

# Evaluation of support system for driving narrow road

Yasuhiko KUMAGAI, Motomune KATAOKA  
Kochi University of Technology

**ABSTRACT:** Kochi prefecture and Kochi University of Technology collaborative development in 2004, as the system which bears one end of road construction of 1.5 lane, it developed support system for driving narrow road. It is the system which can be called the regional property which is utilized to 2005 in Kochi prefecture. It was utilized to 2006 even in other prefecture. Presently it is the system which attracts nationwide high attention. With this manuscript, it reports concerning the qualitative appraisal which introducing basic research of the system and it keeps.

**KEYWORDS:** ITS, Road management, Oncoming car

## 1. INTRODUCTION

There are many rich natural in Kochi prefecture. But while rich it is natural, because of harsh topography and meteorological condition it is the prefecture whose disaster is many. On the one hand, while also below service such as road is late, you can call Kochi prefecture with the reduction of budget of recent years, and that very difficult road administration is approached. In this situation, as for Kochi prefecture you propose, execute road construction of 1.5 lane which, is not standard of nationwide evenness at the time of road servicing in intermediate and mountainous area, is the standard which conforms to the actual condition of area as a new road service project, presently spread to the Japanese entire country. This service technique according to road circumstance, not only 2 lane services, by the fact that the road which combines 1 lane services and local improvement is serviced, achieves the service level which substantial cost reduction and area calculate to early stage, it is effective and efficient technique. But, regarding this service technique, the correspondence for the sudden angular removal where huge construction expense

becomes necessary became topic.

Those where it is observed then are the opposition car approach information system (existing system). This system inspects the vehicle with the sensor, information of approach of that vehicle with the system which offers in the oncoming car, in the past service has been done even inside Kochi prefecture depending upon the information board, but there were two big problems. One is high cost. Introduction of this system in Road construction of 1.5 lane from has designated that cost is held down as purpose. But, the fact that the expensive system is serviced is upside down. One more is functional problem of the system. In regard to the distinction of the full-sized car and entrance leaving etc of the vehicle, it was not the system which always conforms to road construction of 1.5 lane.

Then in order that this problem is solved, as for Kochi prefecture the development of cheap support system for driving narrow road was done in 2004 as Kochi University of Technology and a new system, after that became the system which is utilized inside Kochi prefecture. Furthermore, also is observed from the road manager of other prefecture, is introduced

by 2006 even in the prefecture other than Kochi prefecture, such as Okayama prefecture has started spreading in entire country.

With this manuscript, it is developed in Kochi prefecture after introducing concerning the summary of support system for driving narrow road, as a basic research, it considers concerning the reason which starts spreading even in other prefecture, it reports qualitative appraisal concerning the result of doing.



Fig1 Oncoming car approach indication system

## 2. Support system for driving narrow road

The support system for driving narrow road in order that the problematical point where the existing opposition car approach indicatory system does not conform to Road construction of 1.5 lane is solved, Kochi prefecture and Kochi University of Technology being joint in 2004, is the system which it researched and developed.

At the time of development, in order that it makes the system which is suited for needs, in order to become the function which conforms to price decline and road construction of 1.5 lane, various examinations were done, 2 types of normal mode and simple type were developed. Furthermore the price decline in this research is not system introduction expense, it points to the price decline which includes maintenance cost.

The system which was developed each type inspects the vehicle with the sensor, offers the information of opposition car approach with the information board of opposite side, essentially they are same ones as the existing system.

