Light for sensors in an autonomous vehicle environment:

What are our options and challenges: Lidar, Camera,Night vision, Radar

DVN LIDAR CONFERENCE 2018
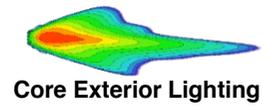
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2nd Generation

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LiDAR integration – evolution

Velodyne LiDAR on Ford Fusion/Mondeo demo
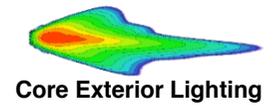
2.232 Aufrufe

nwradu
Am 06.03.2014 veröffentlicht

Four HDL-32 LiDAR units mounted on a new Ford Mondeo demonstrate the technology for detecting nearby objects with a good resolution.
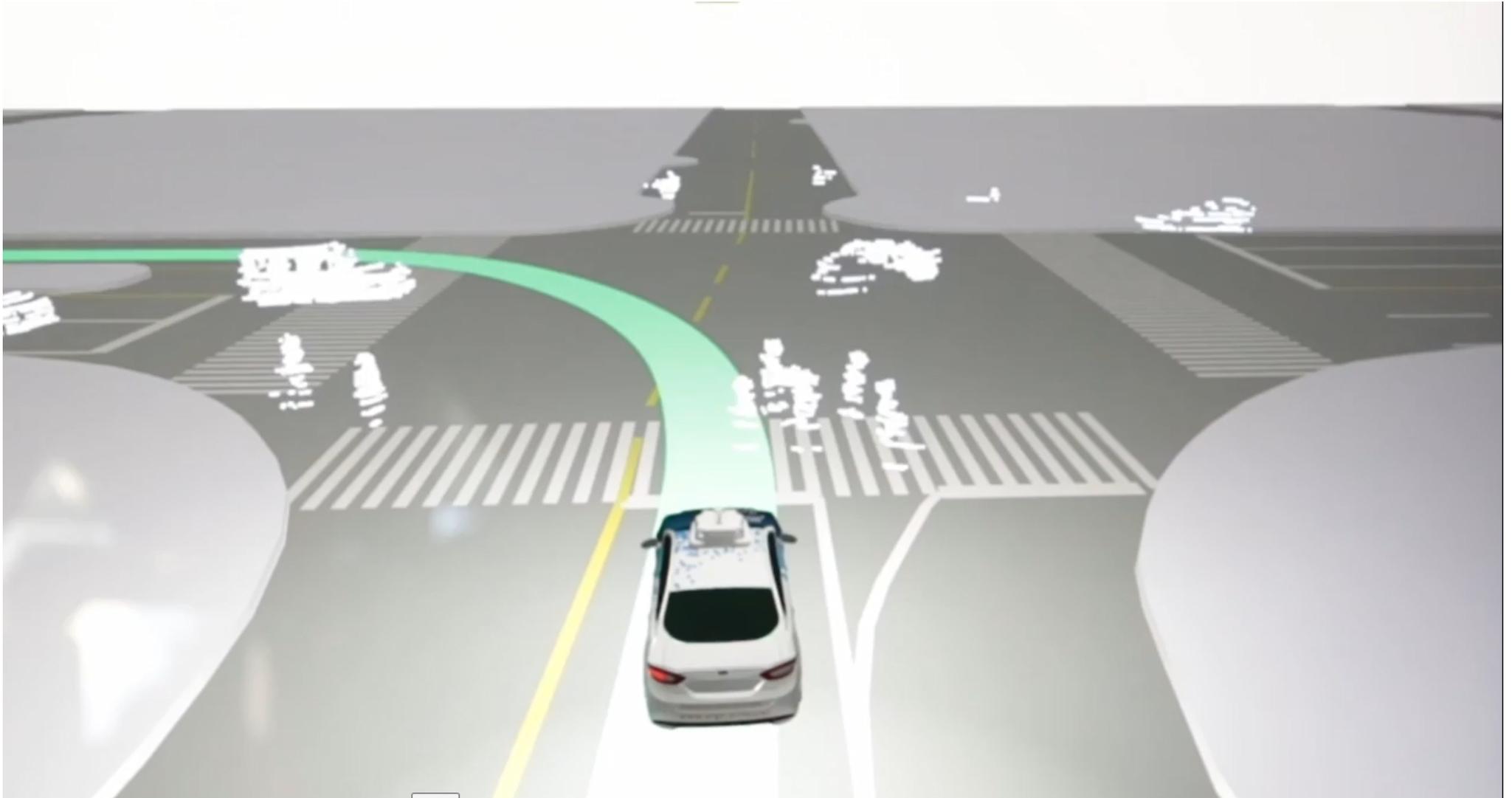
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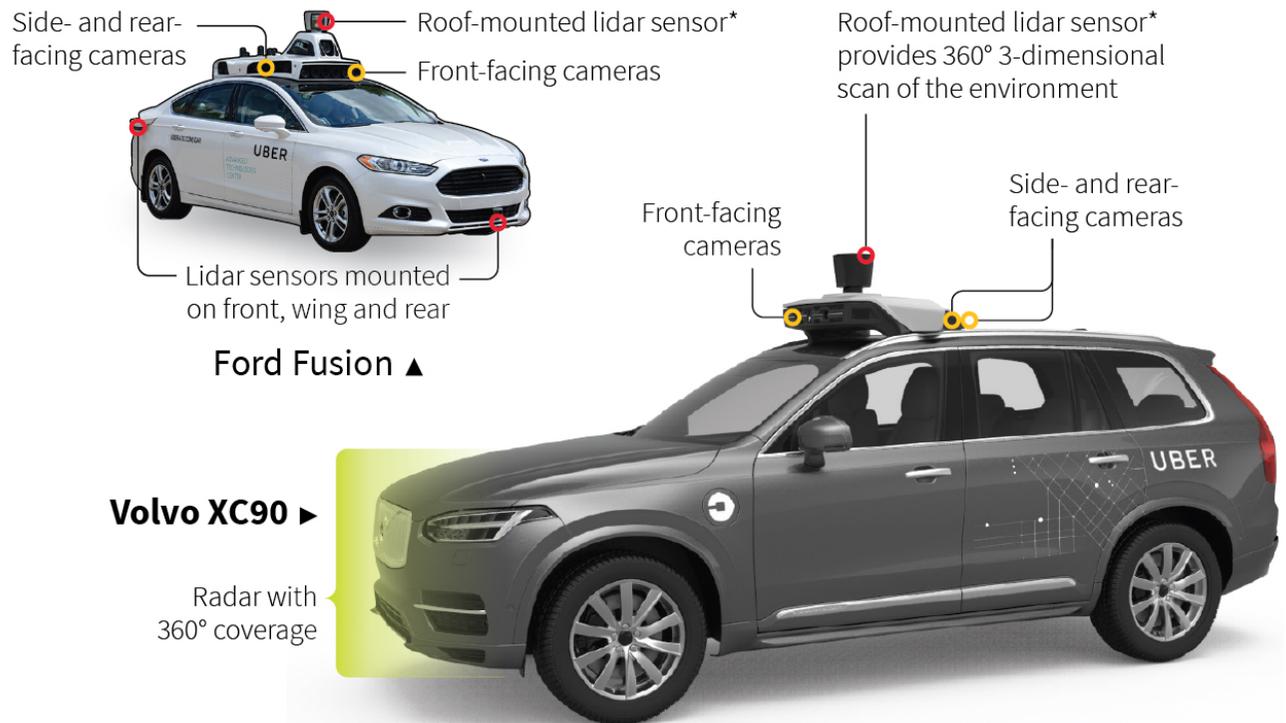twarwel1@ford.com

