VOLVO

Interaction between vehicles and infrastructure (lane markers)

Andreas Lökholm & Carina Björnsson Volvo Cars

Autonomous driving vs manual driving with support

Manual driving:
Driver responsible, vehicle supports

Support and assist for safer and less stressful driving

Autonomous Drive:
Vehicle is responsible in autonomous mode

Fully autonomous. The vehicle can only deal with clear & defined road environments

Active Safety

Collision avoidance & Driver Support

- **Collision avoidance:** Warn, brake, or steer at hazardous situation
- **Support functions:** Parking, support in daily driving

Many dependencies:

Certification, Rating, Consumer tests, etc…

auto motor sport

IIHS HLDI

NHTSA
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

FOR SAFER CARS
EURO NCAP

ADAC

JNCAP

CNTARC

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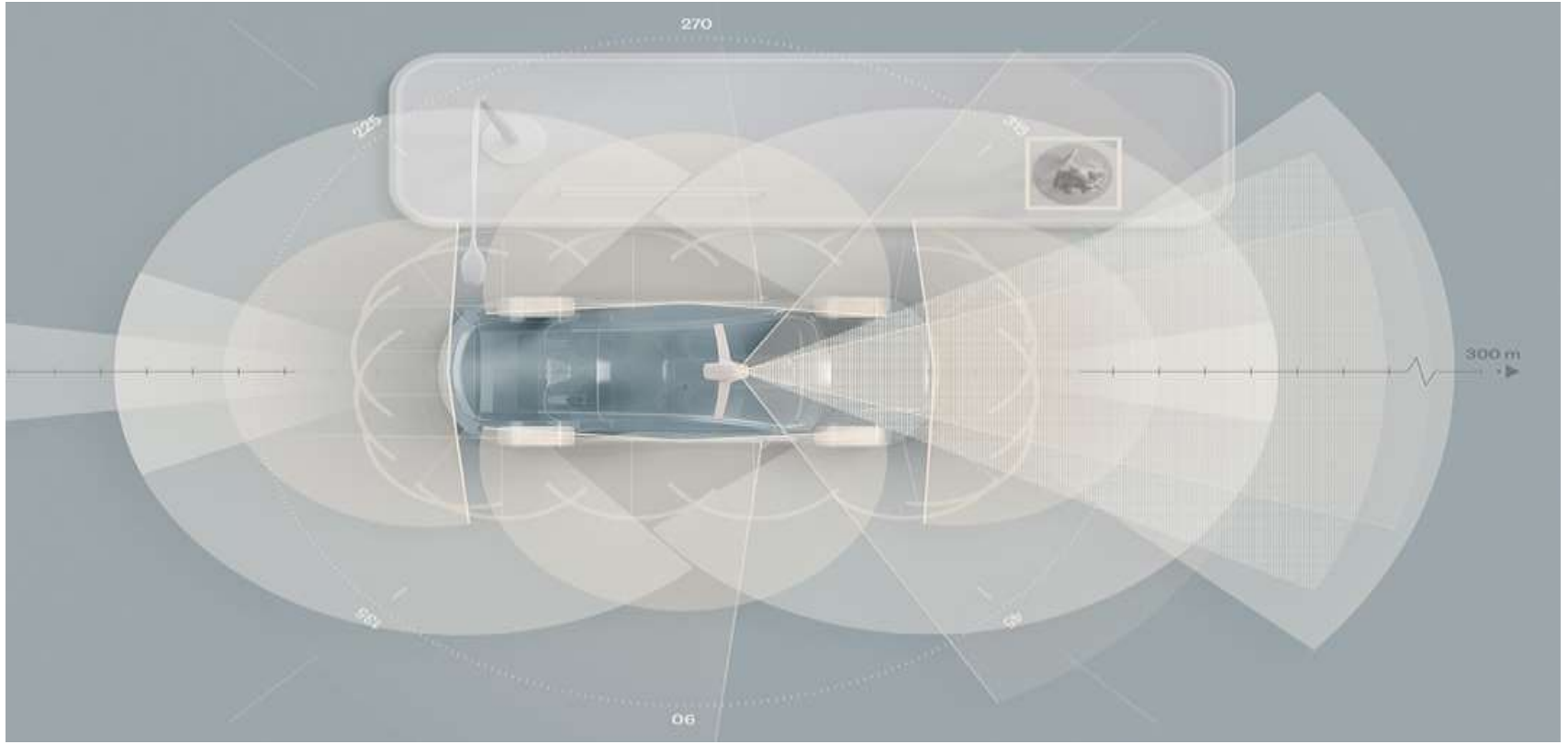
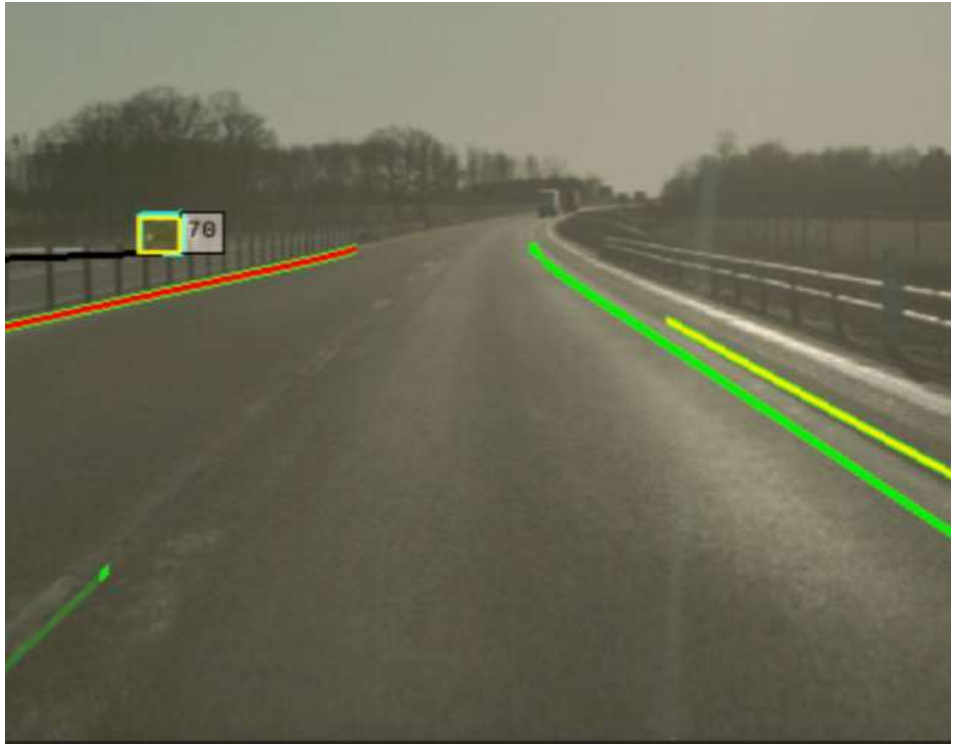
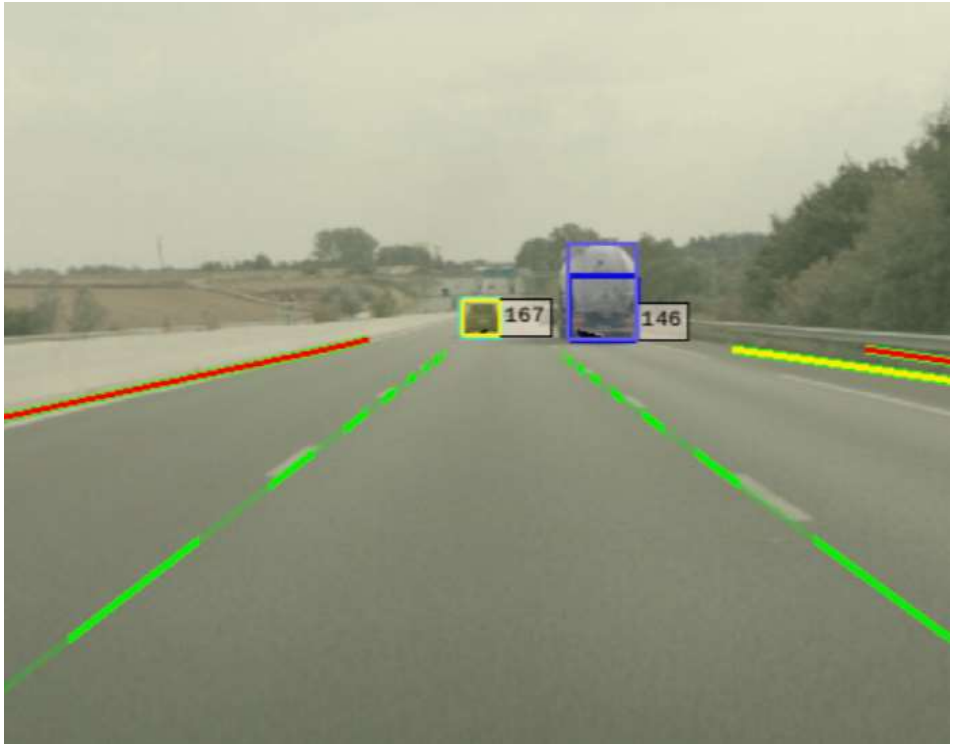
Seeing and interpreting the environment

