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## PEDESTRIAN INFORMATION AND COMMUNICATION SYSTEMS FOR VISUALLY IMPAIRED PERSONS

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### ABSTRACT

Pedestrian Information and Communication Systems (PICS) have been under development for the purposes to provide the elderly and disabled persons with the appropriate information for safety, easy, convenient and comfortable travels in a timely manner and consequently improve their quality of daily lives.

Infrared beacons (Ir Station) installed around the intersection to provide visually impaired persons with voice information (PICS-A) and other disabled persons with text and imagery information (PICS-B). Field tests of these two prototype systems have been conducted for three times to verify their effectiveness and operability. Most of participants evaluated that these systems work very effectively. Test results of PICS-A field test are reported herein.

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### INTRODUCTION

We have been developing Pedestrian Information and Communication Systems (PICS) for the purposes to provide the elderly and disabled persons with the appropriate information in a timely manner and support their safety, easy, convenient and comfortable travels. This consequently improves their quality of daily lives.

In 1998 statistics, about 28% of pedestrian traffic accidents resulted death. The ratio of elderly person in the total death accidents occupies 34% and more than half of disabled person is elderly. The population of elderly person in Japan is increasing rapidly. Foreseeable elderly society it is indispensable to consolidate desirable pedestrian's environment enabling elderly and disabled persons to expand their mobility with safety, easy, convenient and comfortable ways, and consequently enabling them to join in normal social community.

Based on research and study about information services required by the elderly and disabled persons, prototypes of voice information services system (PICS-A) for visually impaired persons and imagery

information services system (PICS-B) for locomotory impaired, hearing impaired and elderly persons have been developed. The first field test was conducted on the PICS-A at the intersection near JR Shinyokohama station in November 1998. The second field test was conducted on the PICS-B near JR Yokohama station in June 1999.

Based on the results of these field tests these systems have been improved to much higher level of the completion. The third field test was conducted on both PICS-A and PICS-B in February 2000 at near JR Isogo station in Yokohama City to evaluate and verify effectiveness of these systems.

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## INFORMATION SERVICES REQUIRED

Group interviews have been conducted to check what kinds of information services are required by visually impaired, locomotory impaired, hearing impaired and elderly persons during their travels. Interviews are set in three phases like "before departure", "on the way" and "at the destination" and ask necessary information required at each phases. As the results, especially at intersection, such information services as follows are required for visually impaired people to support their safety, easy, convenient and comfortable travels.

- What is the direction to the intersection?
  - Where is the intersection?
  - What is the direction to cross the pedestrian crossing?
  - When is the timing to start walking out to across the crosswalk?
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## CONFIGURATION AND FIELD TESTS

From experiences to use infrared beacon in VICS for vehicle communication we applied infrared beacon (Ir Station) as the media to provide information to handy terminal. Infrared communication has merits of secured communication in the designated area because of its sharpdirectivity.

### (1) First field test

The first field test was conducted on PICS-A. System configuration is shown in Figure-1. PICS-A transmits local information such as the name of intersection, walking direction, status of pedestrian signal lights from the Ir Station installed near the pedestrian signal lights.

Visually impaired persons scan their handy terminal toward the intersection and catch the voice message informing the name of intersection and direction for walking. They can reach to the intersection if they walk toward the direction where they get the clearest voice message. They can know the status of pedestrian signal lights scanning their handy terminals at the intersection. They can get the direction to cross the intersection before they start and know the timing to start walking.