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How Uber altered safety sensors on newest test cars

Uber's self-driving Volvo SUV that struck and killed a pedestrian last week in Tempe, Arizona, used fewer safety sensors than the self-driving Ford Fusions that Uber phased out of its test fleet last year.

UBER SELF-DRIVING VEHICLE SAFETY SENSOR SUITE

	LIDAR	RADAR	CAMERA
Volvo XC90	● 1	●●●●●●●●●● 10	●●●●●●● 7
Ford Fusion	●●●●●●● 7	●●●●●●● 7	●●●●●●●●●●●●●●●●●●●● 20

Side- and rear-facing cameras

Roof-mounted lidar sensor*

Front-facing cameras

Roof-mounted lidar sensor* provides 360° 3-dimensional scan of the environment

Lidar sensors mounted on front, wing and rear

Front-facing cameras

Side- and rear-facing cameras

Ford Fusion ▲

Volvo XC90 ▶

Radar with 360° coverage
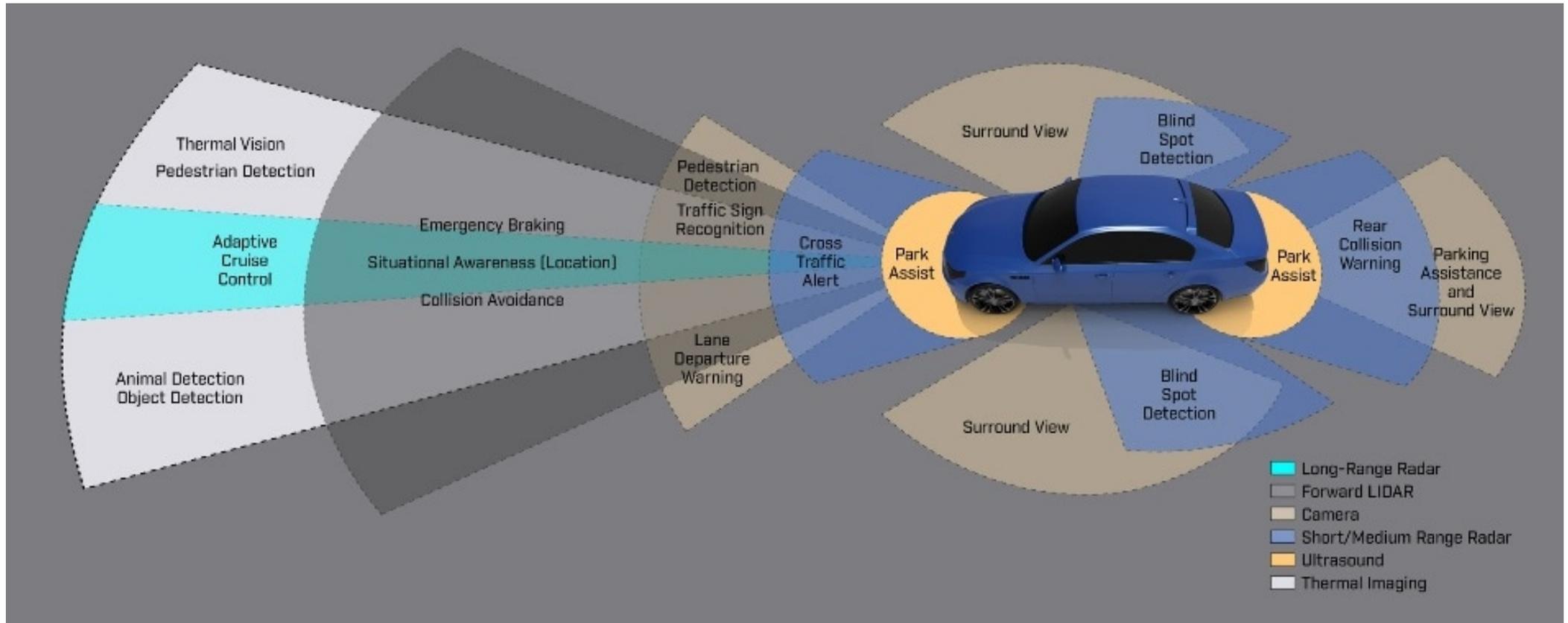
Source: Uber   Images: Uber

* Lidar uses laser light pulses to detect obstacles

W. Foo, 28/03/2018

◉ **REUTERS**

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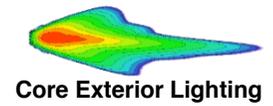
Quelle: Flir Sensing