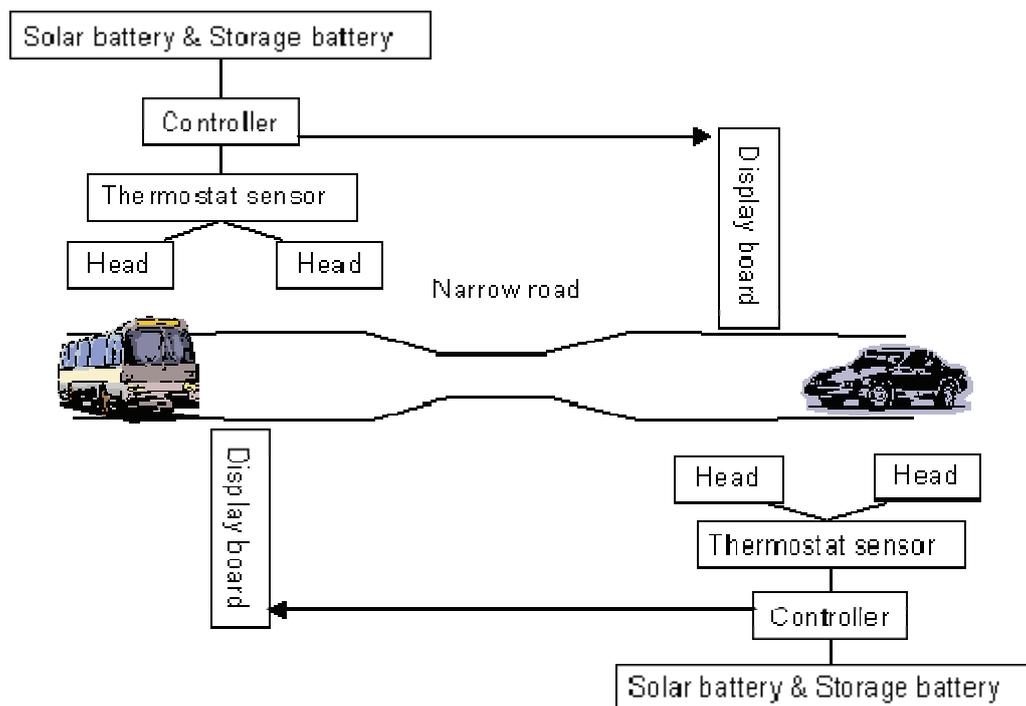


Fig2 Configuration of the device

The system configuration which was developed is as follows. In order to distinguish penetrating or leaving of the vehicle, each 2 sensors are installed in the entrance section of the narrow road which becomes object section, it is something where the information board of opposite side operates in only the time zone which is decided that the vehicle exists inside section. As for the sensor which inspects the vehicle, from the reason such as cost and economical electric power, the thermo- sensor of non contact type is used.

Lastly, support system for driving narrow road, presently is in the midst of patent applying from Kochi prefecture and Kochi University of Technology.

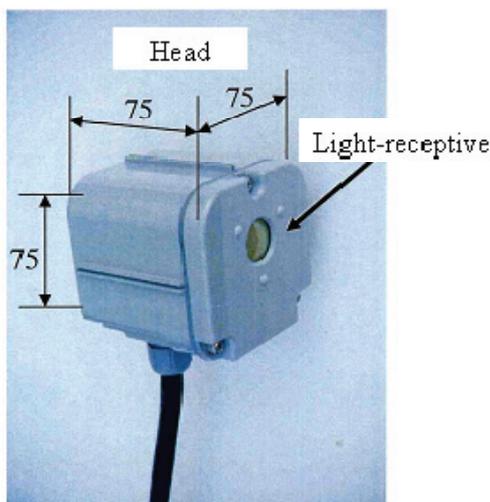


Fig3 Sensor head

### 2.1 Standard type

Standard type has had model distinction function, at the LED information board, you can list the point which does information offer. Model distinction function, at the sensor total length of the vehicle is measured, above uniformity the long vehicle is identified the full-sized car, the letter which is indicated “Attention of opposition car” and “Big car approach” are used properly.



Fig4 Standard type (LED display board)

### 2.2 Simplified type

As for feature of simplified type, you can list the fact that cheaper thing and solar battery drive are possible. Regarding the road of intermediate and mountainous area, because the place where it cannot supply electric power easily to be many it exists, also solar generation of electricity and the drive which combines the battery made possible ones. In order to assure economical electrical conversion attendant upon that, it made the simple information board which installs the LED light in the fixed signboard.



Fig5 Simplified type (fixed display board + LED)

### 2.3 Spread circumstance of Kochi

In Kochi prefecture, 16 systems are introduced. In addition, as for introduction place, not only the curve section where the prospect that at the beginning it is

supposed is bad, introduction is examined even with the section essentially such as the similar hill and the tunnel.

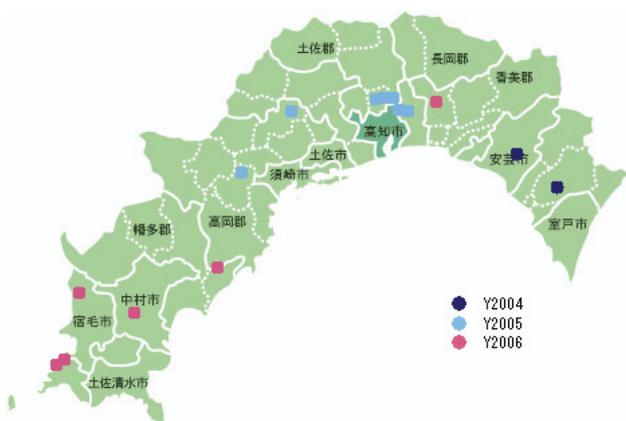


Fig4 Spread circumstance of Kochi

Table1 Spread circumstance of Kochi

Year	No. of pcs
2004	2 Systems (Prototype)
2005	7 Systems
2006	6 Systems (Planning)
Total	16 Systems

