*
- ... AV meer betrokken bij ongevallen*
- ... ongevallen met AV minder ernstig*
- ... oorzaak meestal bij andere weggebruiker*
- ... meer kop-staart aanrijdingen*
- ... minder ongevallen met PTW*
- ... aantal ongevallen daalt als aandeel AV toeneemt*

- bijkomende vorming?





bijdrage van infrastructuur?

- wegmarkeringen (LDW)
 - contrast, retroreflectie, aflijning
- verkeersborden (ISA)
 - harmonisering
 - zichtbaarheid
 - onderborden, impliciete boodschappen
 - taal





bijdrage van infrastructuur?

- digital maps (ISA, SRTI, RTTI)
 - correcte info
 - nauwkeurige locatie
 - up-to-date
- communicatieinfrastructuur (ISA, SRTI, RTTI)
- wegdekkwaliteit (LDW, AEB)



ook zinvol voor menselijke bestuurder

in afwachting ...

- klassieke maatregelen blijven nodig





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CAV & verkeersveiligheid



Verkeersveiligheidsinspecties op wegtrajecten voor proefritten met zelfrijdende auto's

(Mark Broeckaert, VIAS)

Navette autonome de Louvain-la-Neuve et sécurité routière
(Sandra Martens, LLN & Simon Collet, TEC)



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EEN ORGANISATIE VAN



BWV

Belgische
Wegenvereniging



AGENTSCHAP
WEGEN & VERKEER

MET DE STEUN VAN



Opzoekingscentrum
voor de Wegenbouw



BRUSSEL MOBILITEIT

GEWESTELIJKE OVERHEIDSDIENST BRUSSEL



Wallonie
mobilité infrastructures
SPW



BFAW

Belgische Federatie van Aannemers van Wegenwerken vzw



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Contact

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