

Connected Car Initiatives

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1. Overview

Intelligent Transport Systems (ITS) are progressing to a new level as Big Data is being used more practically, and with advancements in communication networks and artificial intelligence (AI). This represents the arrival of a connected-car society, creating new value and business opportunities by connecting vehicles to communication networks. Moving vehicles are becoming sensors, and the information they obtain is collected through various wireless communications networks, and this promises to advance the IoT further and to realize Mobility as a Service (MaaS). Since FY2013, the ITS Info-communications Forum (ITS Forum) has been conducting a comprehensive study of communication technologies related to automated driving, and since FY2015, it has been collaborating with the Japan Automobile Manufacturers Association (JAMA) in a study of communication technologies. This article introduces the current state of ITS Forum activities to realize communication for automated driving in the connected car society, including an example of a study by Oki Electric Industry Co. Ltd. (OKI).

2. Realizing a Connected Car Society

Currently in Japan, various independent ITS services are being provided using telecommunications, such as congestion and other traffic information through VICS, automatic fee collection services through ETC, safe driving support services through ETC 2.0 and ITS Connect, and vehicle management and information services from automobile manufacturers utilizing mobile telephones. In December 2016, the Ministry of Internal Affairs and Communications (MIC) established the “Study Group Focusing on the Realization of Connected Car Society,” which published a report in August 2017. With advancements in mobile networks, such as fifth generation mobile communication systems (5G) and DSRC, as well as developments in AI, connected cars are expected to become more common. This article reports on a study of policies and initiatives toward realizing a connected car society, such as (1) new services and businesses created utilizing data, (2) the nature of wireless communication networks to support a connected car society, and (3) construction of a safe and convenient platform for it. It includes a consolidation of communication requirements for realizing the connected car society, and an examination of the strict requirements on communication in the area of safety, in particular for communication supporting automated driving.

3. Connected Car Initiatives

An important technology for realizing connected cars is Vehicle to Everything (V2X) communication. In the area of safety, as for automated driving, requirements include strong real-time performance and high quality communication. We introduce activity studying V2X, mainly for automated driving.

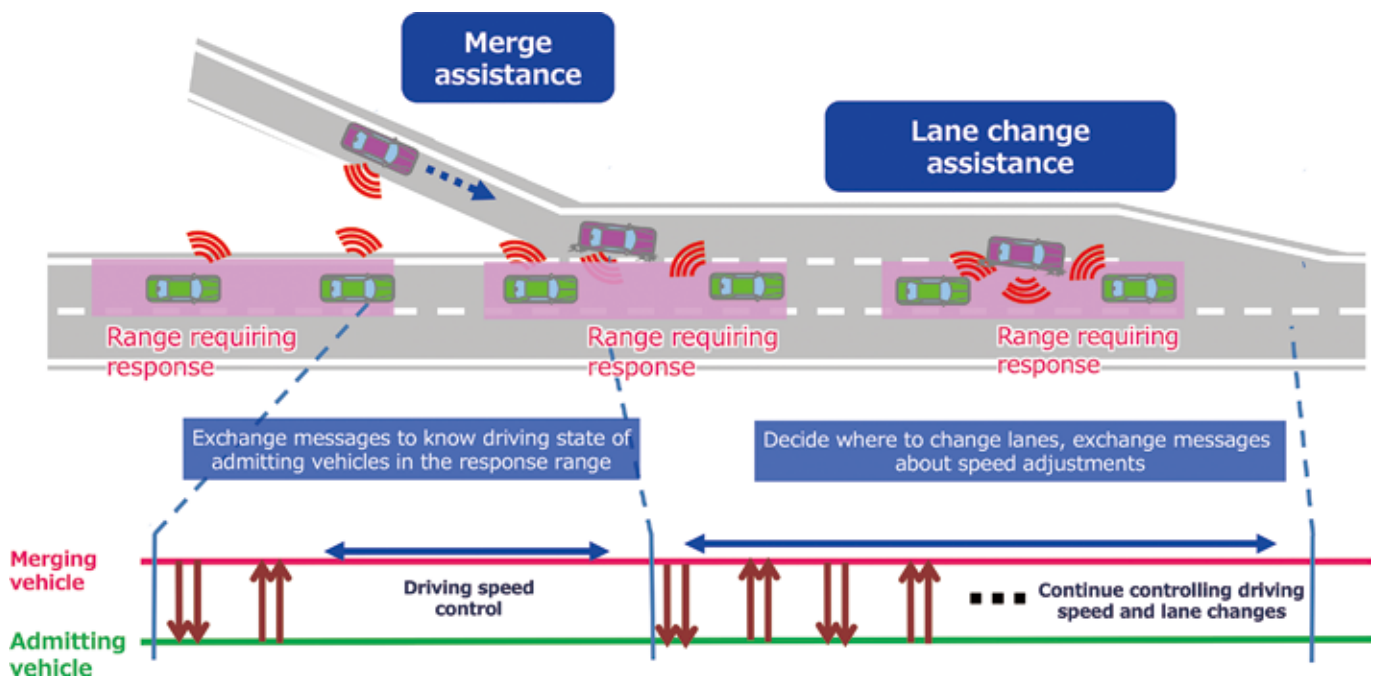
3.1 Study of Communication Supporting Automated Driving

