

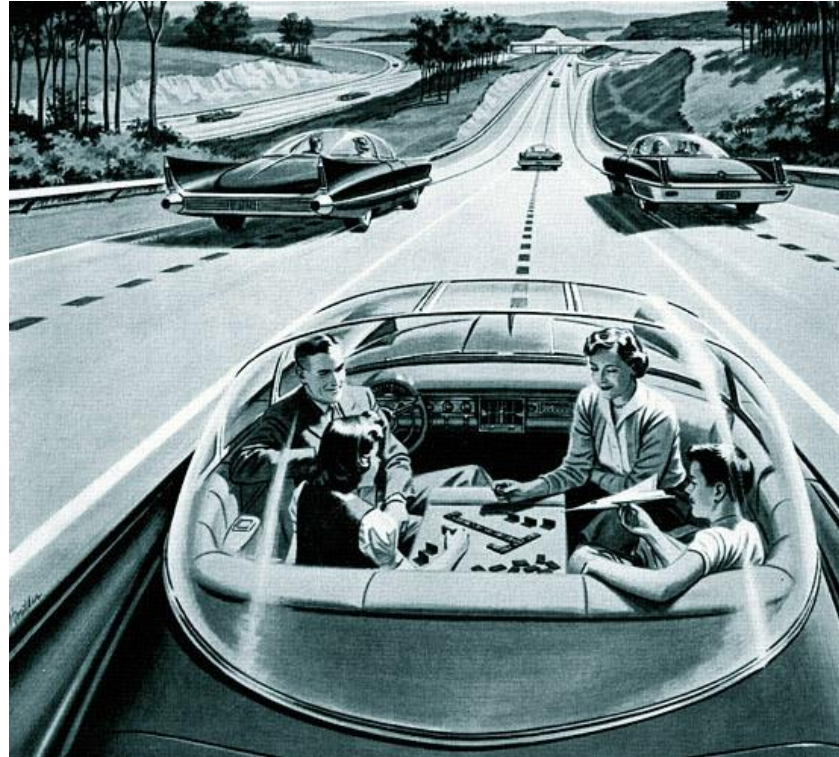
WEpods: Automatic Vehicles on Public Roads

Presentation KIVI 20-4-2016



History

Automated driving is a dream



1956

History in NL

Automated driving is a reality



For Cargo since 1995

History in NL

Automated driving is a reality



For People since 1997

History in NL

Automated driving is a reality



Rotterdam 1999 - 2002



since 2004



automated driving on public roads



Wageningen - 28 January 2016



What's happening?

Automated driving vehicles on public roads in Foodvalley - Gelderland

- Where? Fixed track: railway station Ede/W to the WUR + WUR circle line
- How many? 2
- For who? Guests of the WUR: Station Ede>WUR
Personel + students: on the WUR



WEpods

New frontiers



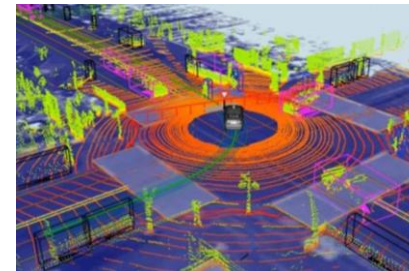
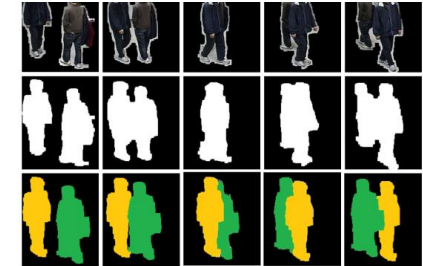
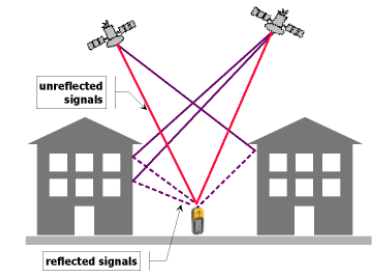
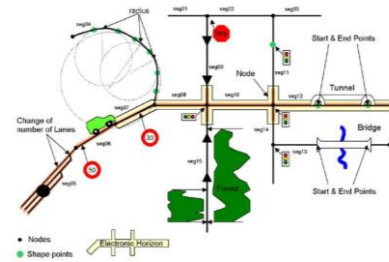
- Automated driving
 - no: steering wheel
 - on: stop-start button
intercom/camera
operator
- Existing roads
 - no: technology in infra
 - on: geselecteerde route
traffic light at busy crossing
- Mixed traffic
 - no: busy or fast traffic
 - on: calm speed (25 km/u)
stop in case of problem



How does it work?

