Introducing ISA to Japan: State of Research, Possibility of Acceptance and Implementation Process

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Japanese research on ITS is not realistic and does not appear promising for accident suppression in the near future. However, one kind of speed limiting system for heavy trucks on highways has already been implemented. A similar kind of speed limiting system for all cars would be a promising method to suppress accidents. Ordinary people's attitudes regarding ISA (Intelligent Speed Adaptation) play an important role in implementing the system in society. Many are in favor of the system while a small number oppose it strongly. The mass media could play an important part in the introduction of ISA. If the trend of public opinion was positive, ISA legislation would be easily accepted. The Swedish Government is developing research on ISA, and we should learn from that.

Keywords: *ITS, ISA (Intelligent Speed Adaptation), Speed, Speed Limiter, Traffic Accident*

1. ISA in Japan

ISA (Intelligent Speed Adaptation) can be regarded as one kind of ITS (Intelligent Transport System). Details of ITS research development in Japan are not mentioned in this paper; suffice to say that ITS has not been viewed as a realistic measure to suppress accidents. Although safety constitutes a part of the purpose of ITS development, ITS is rather an ideal model of a comfortable and efficient transportation system, and does not seem capable of dealing with the realities of accidents. The possibility of hands-free automatic driving is limited to some portions of highways and special roads, considering the cost of preparing the necessary infrastructure. Development of risk monitoring, collision avoidance assistance systems have been under way, some of which are almost completed technically.

On the other hand, the development of ASV (Advanced Safety Vehicles) focusing on individual vehicles has also been promoted, and automakers have manufactured model cars equipped with various safety systems. However, it will take quite a long time for these vehicles to be made available for many ordinary users, partly because such safety systems are costly. They may also require the development of a wide range of infrastructure. Moreover, the possibility in some of these safety systems of inducing even more dangerous driving has been pointed out [21]. This problem should be solved by conducting field studies. From these points, the results of ITS and other safety vehicle systems research in Japan indicate that these systems, though valuable as future ideal models, have little possibility of realization in the near future. We therefore cannot expect the safety systems included in ISA to have a great effect in suppressing accidents.

We need to discover an ITS which is realistic and effective as a measure to suppress accidents. To this end, a noticeable factor is speed in the accident. The major causes of accidents are errors in perception, judgment, and driving operation. The speed factor is relevant to the occurrence of such errors and is also the determinant factor of the degree of an accident. To put it simply, high-speed driving induces a lack of time required for proper perception, judgment, and operation by the driver, and the degree of the damage is proportional to the square of the speed. This writer thinks that an ITS which controls this speed factor, or ISA, is realistic and useful as a measure to suppress accidents.

At present, speed control is basically left in the hands of drivers. It is supplemented by the speed limits under the Road Traffic Law. In Japan, the legal, or maximum, speeds are 60 km/h for open roads and 100 km/h for highways, and lower speed limits are set for specific sections. These speed limits were set empirically and not calculated scientifically. Drivers are caught for speeding based on these speed limits. Most drivers drive at the speed at which they feel safe in the current condition of the road, including other users, while keeping in mind the speed limit as a reference. For most drivers, and for most cases, the subjective safety standard seems effective. But for a specific group of people who have a strong tendency to hurry, or in specific cases which force drivers to hurry, such a subjective safety standard may not function, but lead to high-speed driving with relatively greater danger. Detailed research on the dangers of high-speed driving, the headway distance and collision, and safety education concerning speed were conducted by Matsu-

naga Katsuya of Kyushu University [6]. The speed sense and ability to recognize danger which a human possesses biologically are not sufficient to deal with high-speed driving. Humans may fail to recognize the risks of high speeds.

Such lack of speed control ability in humans while driving is one of the causes of accidents. In other words, a human sometimes fails to select a proper speed appropriate for information processing (perception, judgment, operation), and some physical auxiliary system is therefore necessary. One such system is ISA (Intelligent Speed Adaptation). Taniguchi's MASCOS (Maximum Speed Control System) [11] is a system which categorizes road conditions into regular roads and highways, and forcibly switches a vehicle's maximum speed accordingly. For example, it limits the speed of a vehicle to 70 km/h on regular roads but to well over 100 km/h on highways and freeways. This aims to avoid extraordinarily fast driving with its attendant high risk of inducing serious accidents. Sweden has implemented an ISA system which forcibly switches maximum speeds according to the speed limits subdivided based on road sections, holidays, or time zones [18].

Such ITS related to speed control have not been mainstream in Japan, but one type of speed controlling transportation system has been introduced for certain car models. In fall 2001, a new regulation was enacted requiring all heavy trucks to install speed limiters to restrict the maximum speed to 90 km/h on highways. With a transition period of 3 years, all heavy trucks will have to be equipped with the limiters after their automobile inspection in the fall of 2004.

A field experiment on speed control systems for specific areas such as school zones has been started by the Ministry of Land, Infrastructure, and Transport. Maximum speeds of automobiles are controlled by GPS or transmitters on roadsides. This experiment is planned to be conducted for 3 years from 2002.

The Soft Car Millennium Project Team led by Oguri Yukio studies the transport system related to speed control. This project was one of those selected for the Science and Technology Agency's millennium innovative technology development proposals. The first step of the research is to study the system to indicate the speed of a car to the outside. The project will eventually conduct overall ISA experiments [7].

2. People's attitudes toward ISA

Taniguchi [12] pointed out the problems that the realization of MASCOS in Japan entails. One was the formation of social consensus on its introduction. For this, it was necessary to know what attitudes ordinary drivers take towards MASCOS and to make clear the factors forming such attitudes. Taniguchi [13, 14] pointed out that this system would possibly be accepted by society if it was based on the ethic of respect for human lives, even though it might be accompanied by some inconvenience.