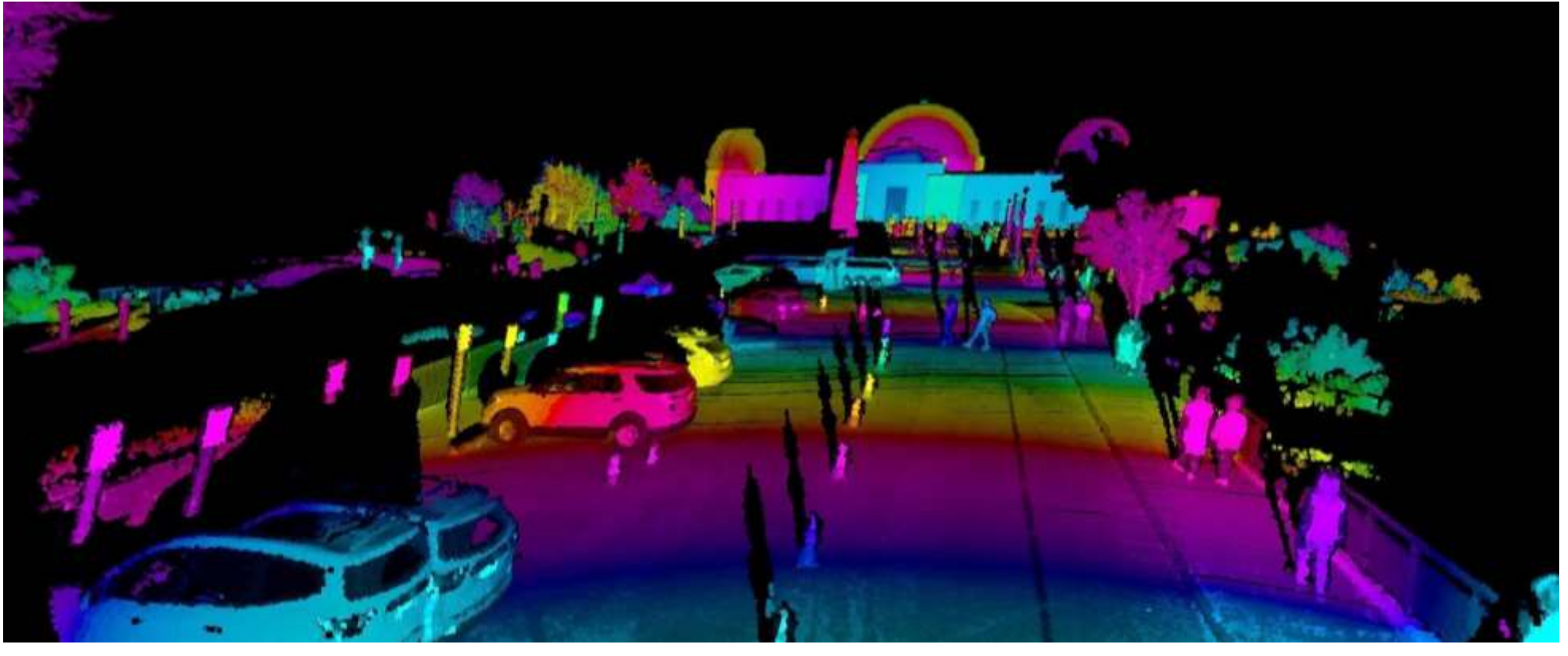


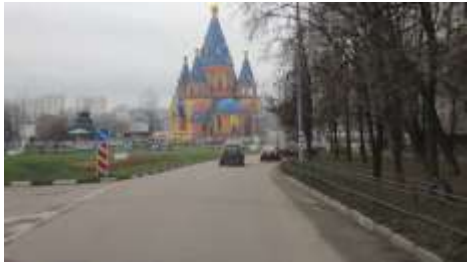
Vehicle’s perception of lane markers





Lidar





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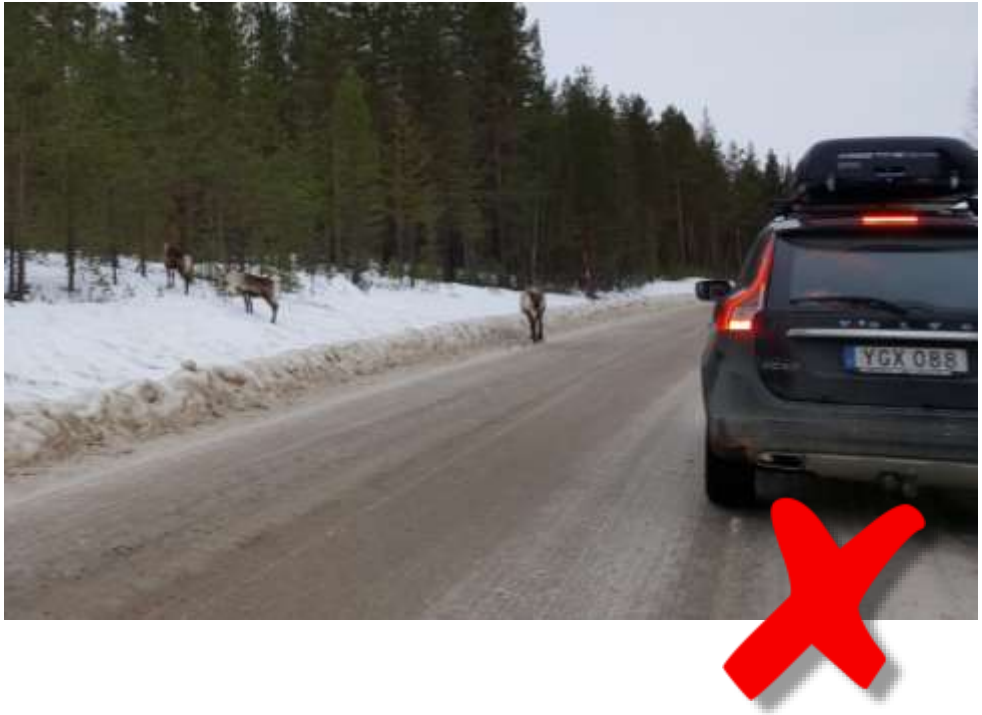
Clear lane markers important for good functionality