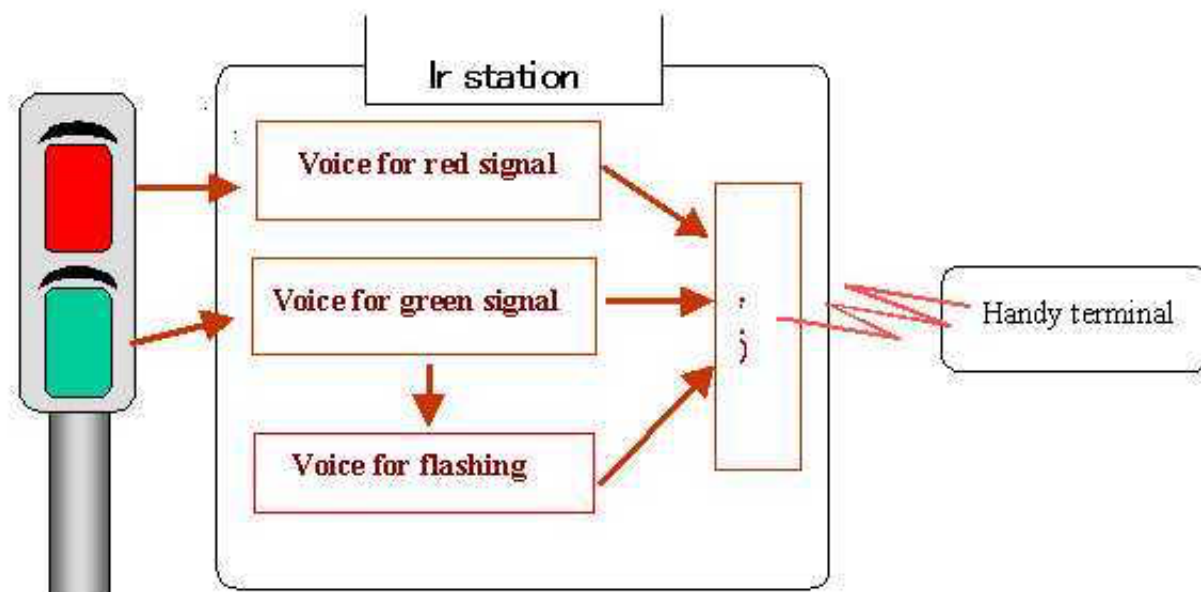


Figure-1 System Configuration

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The first field test on the PICS-A was conducted to have 27(male 16, female 11) participants in total. This system is evaluated by these participants as "feel easy at the intersection" for visually impaired persons and verified as an effective and usable.

Test scene is shown in Figure-2



Figure-2 Test Scene-1

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As further improvement it is required to:

- select words carefully for providing much easier voice message.
- contrive the location and method to install Ir Station because the voice message disappears just before crossing over the crosswalk since the Ir Station is installed higher position.
- make the handy terminal much smaller and lighter.

**(2) Second field test**

The second field test was conducted on PICS-B.

(3) Third field test Based on the results of the first and second filed test both PICS-A and PICS-B systems have been improved to reflect them. Ir Stations for both PICS-A and PICS-B were installed more expanded area to set up test environments closer to the actual operation. For PICS-A, 23 visually impaired participants (male 12, female 11) joined the third field test conducted near JR Isogo station, Yokohama City during February 2000 to evaluate and verify effectiveness of the systems.



Test scene is shown in Figure-3.



Figure-3 Test Scene-2

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PICS-A has been improved to reflect the results of the first field test, "select words carefully for providing much easier voice message" and "provide information till the both end of crosswalk continuously".

Stand alone Ir Station is installed to provide each of additional information services such as trains' departure and arrival information in the hour gearing time table and clock, location of entrance/exit and fare machines inside of the railway station and elevator, bus stop, bank office, Koban and entrances of supermarket store nearby the railway station. Participants travel along with voice information provided by Ir Stations installed at each point through their handy terminals.

Questionnaire and hearing survey are conducted to participants during and after the test. The results of questionnaire and hearing conducted to participants in the third field test are shown in Table-1. It is believed that good evaluation was obtained through field tests conducted for three times to verify system functions,

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Table-1 PICS-A Test Results

Questionnaire		Responses		
Information at intersection	Timing to start walking	Very Good (100%)		
	Status of signal lights	Very Good (100%)		
	Easy to find directions	Very easy (82.6%)	Easy (8.7%)	Good (8.7%)
Environments information	Information in railway station	Appropriate (95.7%)	Better (4.3%)	
	Information about elevator	Appropriate (100%)		
	Information about super-market	Appropriate (100%)		
Operation	Easy to handle	Best (69.6%)	Better (21.7%)	Good (8.7%)
Do you feel easy to walk in town?		Very easy (95.7%)	Easy (4.3%)	

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## CONCLUSION

Most of participants evaluated that PICS-A system works very effectively.

It is highly expected that the system become popular in near future.

To make the system popular for all, it is important to set up the standardization.

For the future ITS, providing the convenience to pedestrians will be essential as well as providing solution to vehicle traffic problem.

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## ACKNOWLEDGMENT

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