Pedestrian Navigation with InfoSign

SAKURAI Mitsunori, MATSUHASHI Masamichi

Abstract

InfoSign is a system that provides position information to pedestrians wherever they are: indoors or outdoors or even in underground shopping malls. It is based on a linkage with mobile terminals using the Bluetooth wireless communication technology. The system allows each pedestrian to obtain a route guidance service and other information that is specific to his or her position.

This paper introduces InfoSign and also describes examples of pedestrian navigation services that can be expected to be supported by the system.

Keywords

position information, route guidance, Bluetooth, wireless information sign, cellular phone terminals

1. Introduction

The significant advancements in ITS (Intelligent Transport Systems) for automobiles in recent years have tended to continuously increase the demands for products for use in navigation systems, VICS (Vehicle Information and Communication System) and ETC (Electronic Toll Collection System).

As this trend has also increased interest in pedestrian ITS, the enforcement of the Japanese Traffic Barrier Free Law in November 2000 has made it an urgent matter to construct a system that can provide basic services for pedestrian ITS such as "Warnings," "provision of information on surroundings" and "route guidance."

There are already pedestrian support systems such as one that provides voice guidance from dedicated terminals and one using cellular phones incorporating the GPS (Global Positioning System) function. However, these systems have their own issues, including "the limited number of services available with a single terminal," "the impossibility of using the system in another town" and "malfunctioning when out of reach of GPS waves in streets lined with large buildings or in underground shopping malls."

2. Outline of InfoSign

InfoSign is a system incorporating a CPU and flash ROM that provides position information (latitude/longitude data, unique ID numbers, etc.) to pedestrians wherever they are: indoors or outdoors or even in underground shopping malls.

Based on linkage with mobile terminals it uses the Bluetooth wireless communication technology (**Photo**). The system allows each pedestrian to obtain route guidance services and various relevant instructions that is specific to his or her location.

As InfoSign provides the registered position information using the Bluetooth wireless communication technology, it can be used easily by installing the software for communication and may be displayed in a commercially available mobile terminal such as a cellular phone or PDA (Personal Digital Assistant) that incorporates the Bluetooth function. This feature makes it possible to implement the system without developing special hardware for use with mobile terminals.

2.1 Specifications for InfoSign

Each InfoSign unit always acts as the slave device standing by for connection from the mobile terminal that acts in turn as the master device. It communicates with the mobile terminals by exchanging the command data that is defined uniquely by using the serial port profile (SPP) belonging to the

Photo External view of InfoSign.

Table Main specifications of InfoSign.

Item	Specifications
Communication system	Bluetooth Ver.1.2
Transmission power	Class 2
Compatible profile	SPP
Communication range	10 meters (variable according to the environment)
Output power adjustment	0 to 14dB, in 2dB increments
Power supply	100V ±10% AC, 50/60Hz
Power consumption	Max. 2W
EMI countermeasure	VCCI Class A compliant
Waterproof performance	IPX5 equivalent
Vibration/shock resistance	JIS C0117 compliant 4M4
Dimensions	∅180(dia.)× 55(H) mm
Weight	Max. 850 grams
Temperatures	-10°C to +55°C

Bluetooth wireless communication technology. It thus permits unconditional connection to any connection request from a mobile terminal.

Table shows the main specifications of InfoSign.

The built-in flash ROM has a 4KBytes × 25 position information write area and a 250KBytes × 1 area that can be used according to the scene of use.

2.2 Modes of InfoSign Usages

InfoSign can provide information in the following three usage modes.

(1) When simple contents in addition to the position information are stored in the 250KByte flash ROM area in advance, the stored content data can be transmitted to the mobile terminal. This mode is preferable for a system that the contents stored in the flash ROM area are not often replaced.

(2) When contents are installed in the mobile terminal, the terminal can select and display content on a display that is associated with the position data or ID number transmitted from InfoSign. If a memory card is used as the storage medium, a larger amount of content data can be stored in the mobile terminal so a large variety of information can be provided. As this mode does not send the content data directly, it is capable of providing users with a very large amount of information easily.

(3) A cellular phone terminal can also provide various kinds of information by accessing dedicated servers using packet communication and by downloading various contents from them (**Fig. 1**). A PDA can utilize this function via wireless LAN instead of by the packet communication method used by the cellular phone.This mode can provide real-time information as well as a very large amount of information. In addition, its capability for providing integrated management of the content information also enables provision of more efficient services.

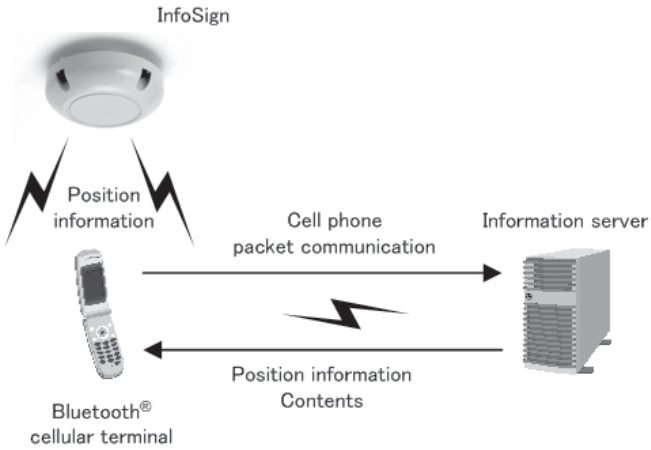

Fig. 1 Mode based on packet communication.

3. Examples of the Services Expected to be Available with InfoSign

In this section, we will describe the services available using the features and operation modes of InfoSign described in the previous section.