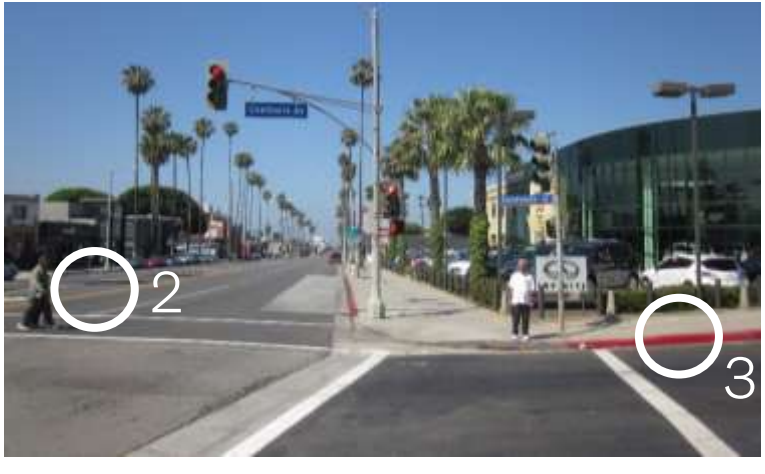


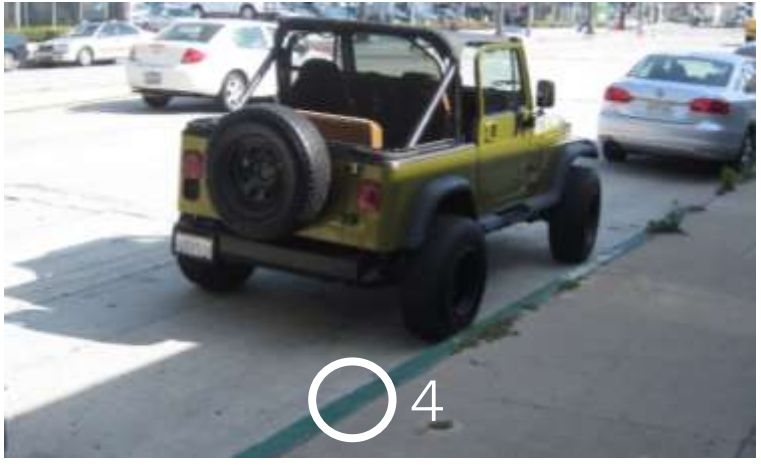
What makes it difficult

- Colours, contrast
- Contamination, dirt, water snow, leaves
- Wear
- Road works, temporary lane markers
- Complexitet, non- standardisation

- To have a good functional performance is good lane visibility and distinct road edges very important

Lane markers in none-white colors has less contrast.
Especially in bad lighting conditions, wear and dirt.
(many cameras are black-white for improved detection)