Modules

- Digital map
- Positioning
- Camera's
- Radars
- Laser scanners
- Ultrasonic sensors
- Vehicle control module



Where will they drive?

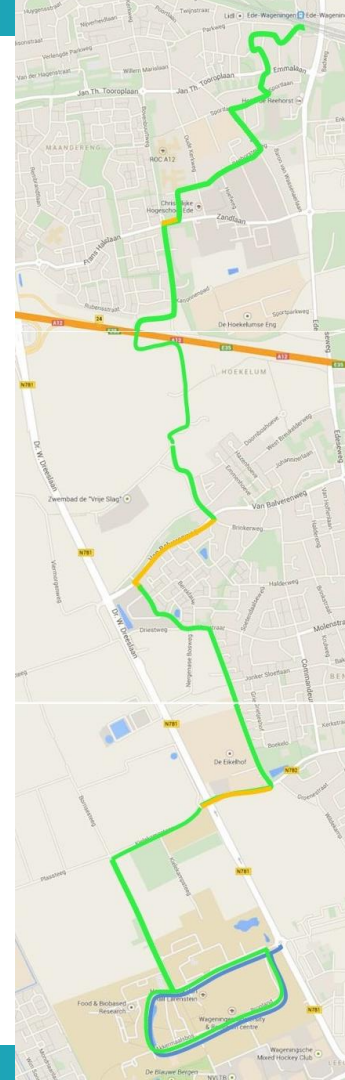
On a fixed track

Selected on:

- limited speed differences
- limited traffic load

High diversity

- road users
- traffic situations
- road side environment



WEpods

Ede

Wageningen

We = you&us

Pod: small
autonomous
vehicle

How will they drive?

Just like other vehicles

Low speed:	Max 25 km/uur for short brake distance
Extra signaling:	Ticker tape, blinkers, driving noise
‘When possible’:	not at peak hours, adverse weather or darkness (at first)
Give priority:	rather than take it
Busy section:	semi automated, with Steward
Stop when problem	

Unmanned?



Human in the vehicle

Dec-april: test-engineers

May onwards: steward: for supervision
speed control in busy traffic
until further decision

Human on distance

Operator: in the Meldkamer in Ede

Camera views (3 cams to choose)

Intercom inside / outside

How should others react?

Quite simple



Do

give way

keep distance

gentle, smooth overtaking



Dont

no sudden cut-ins

double parking

bad jokes

When?

What's the planning?



September 2015
Start test off site



January 2016
Start test on site



July 2016
Start guests



September 2016
End project
Start exploitation

Project content



Vehicle: Easymile EZ10



Additions:

- D-DPS/RTK + INS + Odometry + landmark positioning
- 12 camera's + 9 radars + 9 ultrasonics
- 6 multilayer lasers
- 5 computers
- Interior camera
- Interior + exterior intercom
- 2x4G + 3G + Wifi-P communication
- Ticker tapes front + rear
- 12KWH batteries
- Heater, belts, roller chair fixation, wiper, 3rd brake light, int. covers, steward seat,

Supervisor system

User App

Infotainment

The technical project team



In and with the Food Valley region

WE is all together!



city of life sciences
Wageningen



Challenges

What are the main challenges for Wepods?



