

The Realization of Healthcare Combined with Bluetooth and NFC Technology

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Abstract

The quality of life and function are enhanced with the superior technologies integrated and applied to meet the demands of daily life, achieving lower social costs and ensuring the well-being of the social public. Furthermore, to achieve the goals of enhancing the leisure industry and extending parenting education, so as to facilitate users' physical and mental health, broaden their horizons toward quality life, enhance their cultural standing, and enable them to appropriately stretch outwards in a safe and secure setting, in this paper, the single-chip microcontroller with integrated control of radio frequency identification was combined with the global GPS system, the USB pedometer, and the Bluetooth wireless sensory technology and applied in tourist rolls and the basic physical and mental health care system in travel. Through the technological integration, the wireless sensor Bluetooth device featuring node transfer function and near field communication (NFC) application sends information of the tourist reaching the designated position and corresponding activity range data to the handheld platform of the main controller (leader) inquiring about the personal health information of the user (tourist), thereby enhancing the security of group activities and even allowing the leader to grasp and offer prompt assistance to the tourist should any accident take place.

Keywords: global positioning system, bluetooth, near field communication, USB pedometer

1. Introduction

With the technological advancement in life and the progress in medical technology, life extension is producing an impact on the future of

Taiwan's lifestyle, while the operational structure is still relatively undergoing change. Taiwan's society is currently facing serious problems associated with "aging" and "declining birthrates." Aging will lead to heavy social costs, resulting in a considerable burden on children and the society and in country's resource-related burdens. Hence, if innovative travel services can be integrated to benefit members' health- and security-related care, it will be good news to society. This being said, if wireless technical applications can be integrated to achieve this end, it will be considered as a practical innovation in the applications. Although currently there is no experimental market to validate this point, through the realization of the idea, the elderly most difficult to care for will have access to secure and healthy activities. The same will also apply to the general public. Technology can generate the second identification card with ease (i.e. the provision of personal emergency protection related information), thus deriving industrial applications and generating new travel service models [1-4].

In view of the above considerations and the demand of the application side, the system platform device in this paper integrated the GPS, Bluetooth, USB pedometer, and NFC functions into a four-in-one wireless travel passport device using an 8-byte single chip. As for the wireless detector (Bluetooth), the protocol in line with the IEEE802.15.4 standard was adopted, while the dual cassette body was adopted as the design to set up the Radio Frequency Identification System with 13.56MHz (ISO/IEC 15693 specification) NFC reader, through which related stored data can be read by way of the non-contact electronic tag [5-7]. The pedometer records the number of steps taken by the member and converts the calories consumed to provide the actual

fitness data, while the absolute position refers to the latitude and longitude data obtained from the GPS use, which is then transmitted to the main controller's (leader's) platform, thereby achieving the relative relationship between the designated position reached and the distance. At the same time, an emergency button was designed to notify the main controller (leader) through interruption in case of an emergency [8-10].

2. The System Architecture

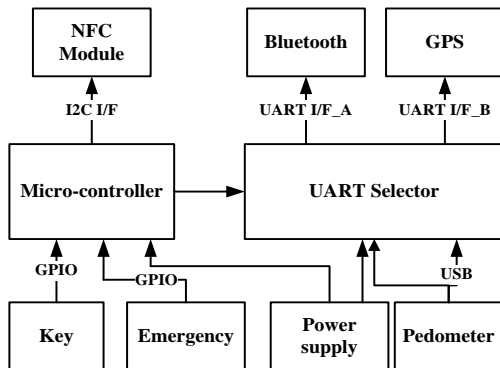


Fig. 1 System prototype machine (left) and systemfunction block diagram (right)

The design ideas of the system are as shown in Fig. 1. Complementary to the satellite positioning data, and combined with group management, personal information identification, and wireless sensor network transfer as the main functions, the relative positions and basic physical and mental state of the members during travel within safe ranges are all monitored by the main controller to achieve the following functions:

- (1) After filling out the questionnaire on personal health information, the tour group member will log in to the management center and enter the information in the RFID card.