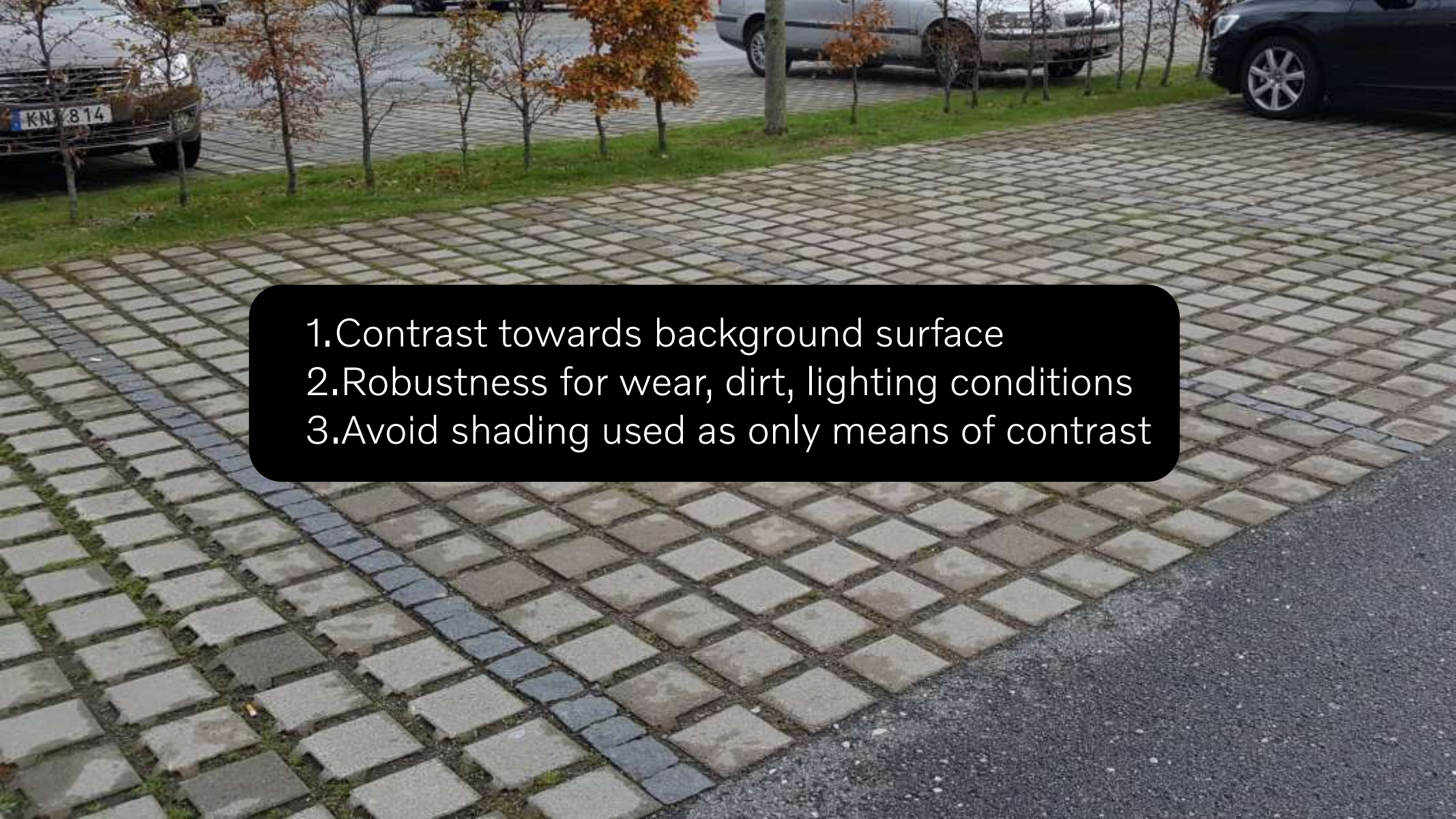




1
2
3
4

Surfaces of different material and color as instructions can be hard to interpret, clutter

Maintenance is on another budget and
maybe under time pressure


1.Contrast towards background surface