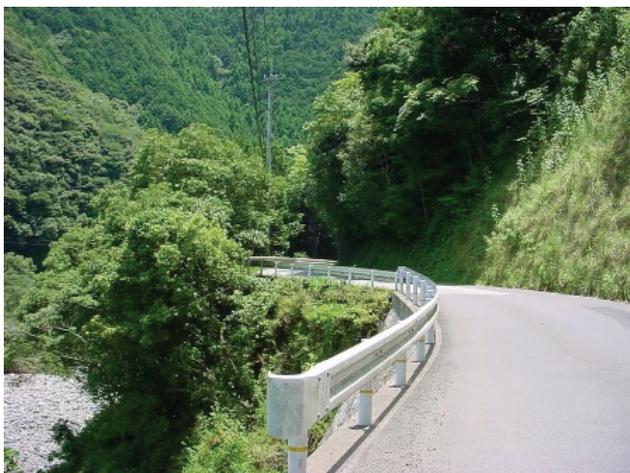


Fig5 Case of curve

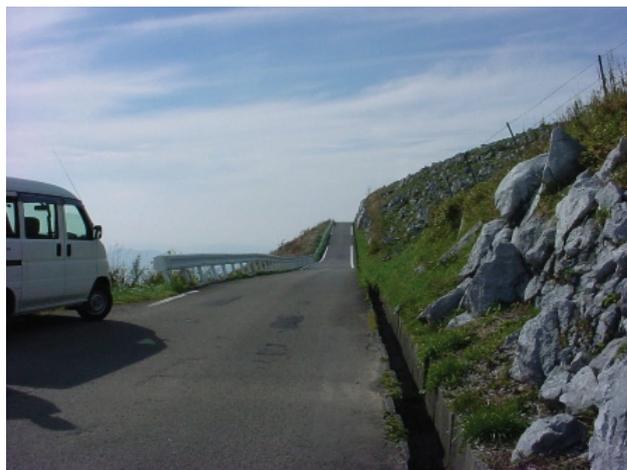


Fig6 Case of brae



Fig7 Case of tunnel

### 3. Spread circumstance outside Kochi

2006, support system for driving narrow road was utilized even in the prefecture other than Kochi prefecture. It includes inside and the maintenance status Kochi prefecture and 31 systems are serviced.

Table2 Spread circumstance outside Kochi

Pref.	No. of pcs
Tokushima	10
Ehime	2
Okayama	2
Shimane	1
Oita	1
Kochi	15
Total	31



Fig8 Outside Kochi pref

#### 4. Evaluation

With the appraisal which is done so far in Kochi prefecture, the appraisal result that is reported it is the mental sense of relief, and useful to the prevention of head-on collision, depending upon the service of this system. On the one hand, after the prototype developing 2004, 13 systems are serviced in 2 years in the future it is the schedule where service is done. That high appraisal can do this, that important role is carried out say furthermore that it is the system which conforms to the policy of needs and road service from the fact that continuous service is done, as the part of Road construction of 1.5 lane.

In the questionnaire survey where we do to the past, we cause Action which many people expect, we have replied, that all people who in addition reply are useful high appraisal is obtained.

Road construction in Kochi prefecture of 1.5 lane is the program which is done time from the cost reason, at the time of fixed conditional converting. Service is done at the time of this programming, furthermore as the project which designates cost reduction as purpose, has contributed to also cost reduction substantially. If you rephrase, it is thought that we do not do construction such as sudden angular removal, can obtain high appraisal even

from viewpoint of protection of the environment.

Furthermore the entry of regional enterprise and it is assured positively, influence to the activation of indigenous industry are listed.

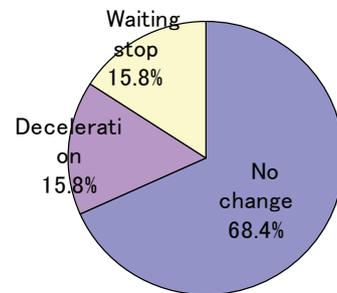


Fig9 Action which is system in operation?

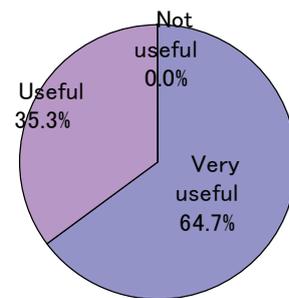


Fig10 Effectiveness of the system?

#### 5. Summary

In this paper, support system for driving narrow road which Kochi prefecture and Kochi University of Technology collaborative development was introduced.

In the future you appraise quantitatively. And, it is the schedule which influence of the road support system for driving narrow road in road servicing clearness is done.

#### REFERENCES

H. Kitagawa, Y. Kumagai, 中山間道路走行支援システムの開発, *Japan Road Conference*, 2005

H. Miyamoto, K. Okamura, H. Kitagawa, Y. Kumagai, The Development of a Narrow Road Driving Support System, *12th World Congress on Intelligent Transport Systems*, 2005