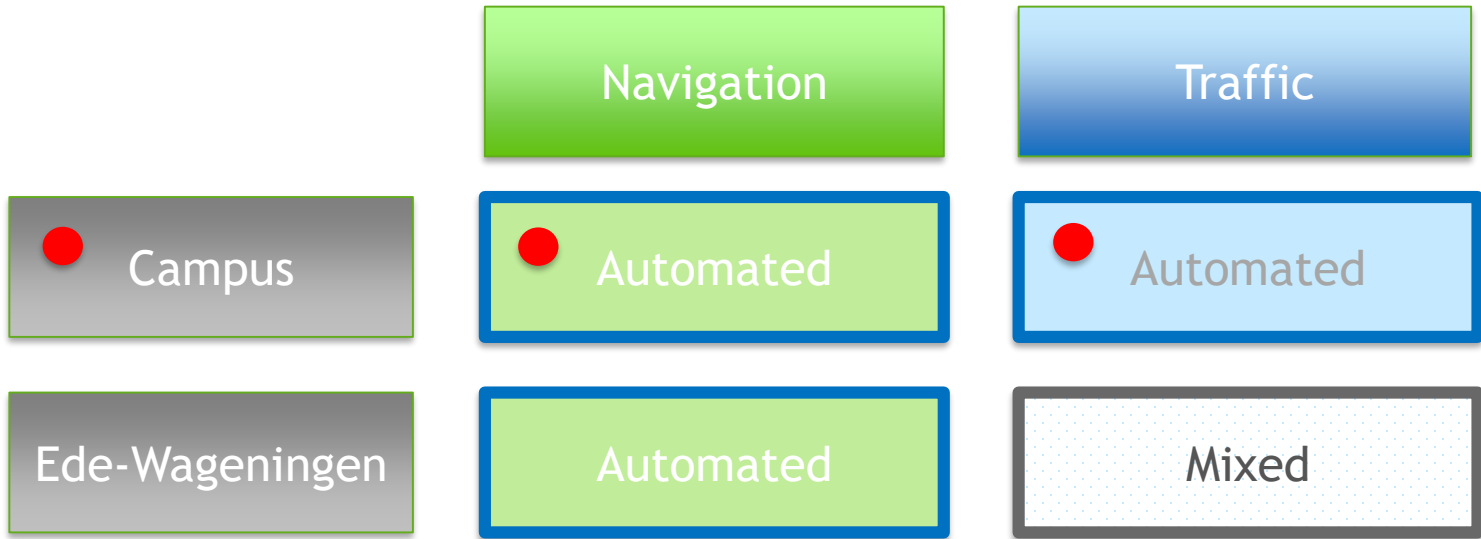
Navigation:

Stay on, follow, the road (no traffic)
+/- 20 cm accuracy
absolute and relative positioning

Handling other traffic:

detect, track, classify > predict path
combine with ego motion
risk assessment
corrective action: brake

Next Horizon



Legal NL

today



RDW Waiver for use on public roads

- modified Mx certified cars (did not work for WEpods)
- special vehicles / special circumstances (=WEpods: ZZ licence plate)

Special, customized, procedure.

- RDW, SWOV, Ministry of Infrastructure and the Environment

But: licensed ‘driver’ inside is required

To go: driving with empty vehicle

Note: Automated driving has enormous advantages on liability



WEpods





Functions	2016	2018	2020	2022
Vehicle	EZ10-6P	New gen /12P		
Higher speed		40	60	80
Empty vehicle	first test	pilot quiet road (20km/h)	pilot more traffic	max 40
Traffic complexity	listed use cases	app specific use cases	more use cases	more use cases
		'turbotondes'	Follow close	roundabouts
		follow close		
Routing	fixed	networked		
Localization	visual slam + RTK	self learning (updates)		
		<i>slam only?</i>		
		<i>E-horizon?</i>		
Fewer stops		reduced false positives	reduced false positives	reduced false positives
		improved robustness		
Detection road users		no LL safety (HL only)	Overtakers and cut-ins	
		read lights: fr/r, side ind., tr lights		
		<i>sensor economy</i>		
Predict path others	start behavior research	take priority (right of way)		
		read side indicators (+traffic lights)		
Classification		More + move envelope	More & better	More & better
Weather		rain	fog	snow
		dark		
Control Room		sub routines		
App		improved functionality		
ICT		security	speed	
		V2V		
Legislation	Waiver Steward (Level4)	Level4 veh. cat. proposal Waiver empty drive (Level5)	Level4 category appr'd Level5 category prop.	Level4 syst approval Level5 category appr'd