2.Robustness for wear, dirt, lighting conditions
3.Avoid shading used as only means of contrast

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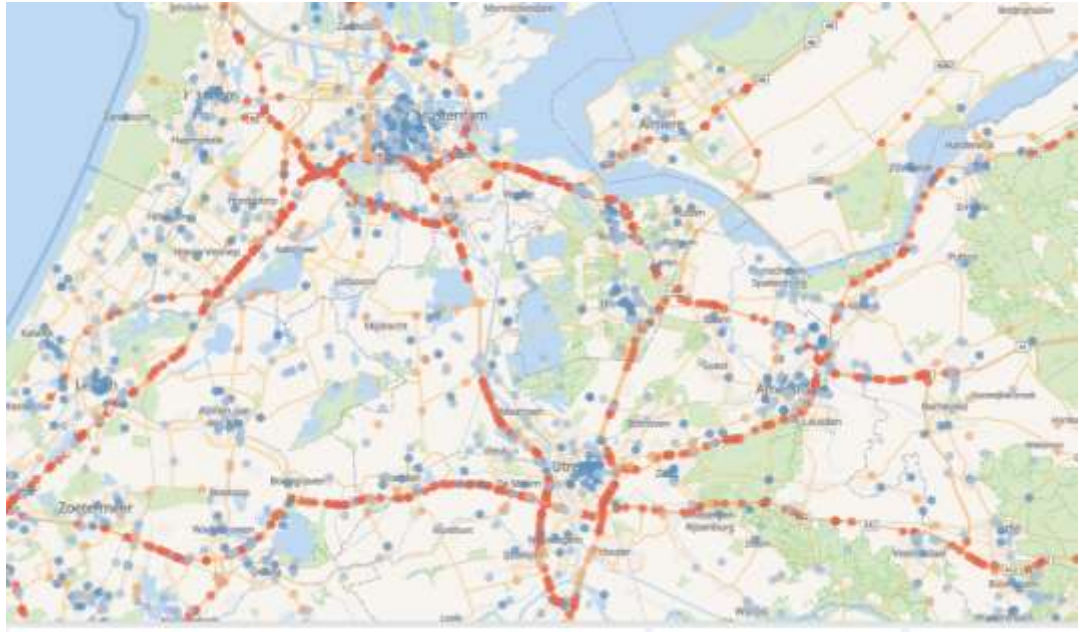
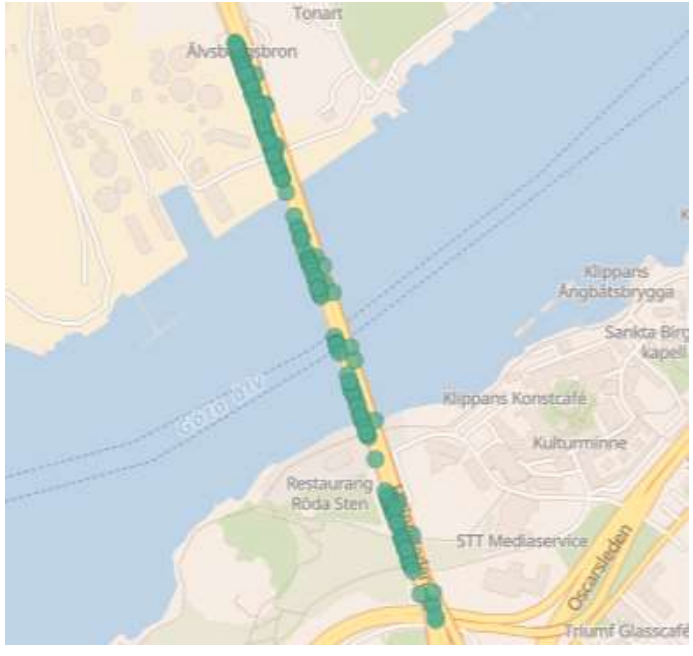
Fleet learning & customer feedback



