Automated Driving for Universal Services

Freedom of Mobility and Safety through Automated Driving Systems and Advanced Infrastructure

The Automated Driving System is a technology that makes use of real-time information from vehicles, people, and roads. The ultimate goal of this program is to eliminate traffic fatalities. In the near future, developments in safety technologies and local traffic management systems will guarantee for the first time that every person across the world can enjoy freedom of mobility and safety. Reducing traffic accidents is a common concern around the world. The Automated Driving System program seeks to lead the world in developing a next-generation transportation system as social infrastructure for tomorrow.

Program Director

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Fellow

* The affiliation and title of PD shall be as of the end of the 1st period (the end of FY2018).

Profile

Mr. KUZUMAKI received a master's degree in aeronautical engineering from Kyoto University in 1985. The same year, he joined Toyota Motor Corporation in the Body Design Department. In 2003, he began working in technology planning and technical development as the vehicle safety function supervisor in the Vehicle Technology Development Department at Toyota. He has served in his present post since 2017. Following his appointment as Sub-PD for the SIP Automated Driving System program for two years from 2014, he was appointed PD in 2016

Research and Development Topics

1. Develop/validate automated driving systems

- Research into commercialization and conduct field operational tests for the rapid deployment of automated driving systems
  - ✓Improve digital map information
  - ✓Develop technology to generate predictive informationusing ITS
  - ✓Develop technology to improve sensing capabilities
  - ✓Develop HMI technology for drivers and automated driving systems
  - ✓Develop technology to system security

2. Advance basic technologies to reduce traffic accidents and congestion

- Develop technologies for estimating the impact on reducing traffic fatalities; create a common national database
- Develop micro/macro data analysis and simulation technologies
- Visualize CO_2 emissions from regional traffic

3. Promote international cooperation

- Prepare an internationally open R&D environment; promote international standardization
- Identify six key areas*1 for international cooperation and engage in strategic coordination
- Promote public acceptance of automated driving

4. Deploy next-generation transportation

- Improve regional traffic management
- Develop a next-generation transportation system, improve and promote accessibility

5. Conduct large-scale FOT's

- Identify five key issues*2 for accelerating practical application of automated driving systems and conduct large-scale field operational tests
- Integrate R&D measures and uncover institutional and other issues

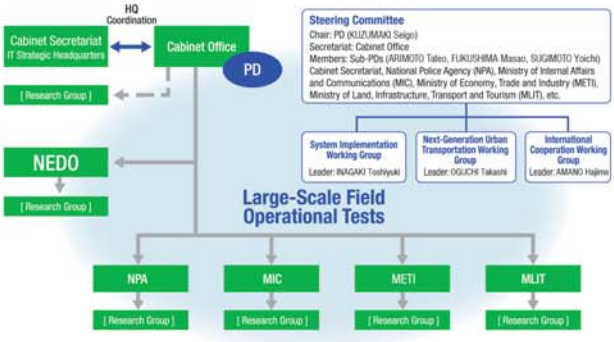
6. Other

- Strengthen industry-academia partnerships, and coordinate with other SIP programs
- Exercise leadership related to Society 5.0 initiatives

*1 Six areas of high interest in international discussions:Dynamic Maps, Connected Vehicles, Human Factors, Security, Impact Assessment, Next-generation Transport

*2 Key issues addressed by the SIP Automated Driving System program: Dynamic Maps, HMI, Information Security, Pedestrian Accident Reduction, Next-generation Urban Transportation

Implementation Structure



The program leverages the government's existing framework for promoting Intelligent Transport Systems (ITS), taking direct charge of research fields under the jurisdiction of various ministries and agencies. In this manner, the government aims to accelerate the promotion of policies and spend budgets efficiently.

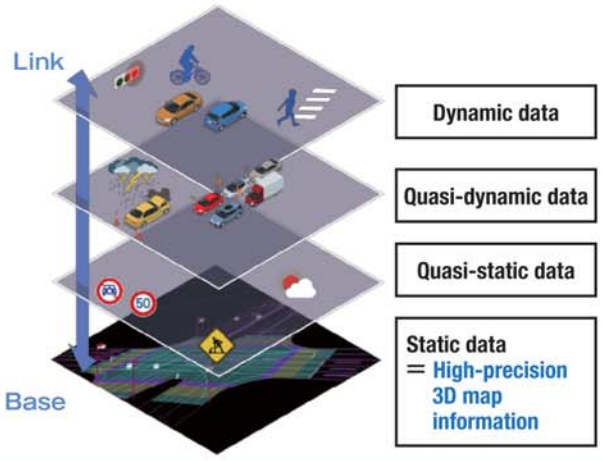
* It shows the structure and organization at the end of the 1st period (the end of FY2018).