Realizing automated driving is a Strategic Innovation Promotion Program (SIP) theme being promoted by the Cabinet Office in Japan, and starting in FY2017, MIC has been conducting a “Survey and Study on Message Set and Protocol for Automated Driving Assistance Communication.” With communication use cases from the JAMA study as communication requirements, the objective and result was an analysis of conditions that will satisfy performance requirements, through study of the message set and protocol, based on ITS communication in Japan, including application and upper communication layers. The ITS forum is promoting this study and the sharing of information, while also contributing results from practical technical studies.

The figure shows an example of studying communication to assist merging onto a freeway. Results of the study confirmed the need to link applications with aspects of communication control, such as the timing of transmissions and how many transmissions are needed. Communication control parameters for each use case are selected, including this result, and compiled into a draft communication specification. By applying these results to use cases from the communication draft specification in the future, improvements in stability of vehicle behavior, traffic flow, and other factors will be verified, both theoretically and in practical tests, toward creation of a draft specification for communication supporting automated driving, the highest priority study item for connected cars.

In FY2017, OKI also received and performed a contract from the MIC, to conduct the “Study of highly accurate positioning systems for automated driving,” which is a SIP theme for implementing automated driving systems. They have studied technologies that complement satellite positioning, which suffers degraded accuracy at intersections among high-rise buildings, and advanced R&D to implement highly accurate pedestrian positioning for automated driving on public roads.

■ Figure: Example study of communication to assist merging on a freeway



They conducted studies of conditions for infrastructure devices satisfying a target measurement accuracy of 10 cm in ideal traffic conditions, and to achieve the target performance under real environments with multipath effects, assuming that Wi-Fi and smartphone applications for positioning foreseeable in 2020 and beyond would be used for implementation. Accurate positioning in vehicles using V2X technology is expected to play an important role in advancing various types of services in connected cars.

3.2 Trends outside of Japan —5GAA—

The 5G Automotive Association (5GAA) was initiated in September 2016, mainly by major German automakers, to link together the automotive and ICT industries (chiefly telecom) and promote implementation of future ITS services based on the 5G specification, creating new business opportunities. As of October 2018, it had 102 corporate members. OKI has been a member

since October 2017, and is currently studying the potential for cellular V2X, while analyzing the latest discussion related to 5G with automated driving and connected cars around the world.

4. Future prospects

In the MIC roadmap for realizing a connected car society, promoting cooperation among SIP automated driving systems and ITU standardization activities are stipulated as the core of the connected-car society realization project. This project was based on initiatives for automated driving technology in the “Public and private ITS concept/roadmap 2018.”

We anticipate enabling more-advanced automated driving and great changes in daily life through study of radio communication network technologies, toward realizing the safest, most secure, and comfortable connected car society in the world.