An example of a system that uses InfoSign can be seen with the “World Heritage Kumano Kodo Navigation Project”. This provides route guidance, historical site information, tourist facility information and shopping information in multiple languages (Japanese, English, Korean and Chinese) for the World Heritage “Kumano Nachi-Taisha” area in Nachi-Katsuura, Wakayama Prefecture, Japan. Another example is the demonstration experiment operated in the Sannomiya shopping district in Kobe, in which the server searches routes based on position information from InfoSign and displays the route guidance information on mobile terminals. The method used in this experiment is being applied for many other systems.

In the following subsections, we will describe each of the representative services.

3.1 Route Guidance in Underground Shopping Mall, etc.

A service providing route guidance to desired destinations by using mobile terminals is also possible in underground shopping malls outside the reach of GPS radio waves. When the information for routes without steps or height differences and on wheelchair-compatible washrooms also becomes available, the system will also be able to provide a barrier-free route guidance service (**Fig. 2**).

Fig. 2 Route guidance for underground shopping malls.

3.2 School–Oriented Services

When the system is installed in classrooms and other school settings etc., information on the movements of pupils who carry cellular phones may be obtained for use in attendance checks as well as notification by e-mail to their parents or guardians. When cellular phones incorporating the GPS function are used, it is also possible to confirm the series of positional information as each child moves from home to the classroom (**Fig. 3**).

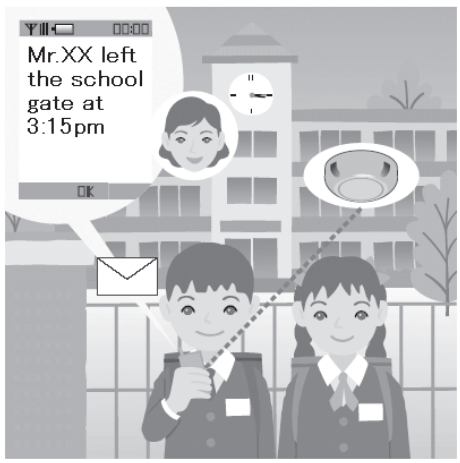

Fig. 3 School-oriented services.

3.3 Tourist and Facility Guidance Services

A visitor to tourist sites, aquariums and museums can automatically receive timely guidance information and details of individual exhibits when entering an area in which communication by InfoSign is available; provided that a mobile terminal is carried. When user information such as the nationality of overseas visitors is set in advance on the mobile terminal, the user can receive information matching his or her own personal circumstances (**Fig. 4**).

The effective use of flash ROM areas of InfoSign can also make the following operations possible:

1) Even when the mobile terminal incorporates fonts only of specified languages such as Japanese or English, the user can receive information in any different language when the guidance text is displayed in the form of a JPEG image.
2) By simply installing an additional InfoSign unit at a tourist site, the site becomes capable of providing information in different languages without the need to rewrite the external memory of each mobile terminal.

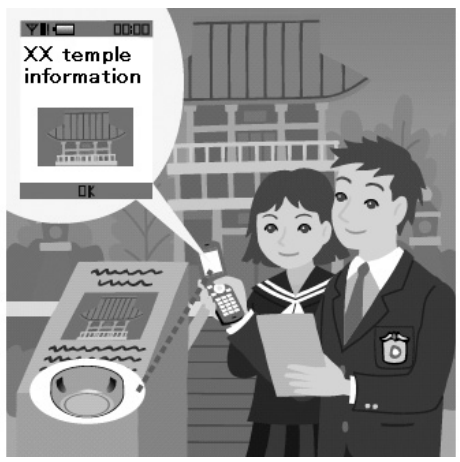

Fig. 4 Tourist/facility guidance services.

3.4 Personnel Position Management Service

When the positions of personnel in a building or of policemen on patrol can be identified, it becomes possible in case of an emergency to give direct instructions to the mobile terminals of the required personnel or policemen according to their

positions, so that they can quickly deal with any incident.

4. Conclusion–Future Development–

Information distribution and route guidance systems based on InfoSign have been exhibited at many shows inside and outside Japan, and attracted keen attention by visitors when they were demonstrated at ITS World Conferences held overseas (in London in 2005, Beijing in 2007). The reason that interest in InfoSign was especially high overseas may be because of the higher rate of diffusion of cellular phones incorporating the Bluetooth wireless communication technology in these countries. However, in Japan also, the number of cellular phones with the Bluetooth wireless communication technology has been increasing following the growth in the need for wireless headsets, which resulted from the enforcement of a law prohibiting the use of cellular phones during driving and the increase in the incorporation of music player functions in cellular phones. This trend is expected to increase the opportunities for providing information via InfoSign systems in the future.

At NEC, we participated in the demonstration experiments with InfoSign for the Autonomous Movement Support Project promoted by the Japanese Ministry of Land, Infrastructure and Transport in order to contribute to the construction of route guidance and information provision systems. The information obtained in these experiments will be used to enable construction of systems that feature higher levels of convenience in the future.

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*Pedestrian ITS is one of the main development fields of ITS. It is a system that aims at providing secure, safe and smoothly functional movement environments for pedestrians including aged and handicapped persons, wheelchair users and bicycle riders.

*The Autonomous Movement Support Project is a project proposed by the Japanese Ministry of Land, Infrastructure and Transport. The project targets at creation of an environment that allows access “at anytime, anywhere and by anyone” of the information on the “movement routes,” “means of traffic” and “destinations” that is required for the implementation of a “Universal Society.”

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Authors' Profiles

SAKURAI Mitsunori
Assistant Manager,
Internet Terminals Division,
NEC Engineering, Ltd.

MATSUHASHI Masamichi
Manager,
Sales & Marketing Division,
NEC Engineering, Ltd.
Member of the Virtual Reality Society of Japan