

Progress of V-I Cooperative Safety Support System in Kanagawa, Japan

Masao FUKUSHIMA^{*1}, Masatada SETO^{*2}, Noriyuki TSUKADA^{*3}

Universal Traffic Management Society of Japan, Airman's Building 7th Floor, 2-6
Ichigaya-Tamachi, Shinjuku-ku, Tokyo 162-0834 Japan

Phone: +81-3-3235-6520, Fax: +81-3-3235-6522

Email: masao-f@mail.nissan.co.jp^{*1}, seto@utms.or.jp^{*2}, n-tsukada@mail.nissan.co.jp^{*3}

*1,3 IT&ITS Engineering Department, NISSAN MOTOR CO.,LTD

ABSTRACT

Although the death rate of traffic accidents is decreasing in Japan, the number of people injured remains at a high level. While on-board mechanism have been developed and actualized, there are still collision types which are difficult to solve by the vehicle alone. To solve this difficulty, Vehicle-Infrastructure communication safety support, the DSSS (Driving Safety Support System), using Infrared Beacon is taking an active role in Japan. Here, we will introduce the progress of FOT (Field Operational Test) taken by the Kanagawa DSSS Analysis WG. which is one of the DSSS activities.

THE UTMS and THE KANAGAWA DSSS

The UTMS (Universal Traffic Management Systems) is a National Police Agency system which aims for the actualization of a "safe, comfortable and environment-friendly traffic society" by using an advanced information communication technology such as interactive communication between traffic control systems and each vehicle using an Infrared Light (IR) Beacon. These systems are being utilized by the UTMS Japan (Universal Traffic Management Society of Japan), which was established in 1996.

Kanagawa Prefecture is located next to Tokyo ---a metropolitan city in Japan. The capital city, Yokohama, is the second largest city in Japan. (Tokyo is the largest). In Kanagawa, the number of traffic accidents is the third worst nationwide and accidents resulting in injury or death per traveling distance is the worst nationwide. Kanagawa DSSS is one of the DSSS actions with the participation of several firms related to automobile, traffic infrastructure, communication and car navigation systems. The aim is to contribute to the local society and the nation by developing technologies to help solve the above mentioned issues to

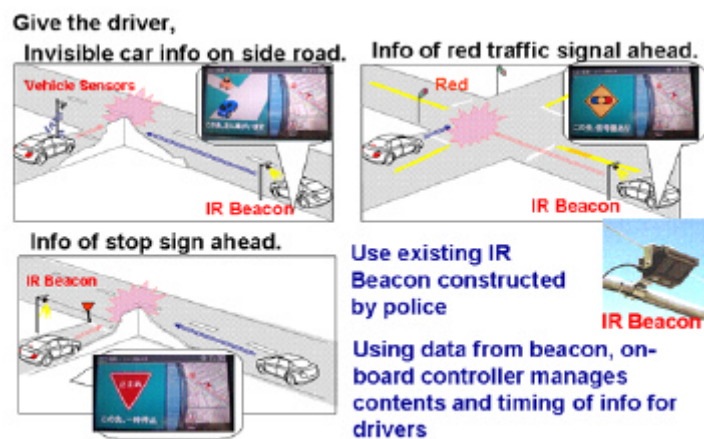


Fig1 Applications - Intersection Collision Avoidance

hold FOT and to make early actualization.

MEASURES of KANAGAWA DSSS

FOT by 2,000 general users has started from October 2006. The test will continue through March 2009. Test items are as follows:

- (1) Stop sign violation avoidance support at intersections without traffic signal.
 - (2) Information supply to a main stream vehicle about a merging lane vehicle at an intersection without traffic signal.
 - (3) Red light violation avoidance support at intersections with traffic lights.
- These 3 are using IR beacon as V-I communication tool.

An on-board unit is based on the current generation car navigation system of NISSAN and "the 3 media VICS beacon" that is widely sold in Japan. The current generation car navigation system has been sold since the beginning of 2004, test vehicles need only re-programming this car navigation software to participate. It takes only 15 minutes for the re-programming at NISSAN car dealers.

