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A mobile phone-based Safety Support System for wandering elderly persons

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INTRODUCTION

Elderly persons with Alzheimer's disease and dementia have many behavior disorders such as wandering, repeatedly questioning and being uncooperative during the day. Their wandering behavior is a major cause of death, so it is an especially serious problem for caregivers. It is therefore very important to monitor the wanderer's location. Numerous mobile phone-based location detection systems have been developed. The location is obtained by the caregivers accessing the mobile company; however, the caregiver is not notified that the wanderer has left home, which is a major problem of these systems.
 In this study, the newly-developed system immediately detects that the wanderer is away from home and then automatically transmits notification of the wandering elderly person's location to the caregiver once a minute.

SYSTEM DESCRIPTION

Figure 1 The overall mobile phone-based safety support system. The system consists of a low power mobile phone having no telephone call function and a conventional personal computer. The limited function mobile phone, which is 51mm x 34mm x 16mm and 27g, is always carried by the elderly person. The PHS terminal seeks the system antenna, which can communicate every one minute and transmits the PHS terminal ID to the mobile phone company within 5 seconds. Numerous antennas spaced every 100m are installed by the telephone company. Therefore, the PHS location is identified within 100 m from the receiving antenna ID.

The PC downloads the latitude and longitude data of the location from the mobile phone company via Internet every minute. The latitude and longitude data are used to detect whether the wandering elderly person is within 100m from home. When the wanderer moves more than this distance away from home, the PC informs this, via the voice mode, to the caregiver and then downloads a map of the person's location areas as a GIF file from a map company, via Internet. The map covers an area of 650m x 650m around the elderly person's location. The map is sent automatically to the caregiver by e-mail.
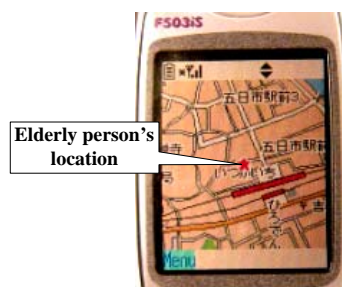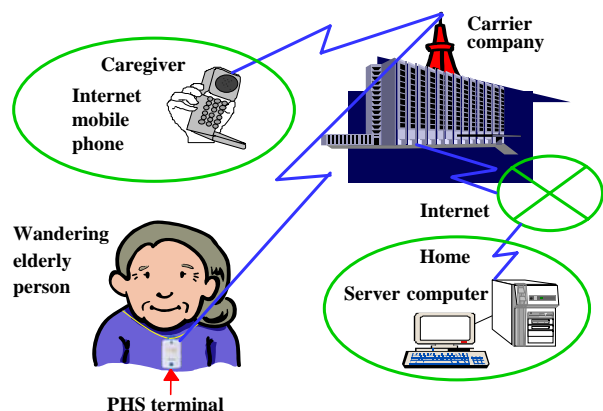

Figure 2 The elderly person's location displayed on the LCD. The caregiver, equipped with an Internet mobile phone, receives details of the wandering situation by voice mode and watches the elderly person's location. If the caregiver does not receive the call, then the PC sends voice information and the map to other registered notification persons.

SYSTEM EXPERIMENTAL TRIAL

The trials of the developed system, the location and rescue time were performed with the same system as shown in Figure 1. A caregiver's mobile phone used is an internet mobile phone (F503is, NTT DoCoMo), The PC used is a conventional Pentium 2GHz Windows computer with 256Mbyte memory, 80GB HDD and a low transmitting power mobile phone (P-in master, NTT DoCoMo).
Measurements of the location and rescue time were performed by a normal age 22 male subject, who wore the PHS terminal as a pendant. The subject stood at 15 different places in Itsukaichi area of Hiroshima and these locations all were identified on a 1/25000 scale map. A rescue test was then performed, with rescue time measured as the time required for the caregiver to find the subject. In this test, both the subject and caregiver started at the same location in the city, and then the subject quickly walked away, on a wandering pathway. Then, after receiving the e-mail, the caregiver started out to find out the subject.
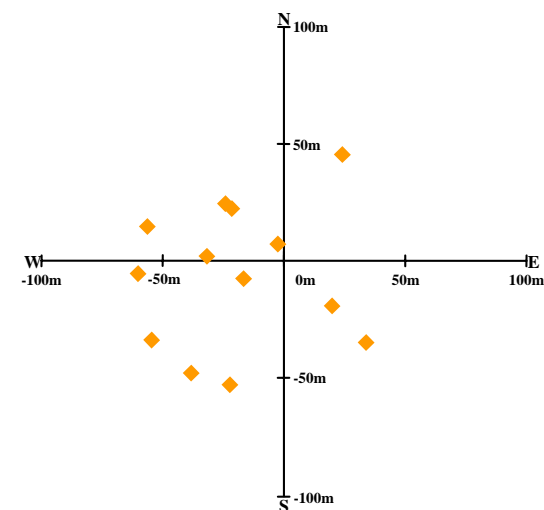
RESULTS

Figure 4 The distances from the identified locations to the detected locations. Although the distances were influenced the houses or buildings around the subjects, the system can detect a person's location within 60m. Maximum rescue time was 18.5minutes, and minimum rescue time was 10.1minutes. The mean rescue time was 13.1minutes.

CONCLUSION

The developed system consists of a standard PHS terminal and personal computer, and therefore does not require any specialized equipment. The system monitors the wandering elderly person's location automatically, which greatly reduces the caregiver's mental and physical burdens.

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