The RFID card features the function of member identification and also serves as a reference for emergency rescue and medical aid.

- (2) During the tour period, if there are accompanying nurses, members experiencing discomfort can be treated immediately. Meanwhile, for members requiring special health care, the members' physiological health information can be collected and sent back to the management center daily in the spare time during travel to enable their relatives and family members to inquire and understand the health condition of the members.

3. Results

In this paper, the man-machine control interface of the PDA-side Host adopts the receiving software developed by Microsoft Visual Basic 2005, as shown in Fig. 2. The interface program shows all the information received by the controlled-side and calculates the position-related information. Meanwhile, it can instantly notify the main controller regarding the status between members.

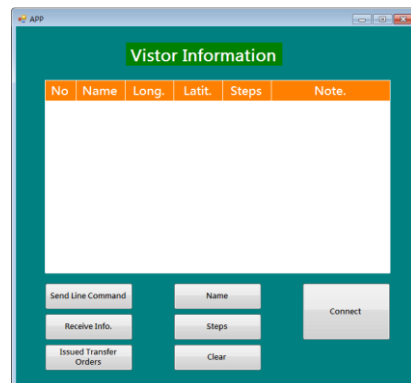


Fig. 2 Host of human interface control software

4. Conclusions

With the more rapid development of the various information technologies, if the technologies can be readily integrated into the life functions where appropriate and be applied in cultural arts, the efficiency can be maximized, the quality of life enhanced, and maximum results achieved at the lowest social costs, which would be great news for all. In this paper, a whole new technology application was implemented: the use of the microprocessor as the man-machine technology, the integration of the various system control modules, and the se-

quence of actions, as well as the functions of the information processing and reading. This device was placed in the actual testing environment. When applied in tourist roll call, its superior function was indeed displayed. It helped the leader save a great amount of time, and showed good results in short-distance monitoring and warning for members needing care. When a situation arose, the most appropriate and instant rescue and care was given within the shortest time possible.

Acknowledgement

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References

- [1] M. Kaur, M. Sandhu, N. Mohan and P. S. Sandhu, "RFID technology principles, advantages, limitations & its applications," *International Journal of Computer and Electrical Engineering*, vol. 3, no. 1, pp. 1793-8163, Feb., 2011.
- [2] S. Shepard, *Radio frequency identification*, 1st ed. McGraw-Hill Professional, 2004.
- [3] K. Finkenzeller, *RFID handbook: radio-frequency identification fundamentals and applications*, 3rd ed. Wiley John & Sons Inc., June 2010.
- [4] K. Albrecht, *RFID tag—you're it*, Scientific American Inc., Sep. 2008.
- [5] R. X. Xiao, W. R. Su, and Y. J. Xu, "The nerve center of the operation of RFID technology-RFID middleware," *Foreseeing Innovative New Digiservices*, Sep. 2004.
- [6] J. Axelsson, *USB complete—The developer's guide*, GOTOP Information Inc., Jan. 2010.
- [7] G. O. Oh, D. Y. Kim, S. I. Kim, and S. Y. Rhew, "A quality evaluation technique of RFID middleware in ubiquitous computing," *Proceedings of the International Conference on Hybrid Information Technology*, vol. 2, pp. 730-735, Nov. 2006.
- [8] Y. C. Liang, S. Sun, X. Peng, and F. Chin, "Tutorial 2: emerging wireless standards for WRAN, WiFi, WiMedia and ZigBee," *The 10th IEEE Singapore International Conference on Communication systems*, pp. 27-29, 2006.
- [9] *Perfecting Just in Time Production*, RFID Journal, <http://www.rfidjournal.com/article/articleprint/530/-1/4>, November, 2003
- [10] Philips, *MF1 IC S50 specification*, Philips Electronics N.V., Jan. 15th, 2007.