Study on a Safety Management Method and Location Detection using Centralized Controlled Wireless LAN System

Katsuya Tanaka[a], Hidenao Atarashi[a], Izumi Yamaguchi[a], Hiroki Watanabe[a], Ryuichi Yamamoto[b], Kazuhiko Ohe[c]

[a] *Department of Planning, Information and Management, The University of Tokyo Hospital, Japan*
[b] *Interfaculty Initiative in Information Studies, Graduate School of University of Tokyo, Japan*
[c] *Graduate School of Medicine and Faculty of Medicine, University of Tokyo, Japan*

Abstract and Objective

Recently medical information systems at patient's bed side are well-practiced using handy terminals or notebook computers via wireless network. For the stable operation of these wireless systems, network administrators need to keep the wireless network system healthy. In the management operation, the main task is to confirm the absence of unauthorized accesses via uncontrolled computers and the absence of unauthorized wireless devices that effects the operation of medical information systems. For the reduction of risks by such unauthorized devices, it is useful to establish an effective monitoring method of unauthorized devices on the wireless network.

Keywords:

Safety management, Wireless LAN, Location detection

Introduction

The Ministry of Health, Labor and Welfare, Japan (MHLW) has been publishing a guideline for safety management of medical information systems since Mar. 2005. Wireless LAN is focused in the guideline, and proper access control and restriction of unauthorized radio signals are mentioned as a risk factor for example, but for a hospital which has dozens of floors, it is often difficult to confirm stable operation continuously. It is effective to realize an automatically monitoring method including risk evaluation and alert function with location visibility [1]. In this research, using centralized controlled wireless LAN system, a safety monitoring is achieved and the experimental results are shown.

Methods

The safety monitoring system in this research consists of following sub systems, Wireless Control System (WCS), Location Appliance (LA) and Location Database (LDB). WCS detects unauthorized IEEE 802.11 radio signals and reports its strength/MAC address/SSID. LA calculates location of all wireless devices under the WCS, every 5 min. LA also has a SOAP XML interface for interconnection and using this interface, historical location database is made into LDB, based on periodically obtained information.

This monitoring system is applied to the wireless network system in our hospital, 40floors/400APs/500Clients. Only by querying to LDB, we can evaluate the signal strength (RSSI) and residence time of unauthorized devices.

Results and Conclusions

Detected alerts were about 30,000 times/week including external radio signals. We could narrow down the focus to about 10 devices using detected signal strength (RSSI > -70dbm) and detected time (multiple days). Portable games were often included, but no serious failure was detected by these devices.

Location detection capability was also measured. Detection error was Avg.:4.1m/Max:10.3m/Min:0.7m. About 5% misrecognition of floor/building was occurred, but it could be reduced by evaluating signal strength. Following capability was about 15min (3 calc. cycles). It is enough to locate the unauthorized devices in the floor. These capabilities are considered to meet the requirements of medical equipments management using Wi-Fi tags.

Using this monitoring system, we could detect and evaluate operation risks in our hospital, and LDB is useful for other location applications such as medical equipments management.

References

[1] Maglogiannis I, Hadjiefthymiades S. EmerLoc: Location-based services for emergency medical incidents.: International Journal of Medical Informatics, Volume 76, Issue 10, October 2007, Pages 747-759.

Address for correspondence:

Katsuya Tanaka, Hongo 7-3-1, Bunkyo-ku, Tokyo 113-8655, JAPAN; e-mail: <katsuya@hcc.h.u-tokyo.ac.jp>