State-of-the-Art in Connected & Automated Vehicles

Northwestern University Transportation Center, The 60th Anniversary, Transportation Summit Technology & Innovation Session, November 14, 3:30 – 4:40 p.m.

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Toyota’s Goal & Approach

**Our Ultimate Goal**
Completely eliminate traffic casualties

**Our Approach**
Cooperation among vehicle-people-road to pursue “real-world safety”

**Connected & Automated**
Advanced sensing technologies are used as the means to improve transportation safety
Our Strategy

Toyota develops vehicles and technologies based on our “Integrated Safety Management Concept.”
Current ADAS Products

ADAS: Advanced Driving Assist System

- Adaptive Cruise Control (ACC)
- Pre-Collision System (PCS)
- Lane Departure Alert (LDA)
- Lane Keep Assist (LKA)
- Blind Spot Monitor (BSM)
- Rear Cross Traffic Alert (RCTA)
- Face Direction
- Adaptive Front Lighting (AFS)
- Night Vision & Pedestrian Detection
- Pedestrian PCS, Full-Speed ACC
Connected & Automated

Risk Avoidance
- Highly-Automated Driving
- ITS Road Systems
- Drive Plan

Risk Reduction
- DSRC (V2X)
- DRCC
- LTC
- HMI

AHDA
Automated Highway Driving Assist

Injury Mitigation
- Body Structure
- Occupant Restraint

Collision Mitigation
- PCS

Collision Avoidance
- PCS & LDA
Extending Sensor Horizon

Collision Avoidance

Radar, Laser, Vision

Risk Mitigation

5.9GHz DSRC

Risk Avoidance

Google Map

Cellular

R=300m

R=30km
Automated Highway Driving Assist

Safety Enhancement with Driving Automation Technology

- **DRCC**: Dynamic Radar Cruise Control
- **LTC**: Lane Trace Control

**Lateral and Longitudinal Control**

**Preview HMI**

**Driver Monitor HMI**

- **Eyes On Road**
- **Face Direction Detection**
- **Steering Touch Sensor**

**Two-Way Driver-Vehicle Interaction**
Connected Driving Assist

V2X enables the vehicle to see potential risk targets

V2X Communication
- Vehicle to Vehicle (V2V)
- Vehicle to Infrastructure (V2I)
- Vehicle to Pedestrian (V2P)
- Vehicle to ???
V2V & V2I Opportunities

**Universal Collision Advisory**
- One application to cover various vehicle-to-vehicle conflicts

- **Straight Cross Path**
- **After Merge**
- **Forward Collision**
- **Integrated HMI**

**Traffic Signal Violation Warning**

**Pedestrian Collision Advisory**

**Green Wave Advisory**

**Congestion Ahead Advisory**

**V2V**
- Vehicle to Vehicle

**V2I**
- Vehicle to Infrastructure
Thank You

Let’s Go Places
We’re going places we never have before.

TeenDrive365
Get the tools to help you talk with your teen about safe driving.

Safety Innovations
See what we’re doing to help make the future of driving safer for everyone.

Technology For Good
See how Toyota is helping to create a greener future.

Advanced Safety Features
Find out more about Toyota’s innovative safety features, available.