Taniguchi [15] revealed the relationship between age and driving speed of drivers and attitudes toward the maximum speed control system and relevant issues. Asked about a maximum speed control system, 56.7% agreed and 32.2% were opposed to the "forcible maximum speed switch system between regular roads and highways," 48.3% agreed and 34.3% were opposed to the "forcible maximum speed switch system among road sections," and 20.0% agreed and 66.8% were opposed to the "voluntary maximum speed switch system." Concerning the "forcible maximum speed switch system between regular roads and highways," when assuming "the number of deaths from traffic accidents will be reduced by about 2,000," 74.1% agreed and 8.8% were opposed. This indicates that to change people's attitudes toward traffic policies, appealing to their ethics of respect for human lives is effective. On the other hand the fact that 8.8% of people were "opposed to the introduction of the maximum speed control system even though the lives of 2,000 people could be saved" cannot be neglected. 17.2% had "the experience of avoiding accidents by abrupt acceleration," 59.7% believes in "the possibility of this system being accepted in Japan," and 5.4% "hope to remove the speed control device and drive faster."

3. Process of ISA implementation: role of mass media

The role of mass media such as TV, newspapers, and magazines in forming public opinion is great. TV reports on accidents accompanied by visual images have an especially large impact on the formation of the general public's impressions. People's perceptions of the actual rates of occurrence, degree of damage, and significance of certain social events is not objective. It rather depends on how the mass media reports such social events (including traffic accidents). It is therefore not too much to say that public opinion is formed by the mass media.

In the mass media, the staff in charge of producing specific programs or articles play an important role. It is important whether a news item or special issue that any of those staff plan to feature can be approved by the responsible section. It is probably highly important whether there is anyone who is interested in the specific issue. In short, whether there is anyone who is aware of the effectiveness of maximum speed control of automobiles is important.

The mass media normally only feature a specific topic for a short period of time. There are so many problems in our society, and due to the mass media's nature of chas-

ing news, it is quite rare for them to keep track of a topic for a long time. Only the issues that are highly significant for society can be repeatedly reported and explored from various viewpoints over a relatively long period. But these are rare cases, and most mass media are afraid that viewers will get weary, so they move on from one novel topic to another instead of keeping track of one issue. Thus, even if the mass media reports how effective a maximum speed control system is, it will last only for a limited period of time.

If, in this limited period, public interest in a certain issue increases greatly and affects the intentions of the people in powerful administrative positions or with authority, it may cause a big change in the social system. Top-down style movements led by those with authority such as lawmakers and high-level bureaucrats can make drastic changes.

On the other hand, there is the bottom-up style process for change. If a big anomaly spreads so widely that the mass media cannot neglect it, they feature the issue. This is the case where strong pressure from the "bottom" urges government to take action. For measures for traffic accidents, this bottom-up style approach should have happened. Despite the numerous daily reports on traffic accidents with deaths and injuries, people take them for granted and give up on taking any action. Despite the deep sorrow of the bereaved families, they seldom join forces to protest against the authorities, unless its is clear where responsibility for the accident lies. In short, many people consider traffic accidents an incurable disease and they think since the police and other related authorities do everything they can, there are no more effective measures.

4. Learn-from-Sweden approach

In 1997, the Swedish government set a goal of reducing the number of victims from traffic accidents eventually to zero, and it was approved by parliament. This long-term goal is called Vision Zero. With a population of 8,854,000 and 4,145,000 vehicles as of December 1998, the number of people injured in accidents was 21,130 (3,930 were seriously injured) and the number of deaths was 540, in 1998. This means 6.1 per 100,000. In the past, the death toll exceeded 1,300 (about 17 per 100,000) between 1964 and 1966, but after that, the number has continued to decrease. The Swedish National Road Administration, or SNRA, currently aims to reduce the number of deaths to 270 or below by 2007, as an interim goal based on Vision Zero. It also set a strategic goal of reducing the number of deaths to 400 or below in 2000, which seems difficult to achieve [10].

In order to find effective measures to achieve Vision Zero, SNRA reexamined past measures against traffic accidents. As a result of this, it decided to focus not only on human factors but also on the speed performance of automobiles to figure out where in the traffic system the problem lies. SNRA thus decided to conduct field experiments on some thousands of vehicles as its speed control project. It announced that 75 million Swedish krona (approx. 1 billion yen) would be spent between 1999 and 2001 for the experiments.

One background factor for such a national project to have gained public support in Sweden seems to be the attitude of respect for human rights prevailing among Swedish people. The fact that the nation is known as the most advanced welfare state is also based on the same background factor. This is an attitude of respecting each individual's happiness, safety and life. This basic attitude constitutes the driving force of their serious attempt to reduce the victims of traffic accidents. Another background factor is the logical approach to handling problems. They try to solve a problem based on rigidly scientific and rational approaches. They develop logical plans on the desk and try to apply them to reality as planned. Such approach inevitably faces failures, but it is modified and will lead to the next approach. In short, they deal with reality while conducting experiments.

Behind the field experiments on a speed control system designed based on Vision Zero, there is an extremely simple and clear logic. Based on the field experiment data on some specific traffic systems, the feasibility and effectiveness, or the problems of an accident suppression measure focusing on the speed factor of traffic accidents are revealed. This will steadily lead to the next step, and how the speed control should be developed as a concrete accident suppression measure can be clarified.

Compared to these approaches of Sweden toward social problems, Japan's approach is very different. We need to learn from them the attitude of seeking realistic measures to secure the safety of as many people as possible, and as quickly as possible, instead of overlooking the annual 12,000 victims of traffic accidents as beyond help. One significant choice for this is ISA.

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