Standardization and research activities on cooperative systems in Japan

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Contents

- Background
- Feasibility tests
- Challenges
- Approach for international harmonization
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Framework for ITS cooperative systems realization

New IT Reform Strategy
The world’s safest road traffic environment

[Targets]
Reduce the number of traffic fatalities and serious injuries by deploying Cooperative Safe Driving Support Systems.

Contribution for deployment

J-Safety Committee, ITS Japan

Cooperation

ITS Promotion Council

Harmonization between Private-Public Sectors

Ministries and Agency, Organizations, Academia

Exchange Opinion

Proposal

Harmonization between Private-Public Sectors
80% of traffic accidents occur at intersections or locations with poor visibility. 70% of traffic accidents are caused by failure to recognize a hazard in time.

**[Types of traffic accidents]**
- Collisions with pedestrians: 9%
- Collisions with cross traffic at intersections: 26%
- Rear-end collisions: 32%
- Right-turn or left-turn collisions: 14%
- Other: 9%

**[Types of human error]**
- Errors in operation: 70%
- Errors in judgment: 30%
- Failure to recognize a hazard in time: 26%

Safe driving support systems utilize radio systems to effectively supply information on hazards that may not be visible to the driver.
Contents

- Background
- Feasibility tests
- Challenges
- Approach for international harmonization
Feasibility tests

- FY2008(-March, 2009)
  - Evaluation on propagation characteristics and packet delivery performance in some of V2V use cases
  - Feasibility evaluation on some of V2V use cases

- FY2009(-March, 2010; under testing and evaluation)
  - Evaluation on propagation characteristics and packet delivery performance in various environments
  - Evaluation on V2V and V2I integration
  - Evaluation on Inter-system interference

- FY2010
  - Further evaluation on other technical challenges
Feasibility test guideline for Safe Driving Support Systems in 700MHz Band “ITS FORUM RC-006”

- Radio frequency: 720MHz (Single channel)
- Type of transmission: Broadcast
- MAC: CSMA/CA
- Modulation: BPSK OFDM/QPSK OFDM/16QAM OFDM
- Number of subcarriers: 52
- Maximum transmission power: 10mW/MHz
- Occupied bandwidth: Less than 9MHz
MIC–MLIT joint tests (FY2008)

- **Purpose:**
  1. Finding out the feasibility of V2V application
  2. Evaluation and verification of transmission performance

- **Date:** in October and November, 2008

- **Place:**
  1. Test truck at JARI (Japan Automobile Research Institute)
  2. Public road at Odaiba (Tokyo bay area)

- **Content:**
  1. Transmission tests among 30 vehicles in simulated accident models
  2. Transmission tests between 2 vehicles on the public road based on accident-prevention scenario
Wide view of simulated intersection and street
Verified to meet the requirement:

PDR > 95% at 79.7m from the center of the corner
N to N Heavy air traffic tests

Congestion in radio channel was emulated using 30 vehicles.

At the blind corner

- PDR>95% while the RX vehicle in 5m evaluation range, on the condition up to 101 Interfering vehicles and 50 hidden nodes
- PDR>95% while the RX vehicle in 10m evaluation range, on the condition up to 203 Interfering vehicles and 67 hidden nodes
Right turn scenario on public road

Verified to meet the requirement:

PDR > 95% at 113.2m from the center of the intersection
Contents

- Background
- Feasibility tests
- Challenges
- Approach for international harmonization
Technical Challenges

- Integration of V2V and V2I communications in a 10MHz channel
- Inter-system interference
- Shadowing and Hidden node problem
- Accuracy of position information
- Information security
- Standardization and International harmonization
Next Steps/Actions

- Under studies in ITS Radio System Committee, Telecommunications Council
  - V2V and V2I integration
  - Inter-system interference
- Studies to be done
  - Shadowing and Hidden node problem
  - Accuracy of position information
  - Information security
- Standardization in ARIB and international harmonization
Contents

- Background
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- Challenges
- Approach for international harmonization
Standardization in Japan

- Feasibility test guideline; RC-006 has been developed in ITS Info-Communications Forum.

- ARIB standard development will be started soon, based on RC-006 and feedback from feasibility tests.

- Activities toward international harmonization should be started now!

- Letter of Intent between ETSI and ARIB for cooperation in the area of ITS, will be a trigger for harmonization.
Proposal for international harmonization

- For future harmonized standards, it will be beneficial to share the information on ITS cooperative systems, obtained in each region.

- In ITU-R, development of a new technical report has been proposed; “a report on advanced ITS radiocommunications”.

- The initial working document is based on contribution from Japan, and open for further input from other members.

- Call for contributions!
Feasibility tests on ITS cooperative systems have been actively conducted in Japan.

ARIB standard development will be started soon, based on test guideline; RC-006 and feedback from the feasibility tests.

Activities toward international harmonization should be started.

As a harmonization activity, cooperation in development of a report on “advanced ITS radiocommunications” has been proposed.