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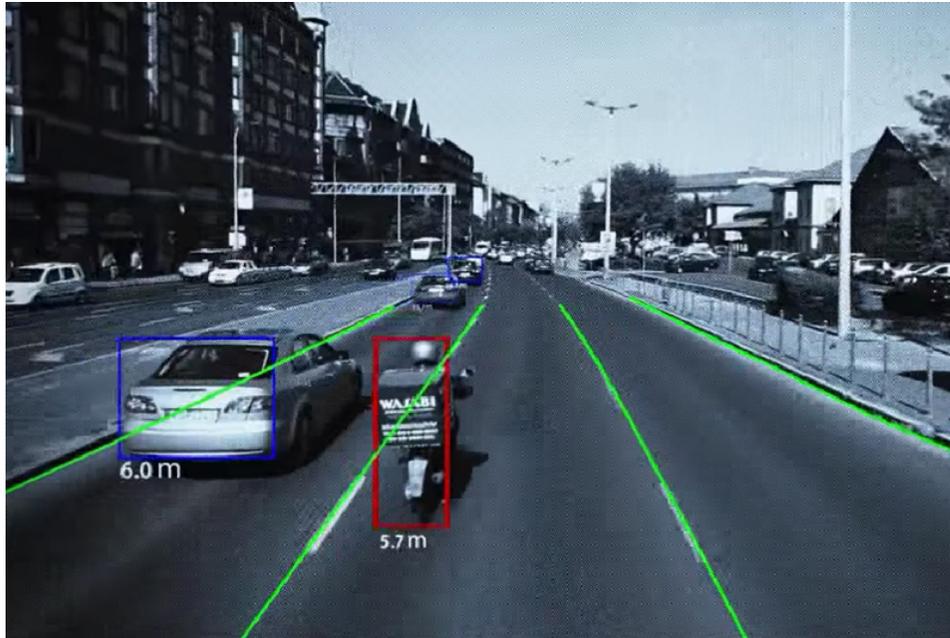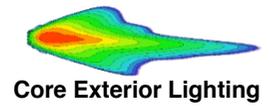
- Cameras arrived long time in car industry. Cost efficient

- Precise in color and geometrie detections

- Needs light!

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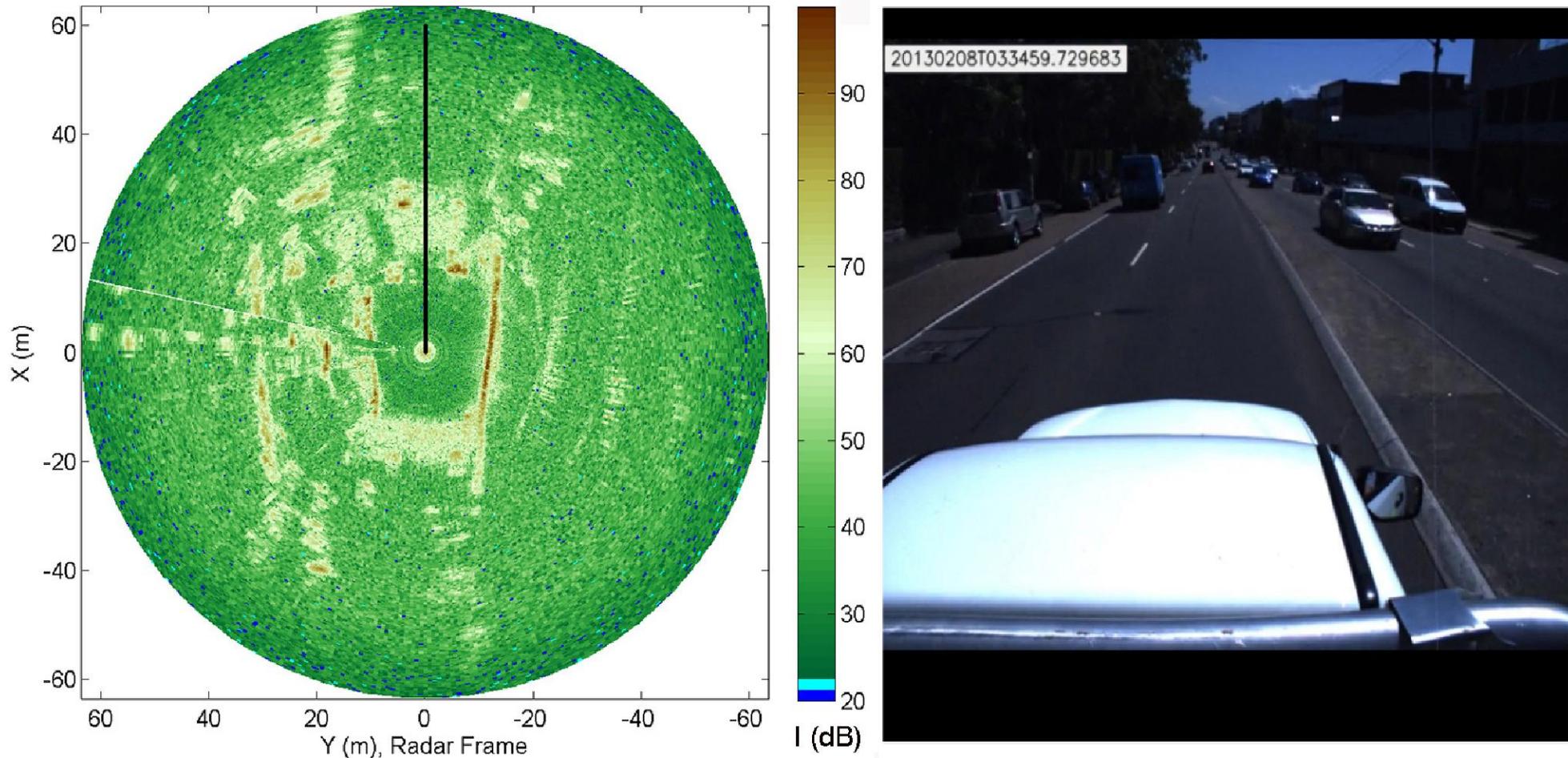twarwel1@ford.com