①Dynamic map, human machine interface (HMI), and cybersecurity

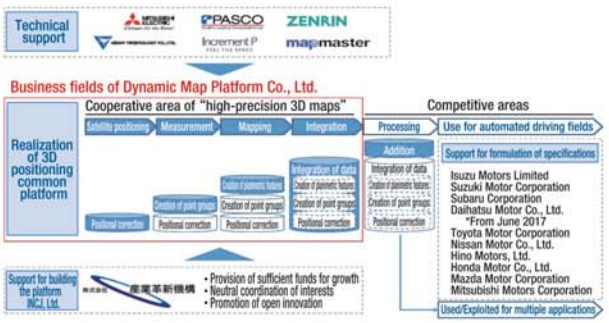
Commencement of the commercial distribution of high-precision 3D maps, which are necessary for automated driving, of approximately 30,000 km of expressways and their reflection on industrial guidelines for the spread of automated driving systems.

For the advancement of automated driving, it is necessary to link traffic environmental data on high-precision 3D maps. Therefore, cross-industrial unified specifications for dynamic maps, including high-precision 3D map information, were developed and their effectiveness was validated through FOTs.
Electric appliance, map, survey, and automobile companies established the Dynamic Map Platform Co., Ltd. (DMP) through a joint investment and developed and commenced the commercial distribution of high-precision 3D maps for expressways (March 2019).
Reflecting on the fact that Level 3 automated driving became technologically possible with the development of high-precision 3D maps, the bill to revise the Road Traffic Act and the Road Vehicle Act were enacted (May 2019).
Internationally harmonized commercialization efforts have been promoted, including the promotion of standardization processes based on Japan's proposal approved by ISO/TC204/WG3 and exchanges with organizations promoting cross-industrial standardization on automated driving (e.g., DADF).
Concerning HMI, R&D has been conducted on technological tasks to achieve Level 3 automated driving, including the clarification of methods of indicating information when drivers take over from automated driving and guidelines on the preparedness of drivers; the obtained results were reflected on the "Considerations on automated vehicles HMI " industrial guidelines (Japan Automobile Manufacturers Association, Inc.). In addition, a proposal from Japan for international standardization was made (ISO/TC22/SC39/WG8) in cooperation with the Society of Automotive Engineers of Japan, Inc. and the Japan Automobile Manufacturers Association, Inc.
Concerning cybersecurity, a method of vehicle security defense evaluation (penetration test) from the viewpoint of an attacker was developed, and the results, including know-how that is not usually disclosed to the development side, were reflected in the industrial guidelines (in cooperation with the Japan Automotive Software Platform and Architecture (JASPAR)).

•Dynamic map
Specification development and provision of high-precision 3D map information



•Foundation of Dynamic Map Platform Co., Ltd.



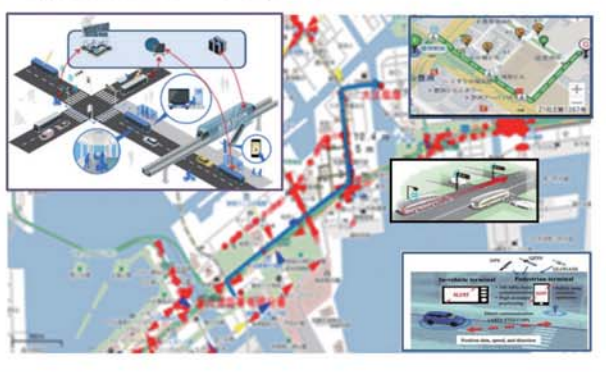
Data source: Dynamic Map Platform Co., Ltd.

②Next-generation transport /reduction of pedestrian accidents

Technological validation through large-scale FOTs for next-generation transport in anticipation of 2020 Tokyo Olympic/Paralympic Games and the future.

Technological developments concerning precise docking control at bus stops (precision: 4 cm ± 2 cm) to make it easier for wheelchair users to get on and off buses and a smooth acceleration/deceleration control of next-generation transport system ART*1 vehicle control functions.
Furthermore, traffic information distribution services for ART users were achieved with the on-time operation of advanced PTPS*2 and ART information center functions.
To validate the effectiveness of automated driving and other systems, a database that classifies accidents into more than 200 patterns based on road shapes and accident types using ITARDA*3 macro data was constructed and made public.
The effectiveness of pedestrian-vehicle alert systems using pedestrian-vehicle communication technology was confirmed through FOTs.

•Large-scale demonstration experiment



*1 Advanced rapid transit *2 Public transportation priority systems *3 Institute for Traffic Accident Research and Data Analysis