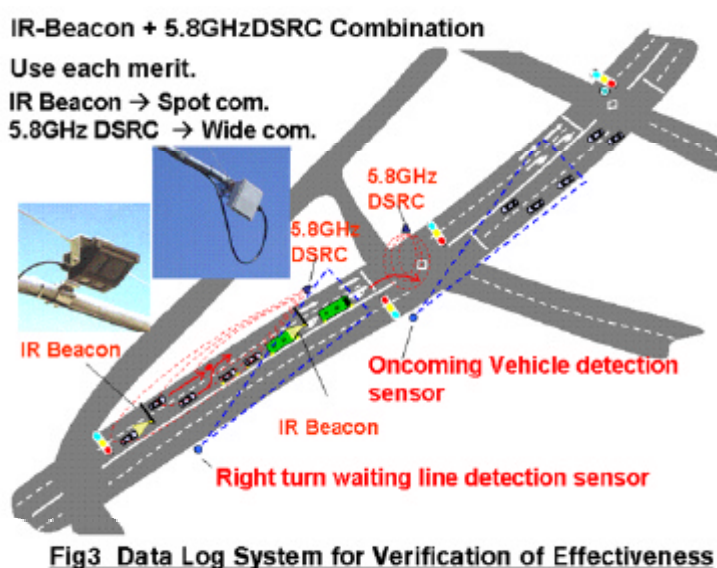
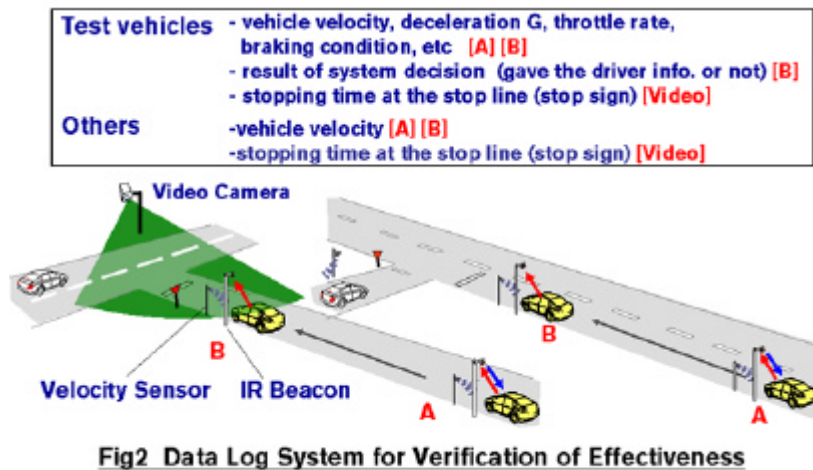
The system has a function that enables a vehicle to judge the timing to supply information, to judge if/if not to supply information by considering the brake condition and speed based on data received from the outside world. The system also has a function to estimate the driver behavior change with/without information support.

Figure 3 shows the estimation system using Up-Link of the vehicle real time running data.

From 2007, following tests started using IR beacon and DRSC (Dedicated Short Range Communication) combination in order to use the each communication media merits.

- (4) Right turn vehicle existence information supply.
- (5) Right turn collision avoidance support.
- (6) Red light violation avoidance and rear end collision avoidance for the stopping vehicle before the red light.

The purpose of these test is to develop more sophisticated safety support using continuous V-I communication.



PROGRESS of FOT

2,000 general users will evaluate the system receptivity ---how information is supplied, etc. ---through every day car life without being conscious of the test. We are receiving good quantitative results that drivers change their driving

behavior to safety side by such info support. The first stage result is shown in Table 1. We also had good user acceptability supported by large majority.

The continuous testing which will last for more than two year will also enable us to grasp the influence of the users' experience with the system and the influence of over trust or learned adaptation when no information is received at the test sites for the drivers who have once experienced the information.

Japanese government started "ITS-Safety 2010" national project by public-private sectors in order to actualize cooperated safety support system using V-I from 2010. We hope that the success of Kanagawa DSSS will contribute to government plan of V-I, V-V safety support system actualization in 2010.

SUMMARY

Here we have introduced the Kanagawa DSSS project that challenges, through a new technology field as follows, to help reduce traffic accidents which current technology could not solve. We are receiving good quantitative results such as driver behavior change to safer driving and user acceptability supported by large majority. We hope that the success of Kanagawa DSSS will contribute to Government plan of V-I, V-V safety support system actualization in 2010.

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without system → with system

Application	Speed before intersection	Driver behavior change rate
Stop Sign Alert	5km/h down	35%
Intersection collision avoidance	10km/h down	25-30%
Red Light Alert	6km/h down	30%

Table1 Test Results (still in progress) Summary