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© Ford Europe

- Costly, detects warm bodies (living bodies or heated bodies)

- Does require IR emitter for dead geometrie

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Quelle: Auto Blog
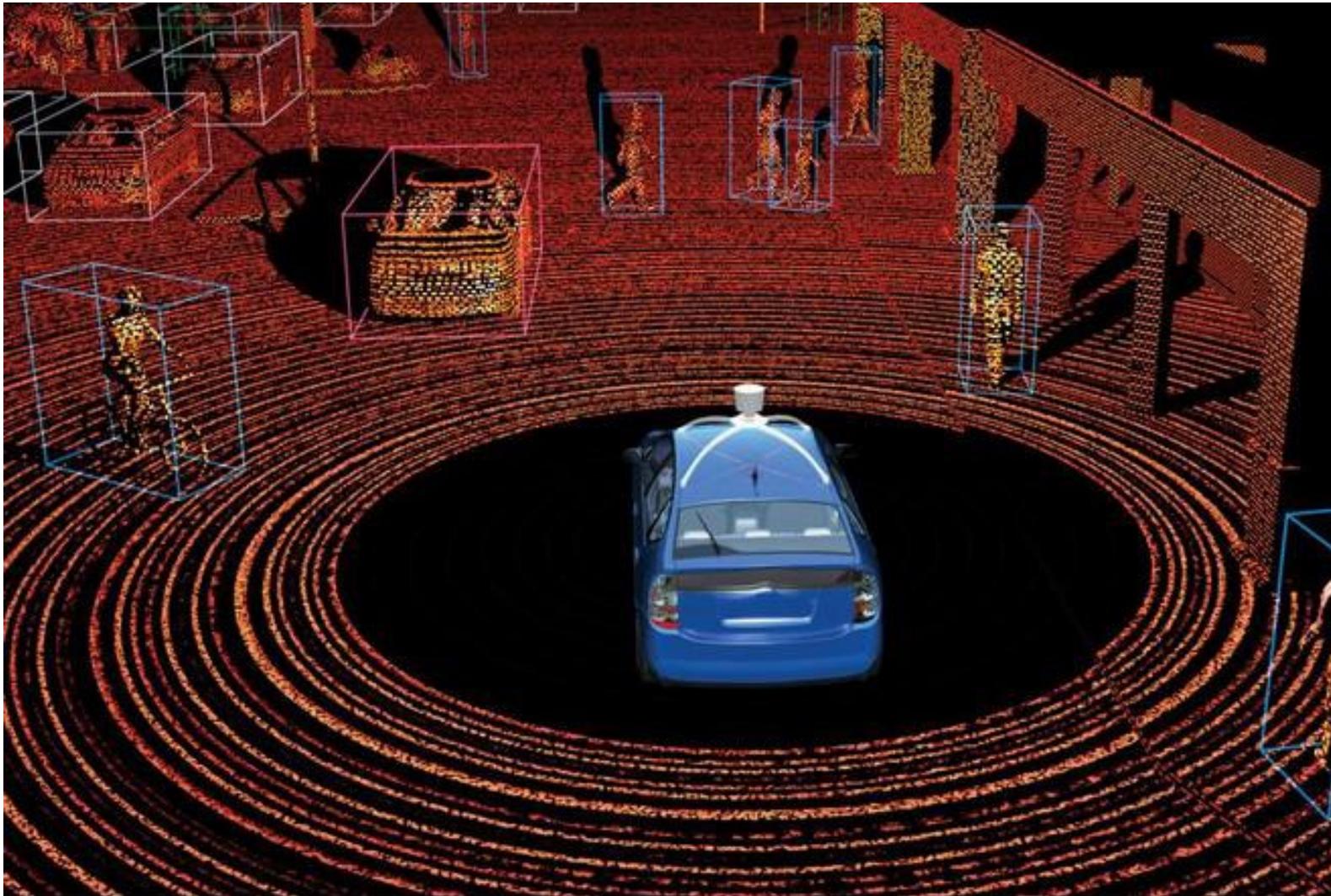
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- Cost efficient, already arrived in Car industry and integrated in the lamps
- Detection with reduced resolution and accuracy

