HIROSHIMA INSTITUTE OF TECHNOLOGY

A Mobile phone-based Safety and Life Support System for Elderly People

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INTRODUCTION

The sudden death of elderly people in daily life remains a serious problem worldwide now. The causes are mainly cardiac and cerebral problems, which are induced by an unexpected cardiovascular incident, or a fall.

In this study, the mobile phone-based safety and life support system detects the person's life-threatening physical condition from body movements produced by respiration, posture changing, walking and running. When the elderly person is in an emergency situation at home or away from home, the system automatically sends the elderly person's location by e-mail and informs the person's family by voice, via the mobile phone.

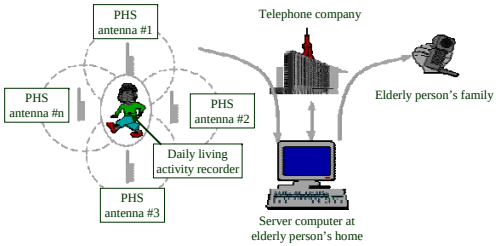

Figure1 The overall mobile phone-based safety and life support system. The system consists of a daily living activity recorder and a personal computer placed at home. They communicate via 2.4GHz low transmitting power mobile phones (PHS), which are incorporated in the daily living activity recorder and the PC.

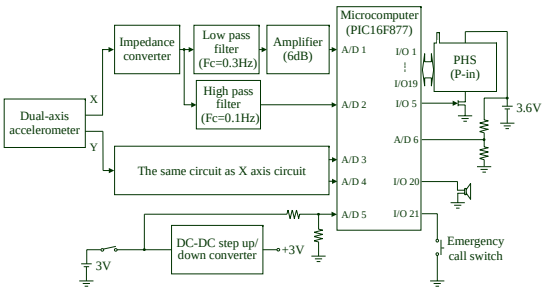

Figure2 The daily living activity recorder block diagram. The static acceleration force components, mainly generated by respiration, are detected by 0.3 Hz low-pass filters and then the slow acceleration magnitude is amplified by the 6 dB amplifiers. The dynamic acceleration force components, mainly generated by posture changing, falling and activities, are detected by 0.1 Hz high-pass filter.

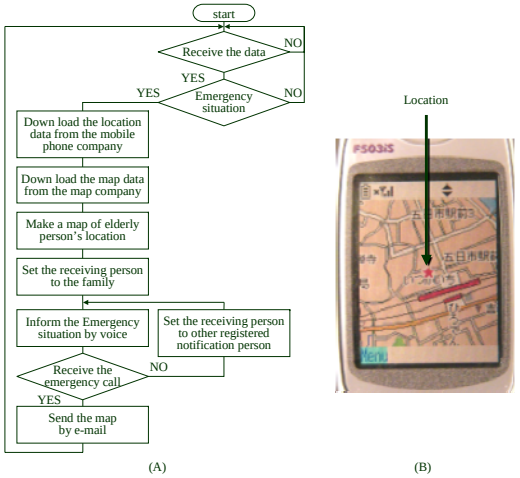

Figure3 The flowchart of the PC(plot a) and the elderly person's location displayed on the LCD of the mobile phone(plot b). When the PC receives the emergency call code, then the PC downloads the latitude and longitude data of the person's location from the mobile phone company via internet. A map around the elderly person's location is downloaded as a GIF file from a map company, which provides a free map, via internet. The map covers an area of 800 m x 800 m around the elderly person's location. The map data capacity is 5kbytes. The emergency situation is informed automatically elderly person's family via the voice modem, and then the map is sent automatically to the elderly person's family by e-mail. If the family does not receive the emergency call, the PC sends voice information to other registered notification persons.

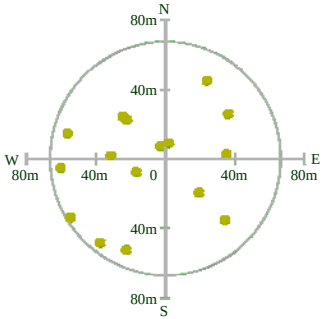

Figure4 The distances from the identified locations to the detected locations. Although the distances were influenced the houses or buildings around the subjects, the system can detect a person's location within 60m.

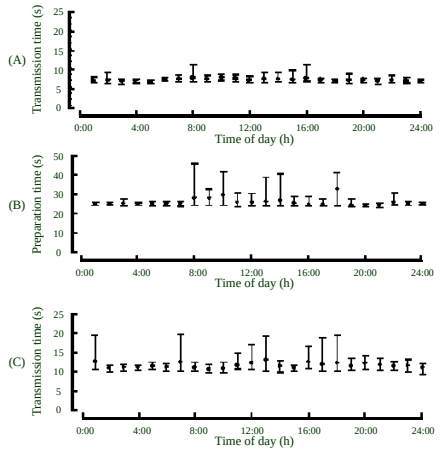

Figure5 The emergency call time from PHS to family measured for 24 hours at intervals of one-hour. The transmission time from the PHS to the PHSpc incorporated in the server computer (plot A). The preparation time of the elderly person's location map (plot B). The e-mail and voice transmission time from the PC to the mobile phone of the family (plot C). The results indicate that the developed system informs the emergency situation and location to the family within 77.5 seconds.

CONCLUSION

The developed mobile-based phone safety and life support system can detect an emergency situation from recorded daily life activity and automatically inform the situation to family or other registered person. Since the system also works well away from home, and in other buildings, it encourages elderly people to maintain a beneficial outside activity level, without undue uneasiness about their health condition.

The developed life-safety system is not only very applicable to elderly people living by themselves, but should also be found very useful for monitoring hospital patients and people in welfare facilities, especially wandering elderly persons.

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