

Connected & Automated Vehicles

An Automotive Perspective

American Meteorological Society
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Cooperative ITS with 5.9GHz DSRC

DSRC enables expansion of safety horizon

On-Board Sensor
Collision Mitigation → Collision Avoidance → Risk Mitigation → Risk Avoidance

5.9GHz DSRC
Current On-Board Sensor

http://www.toyota.com/us/3279786_010

Integrated Safety

Toyota's Cooperative ITS (V2X) Activity

Cooperative ITS Products

Electronic Toll Collection
& ITS Safety Support Systems

http://www.toyota.com/us/3279786_010

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Toyota's Approach for Automated Driving

MOBILITY TEAMMATE CONCEPT

Automated Highway Driving Assist ITS World Congress (Detroit, 2014)

Driving Intelligence
Connected Intelligence
Interactive Intelligence

http://www.toyota.com/us/3279786_010

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Toyota's Approach for Automated Driving

Driver Assist
On-Board Sensors

Vehicle & Pedestrian Pre-Collision System
Dynamic Radar Cruise Control
Lane Departure Alert
Auto High-Beam

Toyota Safety Sense
Lexus Safety System +

http://www.toyota.com/us/3279786_010

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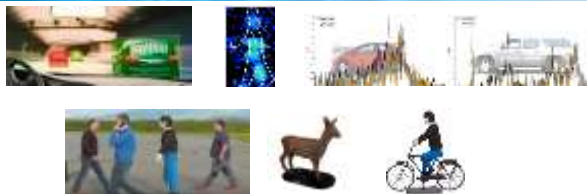
ADAS Performance Assessment

IIHS AEB: ADAC Target
NHTSA CIB/DBS: SSV
Future Target

http://www.toyota.com/us/3279786_010

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Target for ADAS Performance Confirmation



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Target Road for ADAS Performance Confirmation

Traditional Approaches

- Camera →
- Road Map →
- Test Drive →
- Experience →

New Opportunities

- ← V2X
- ← 3D Map
- ← Data
- ← Levels

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V2X as an Additional Sensor for Automated Driving Systems

Source: English
http://www.toyota-global.com/info/asia/infocenter/agent_topnavi_systems/infocenter/

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Automated Highway Driving Assist

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Automated Highway Driving Assist Driver Support

A: Left Merge Preview

B: Exit Only Lane Preview

C: Unsupported Scene Preview

D: End of Highway Preview

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Connected and Automated

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OUR GOALS ARE THE SAME. WE NEED EACH OTHER.

Vehicle Design

How should we set requirements for line marker detection?

It is in Part 3 of MUTCD (10 pages) guidelines

There are many faded lane markings. ("Is the road?")

It is maintained based on our standards ("make cars better")

It is important for us to work together

Road Design

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What Vehicles can "See"

(sample images found through Google search "sensor image on-board car")

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What Vehicles may not be able to "See" sometimes

It cannot see if it is not there

It may not see if it is hard to see

It may not see everything

It may see something even if it is not there

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Potential Areas for Collaborative Work

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Potential Areas for Collaborative Work

250cm

Signal Phase & Timing

New Signs?

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Potential Areas for Collaborative Work

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Summary

Vehicle Technology

- ADAS system availability and performance
- V2X and data/map will serve as additional sensors

Road-Vehicle Interaction

- Inter-industry dialogue is essential
- Working through industry associations may be most efficient



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