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Lidar opportunities

- Costly, size, accurate detection of geometrie
- No color or sign detecion
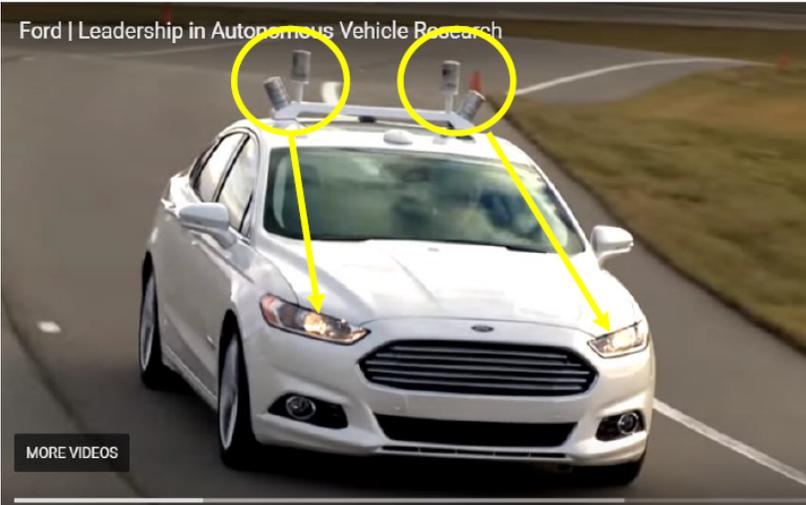- Near and far far field capability

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Quelle:LeddarTech Internet

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Koito

Magneti Marelli

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- Light fraction at lens:
    - fraction dependant on lens shape and surface quality
    - design and tooling impact

- Mechanical Lidar: positioning tolerance sensitive (VS SSL)

- High data speed for recognition time needed

- Laser usage and ISO 26262 compliance

- Object detection dependant on lens cleaness
  lens needs to be replaceable or cleaned within mili seconds

- Cleaning and service strategy

Sensor comparison
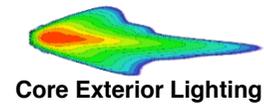
Rating: H = High, M=Medium, L = Low

	📷 Camera	📡 Radar	✴ LiDAR	Autonomous Requirement
Object Detection	M	H	H	H
Classification	H	M	L	H
Close-Proximity Detection	M	H	L	H
Speed Detection	L	H	M	H
Lane Detection	H	L	L	H
Traffic Sign Recognition	H	L	L	H
Range	H (200m)	H (250m)	M (120m)	Full range
Work in Rain, Fog, Snow	L	H	M	H
Work in Low Light	L	H	H	H
Work in Bright Light	M	H	H	H
Size	Small	Small	Medium	Mix
Cost	$	$$	$$$$	Mix

Quelle: NXP 2017

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- Lighting supplier need more sensor knowledge to improve
    - Mechanical connection
    - Optical defraction improvements
    - ISO 26262 capabilities

- Sensor providers need to develop their systems to be less sensitive in:
    - Mechanical fixations and tolerances
    - Cleaningness requirements
    - Object classifications

- Sensors need to shrink and improve detection capabilities

- Avoid redundant sensoring

- Improve sensor fusion……………..the best wins

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