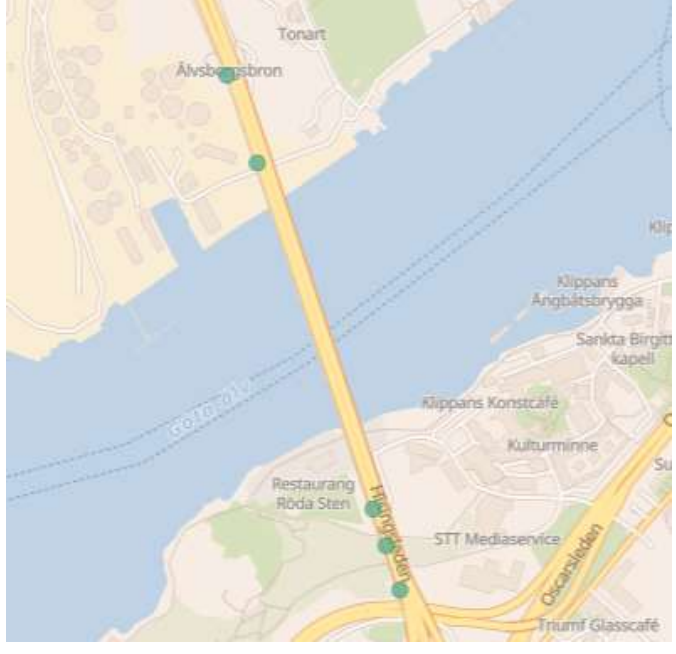
Fleet learning - Road work

Fleet learning - Road work

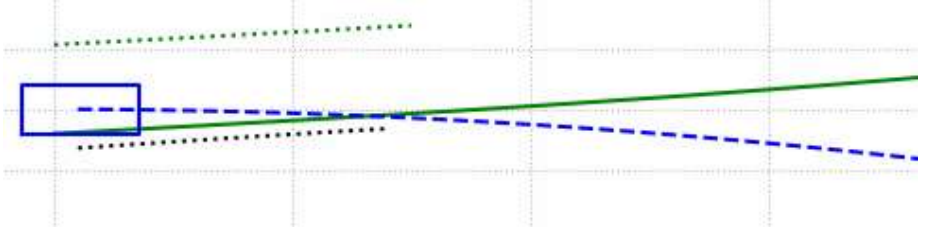
1 month with road work



1 month without road work



Fleet learning - Road work



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Fleet learning - Customer feedback

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Fleet learning - Different road designs

Conclusion: How to make roads safer

- Straight , clean, highly visible lane markers
- Standardisation
- Important to restore after road work or maintenance, especially the lane
- Future is here: the machines way of seeing things needs consideration

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