Next-Generation Intelligent Transport Systems (ITS) utilizing ICT

November 17, 2014
Ken Nakaoka
Panasonic Corporation
1. MIC* Research Activities for Next-Generation ITS

2. Development of V2V and V2I Communication Technology for Automated-Driving Systems (Theme 1)

3. ITS-Connect Promotion Consortium in Japan

*MIC: Ministry of Internal Affairs and Communications in Japan
Next-Generation ITS utilizing ICT

• MIC plans to realize an advanced Safety Driving Support system.
• The system can prevent traffic accidents on the basis of information transmitted by V2X (V2V, V2I, and V2P) communications, as well as information collected by Infrastructure Radars.
• The feasibility of systems are going to be demonstrated on public roads.

**Theme 1**
- **Vehicle-to-Infrastructure (V2I) [700 MHz]**
  Information around an intersection is transmitted from a road side equipment (RSE) to vehicles.

**Theme 2**
- **Vehicle-to-Pedestrian (V2P) [700 MHz / cell-phone]**
  Information of a pedestrian and a vehicle are transmitted between pedestrians and vehicles.

**Theme 3**
- **Infrastructure Radar System [79 GHz]**
  Small objects such as pedestrians and bicycles around an intersection are detected and collected by infrastructure radar.
Towards Automated-Driving System using Communication Technology

• V2V / V2I communications contribute the realization of the Cooperative Driving Support system
• Enhanced and sophisticated driving support system are required for Automated-Driving system

Vehicle-to-Infrastructure (V2I) Communication [700 MHz]
- Safe and smooth Intersection passing assistance
- Safety driving support at intersection

Vehicle-to-Vehicle (V2V) Communication [700 MHz]
- Blind intersection collision avoidance

Enhanced and Sophisticated
- Cooperative Automated-driving
- Commercial Vehicle Automatic Driving

Source: ITS WC home page
**Theme 1: Vehicle-to-Vehicle / Infrastructure Communication (V2I, V2V)**

**MIC Theme 1**

Development of Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) communication Technology for Automated-Driving System

**Sub-Theme (a)** Research on Communication Technology

**Sub-Theme (b)** Research on Cooperative Driving Support Service

**Sub-Theme (c)** Research on Penetration Promotion of Driving Support System

**Sub-Theme (d)** Research on Reliable and Low-Delay Network Technology for Automated-Driving System
Sub-Theme (a) - Research on Communication technology

**Objective**

Verify the V2V and V2I communication performance and scalability under the condition that a large number of vehicles exist in the high density.

Increase a number of vehicles and measure the packet delivery ratio and transmit delay.

Higher data communication traffic when vehicles equipped with OBE devices increase.

The communication Reliability and Latency under the congested traffic.

The diagram illustrates the intersection movement assist, left turn assist, and right turn assist with corresponding timing for V2V and V2I messages.
Objective

Examine how to provide drivers with driving support service under the condition that V2V and V2I communications co-exist or plural V2V and V2I services occurs.

Case: Same Driving support services are provided by way of both V2V and V2I.

Case: Ambulance information are provided by way of both V2V and V2I.

Case: Driving support service and ambulance information are provided simultaneously.
**Objective**

Examine the effectiveness of V2V communication system when deployed in public vehicles (ambulance, fire truck, tramcar, etc.) for future penetration of V2V system

**Assistance for emergency vehicle traveling**

- Provision of information at the corner
- Provision of information in right turn
- Provision of information in overtaking

- Reduce the arrival time of ambulance by means of dissemination of V2V information

**Collision prevention between tramcar and vehicle**

Field Operational Test Area

- Nagoya
- Yokosuka
- Kobe
- Hiroshima
Roadmap of Research Theme 1

2014

Research of element technologies of V2V and V2I communication
- Verification of communication performance
- Assessment of serviceability of V2V and V2I applications in a controlled environment
- Collecting basic data to analyze the applicability of ambulance traveling assistant

2015

Development of advanced V2V and V2I technology to contribute to the realization of Automated-Driving System
- Large-scaled field operational test with regular drivers in real-world conditions
- Deployment of the system to tramcar, road work vehicle, and other public transportation

2016

2017

Development for further sophisticated Automated-Driving System and penetration promotion of the system for market expansion

2018
Objective

• Promote R&D and FOT activities of Cooperative Driving Support System utilizing ITS towards the practical use and penetration of the system.
• Planning of system operation, management of specification documents, supporting interoperability test, public-relations and promotion of the system.

ITS-Connect Promotion Consortium

Organization of ITS-Connect Promotion Consortium

- General Assembly Meeting
- Board Member Meeting
- Steering Committee
- Security Committee
- Technical Examination WG
- Interoperability WG
- Promotion WG

- Established on Oct. 28, 2014
- 9 board members
- 2 regular members

[Image: Diagram showing V2V, V2I, and information exchange between vehicles]
Thank you for your attention!