Efforts of the Road Traffic Department for Road and Traffic Innovations

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Keywords: road traffic, ETC 2.0, traffic safety, vehicle operation management, autonomous driving, removal of utility poles

1. Introduction

Roads constructed across Japan have greatly contributed to the improvement and enrichment in the quality of life as infrastructure. Meanwhile, roads must continue to respond to rapidly progressing technological innovation, reconsiderations of the relationship between people and cars, and social needs for the pursuit of new cooperation / collaboration through road space. In such circumstances, the Road Subcommittee of the Social Infrastructure Improvement Council prepared a proposal titled "Road / Transportation Innovation" in August 2017 as a future vision of road policy, including the following three directions: "Road, transportation, and innovation --- Innovate social infrastructure beginning with roads", "Best mix of people and cars --- Realize advanced road transport," and "Make roads more open --- Pursue various forms of cooperation and collaboration".

This paper introduces part of the activities of the Road Traffic Department, NILIM, in relation to specific proposals for road policy based on the new directions of the above-mentioned proposal.

2. Ensuring smooth mobility

--- Strengthening transportation management with full utilization of ICT, etc. ---

(1) Road traffic management using big data

ETC 2.0 can collect travel and behavior histories of automobiles accumulated in ETC 2.0 on-vehicle units through the roadside units installed by the road administrator. ETC 2.0 on-vehicle units are widely installed, totaling about 3.12 million as of the end of September 2018, and it is possible to utilize these probe data as big data. Probe data on the speed, position, etc. of automobiles equipped with ETC 2.0 can be obtained in time and space sequence regardless of the type of road, etc.

NILIM is conducting R&D activities for traffic management by grasping the situation of road traffic in real-time using ETC 2.0, road monitoring cameras, etc. For example, traffic safety measures including speed control and through-traffic access control measures are implemented by identifying dangerous spots, such as where abrupt slowdowns occur, with utilization of analysis results of ETC 2.0 data, etc. Further, in order to utilize ETC 2.0 data as well to analyze the effect of measures, R&D for upgrading the analytical method, etc. and technical support for road administrators are conducted.

(2) Next-generation cooperative ITS

Autonomous vehicle technologies that supports safe driving, such as an automatic braking system, which is one of many automatic driving technologies, have been developed as cooperative / collaborative efforts of automobile manufacturers, IT companies, etc. and have already been installed in commercial cars.

Since information on roads, such as the traffic situation of the trunk road at the junction with an expressway or regulated traffic areas on the road ahead, is also needed for the realization of fully autonomous driving (as information only from autonomous vehicle technology is insufficient), collaborative activities for the next-generation cooperative ITS are going on between government and industry.

In fiscal 2017, the NILIM started government-industry joint research into services for providing information at expressway junctions on traffic accidents and other matters on the road ahead, and conducting technical studies to achieve the government target of realizing autonomous driving on expressways by 2020.

(3) Making ETC 2.0 probe data open

In order to promote open innovation with big data utilization, it is necessary to establish an appropriate mechanism for making data open, including secondary use, considering the viewpoint of personal information protection. With the aim to promote the utilization of ETC 2.0 data, NILIM has been conducting joint research since October 2018 in cooperation with industry in order to open access to ETC2.0 data collected by the government.

3. Promotion of strategic flow of people and goods

(1) Upgrading of road management with on-vehicle sensing technology

For the purpose of upgrading and reducing the labor of road management, Ministry of Land,Infrastructure, Transport and Tourism(MLIT) has been studying the utilization of sensing technology, including camera image analysis and laser measurement, which has progressed remarkably in recent years. In 2017, NILIM sought practical applications of on-vehicle sensing technology from the public. As a result, 9 teams from survey and map companies joined an experiment to compare and verify the accuracy, cost, etc. of the prepared map data. We continue to prepare technical data concerning the performance of sensing technology required for road management and to study ways to upgrade the examination of specially

permitted commercial vehicles.
(2) Vehicle operation control support services for logistics business operators
MLIT is promoting the introduction of a service that enables logistics and other business operators to use ETC 2.0 for operation management through real-time acquisition of information on the position of their trucks, use of brake, etc., and, thereby, improve the efficiency of operation management, such as by reducing the time for waiting for cargo, and ensure the safety of drivers.
Aiming to realize this vehicle operation support service, NILIM conducted a social experiment from 2015 to 2017 in cooperation with logistics and other business operators for the purpose of analyzing and evaluating the effectiveness, feasibility, and social effect of the service and developing measures. Since this service went into full-scale operation in October 2018, NILIM has been working to improve the convenience of this service by analyzing operation results, etc.
(3) Autonomous driving demonstration experiment based on Michi-no-Eki (roadside rest area), etc.
MLIT has been conducting a demonstration test of an autonomous driving service based on Michi-no-Eki and other sites, with the aim of social implementation by 2020. The purpose here is to promote the flow of people and logistics in the interest of rural area revitalization by utilizing autonomous driving vehicles in hilly and mountainous areas, where the population is aging.
In fiscal 2017, a demonstration test was conducted in 13 areas across the country for a period of about one week. The Regional Development Bureau formed a regional council of experts, local governments, vehicle providers, etc. and NILIM provided technical support. As a result, many issues that weigh on the realization of an autonomous driving service were found, including defect events that arise under various road structures or traffic environments. Since fiscal 2018, we have been conducting a more practical long-term demonstration test of one to two months, in order to develop standards for road space adapted to autonomous driving and establish operation management systems and business models according to the circumstances of area.

4. For disaster resilient roads of high safety and reliability

(1) Promotion of no utility poles
MLIT has been systematically working to remove utility poles from the viewpoints of improving the disaster prevention capacity of roads, securing safe and comfortable traveling space, beautifying landscapes, and promoting tourism. However, progress is far behind major European and American cities and one of the factors for the delay is the high cost. MLIT also intends to promote the removal of utility poles because many poles were damaged and fallen by strong winds caused by typhoons last year. NILIM is studying technical issues for introducing a method of implementing the no utility pole project at low cost and smooth consensus-building with relevant organizations, etc.
(2) Strengthening heavy snow countermeasures
In recent years, heavy snow has stranded vehicles on a large scale and suspended traffic for long periods of time. Moreover, traffic hazards due to heavy snow often occurred in areas other than snowy areas. Given the circumstances, NILIM has been studying measures to solve issues, including road structures unlikely to cause traffic standstills such as wide shoulders required from a viewpoint of winter road management and uphill lanes, by grasping characteristics through analysis of data on cars in stuck and on-site hearings and organizing causes, issues, etc.

5. Conclusion

This paper introduced some of the activities for road and traffic innovation, but the relationships between people, cars, society, and road technology are changing at an unexpected speed, as evidenced by the advent of a super-aging society, changes in fuel and type of ownership, micro mobility, and autonomous driving technologies. In response to such changes, NILIM intends to work for the realization of safe and smooth road traffic quickly and flexibly based on a medium to long-term viewpoint.