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A Study of Patient Monitoring System in Hospitals through RFID

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Abstract: *Radio Frequency Identification (RFID) has become popular from army to industry. RFID tags have been implanting into many various products, especially in organization part. A tag stores individual information of its fix object and an RFID reader reports with the tag in radio frequencies to determine the object. This object to be monitored may also be a human. In our use, RFID technology is applied in health care systems. The system carries wireless mobile communication between the reader and RFID tags. Each patient available in the system is wears a bracelet and built-in mobile united with a unique tag, and the readers are mobile PDA devices each including a wireless RFID reader card. The proposed system can be used to identify and monitor the patients.*

Keywords: *Security, Smart Monitoring, Smart Reader***.**

I. Introduction

Radio Frequency Identification is a dispatch technology, which permits for explaining some unique attribute of an object, usually its identification information, by relating it to a numeric serial number within a tag, and ensures that this number is conveyed by using radio waves. RFID provides a transmission at the radio frequencies between a reader device and special tag that can detect the tag, and allows for establishing communication between devices within the system without any physical contact. Communication comfort can be provided with RFID technology in environments where technologies which require that the devices must exactly see each other, like the case in barcode systems, cannot be used.

RFID technologies are used in number of fields including military, logistics, education, production, security, and health. For these dissimilar areas, passports with implant RFID-tagged chips with identification purposes, RFID systems used by locating tags with antennas in library books, systems with tags for tracking objects and human beings, automated processes used for product identification and monitoring in stock warehouses, authorized entry and exit systems to and from certain territories, applications in hypermarkets in shopping industry, and various similar applications can be given as examples. Due to its low cost, RFID technology is becoming universal throughout the global world.

There are different applications of using RFID technologies in the health service. In addition, member groups of RFID in Healthcare partnership assert that wireless Technologies should be used in a systematic and secure manner in the health care industry. When the importance of human health is considered, it is necessary that information is moved in a correct and fast manner to rapidly performthe tags that they carry and to quickly process the previously stored information about that patient. Based on this sensible inspiration, an RFID-supported patient monitoring system in hospital is designed. The proposed design and the implementation of the system are examined in this paper.

In this aim, the goal is to transplant the identification information of patients who use RFID tags in a preserve them in a digital environment and safe manner so that transmission between authorized doctors and patients could be improved by means of RFID technology. In this consider, another purpose is to present a running solution example, with RFID applications in systems which perform patient monitoring system in hospitals. The rest of the paper is ordered as follows: Section 2 surveys the main characteristic of RFID technology. Section 3 presents the design and the implementation details of our patient monitoring system in hospitals. Finally Section 4 concludes the paper.

II. Rfid Transmission

In this part, primary components of RFID transmission and standards used in communication are presented and the topology used for RFID communication is described. In addition, the privacy issue, which is seen as a prime social fact in perceiving RFID based applications, is also indicated.

2.1 RFID Tags

As a widespread category, RFID technologies can be seen as a kind of technology. MIT-centered Auto-ID laboratories are developing network similar to the Internet so as to monitor in international territory the products which bring the Electronic Product Code. In this estimate, an attempt is made to develop RFID

networks along with EPC-inclusive RFID tags. Devices which are called RFID tags basically include a microchip which includes EPC in its memory and an antenna. They can be in a number of forms and they can implant on products in various ways. For example, an RFID-tagged anklet, which is considered for making the patients wear.

EPC is utilizing for recognizing the object on which it is implanted via RFID tag by giving it a serial number. An EPC at Auto-ID standards is a piece of data with 94 bits, where the first 8 bits are title, following 28 bits is the producer of the product, the next 24 bits are the variety of the product, and the last 36 bits are the serial number which identifies the product. This piece of data which is included in the memory of the RFID tag can be read by an RFID reader device via radio communication through the antenna in the tag.

2.2 RFID Transmission Standards

In Table 1, frequency meantime, tag reading gap, and data transfer rates in transmission are shown for major RFID transmission types which can be used at different frequencies according to these standards.

a. Low frequency (125 – 134 kHz)
b. High frequency (13.56 MHz)
c. Ultra-high frequency (433, and 860-960 MHz)

2.3 Privacy in RFID Applications

Security is a matter which should be inspect in all types of new technologies. In terms of data security, privacy concept means battering personal information or not displaying any single information. In monitoring and tracking applications where RFID tags are implant to living beings, for example when patients are monitored through RFID tagged anklet, if the communication between tags and readers is performed in wireless territory and without any encryption, people with ill-intentions can have access to the system. If the transferred information is private, this act can constitute a violation of privacy. In case the shift information is single and EPC code, there can be an opponent in the environment with illegitimate access to the computer where this EPC code and relevant information is preserved. In introduction, wireless environment normally includes a number of security threats. In RFID applications which can be the target of social response, privacy may not be totally secure, but systems which allow maximum security can be favored. The first resolution, which comes to the mind is encrypting the data communication. In inclusion, authentication might be examined as well. Due to cost considerations, additional procedures might be chosen depending on the importance of the application.

III. Patient Monitoring System Using Rfid

In this study, an RFID- established patient-monitoring system in hospitals has been considered. This system, which can be generated by combining a probable patient information system and advanced RFID application, is seen as a proper solution in cases when doctors want to have quick and automatic access to patient information and in particular when patients are not able to initiate healthy communication. From this point on, after the information of patients who come to the hospital is recorded in the system, an anklet is worn by the patients which includes an RFID tag, and the applicable doctor who is allocate to the patients can read the tag in the anklet with authorized access to an RFID card reader-supported PDA device, and, as a result of this sense, PDA device can reach the server and withdraw applicable health information from database and submit them to the doctor.

3.1 Structure of the System

In Fig. 1, the communication structure of the designed system is shown. In this system, the network structure of the RFID application was predicted to have star topology and using resigned tags the radio frequency communication can be seen as a one directed graph. The bottom server of the system may be connected to many of different local stars, each including a number of tags and a mobile reader. The wireless reader cards are integrated into mobile PDA devices, and the tags are implanting into an ankle. Taking into reflection the issue of privacy in RFID applications, it is decided to use symmetric encryption in data transfer to the server during the communication between server and the PDA so that the transferred tag data can be protected.

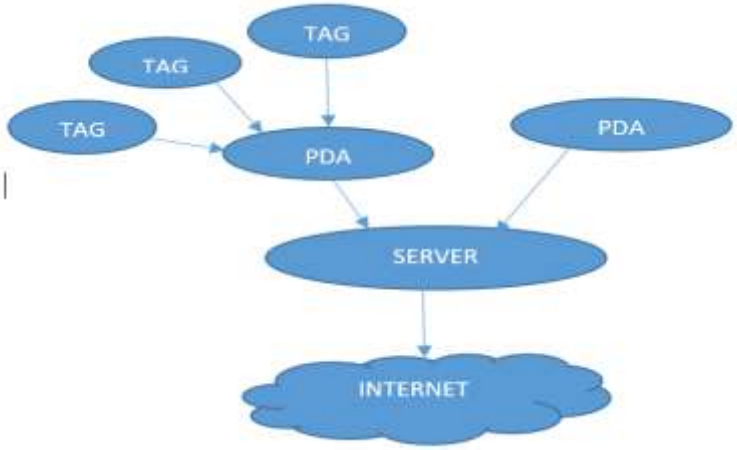

Figure 1: Communication Structure of the System

Flow Process work on the addition of patients in the designed patient monitoring system in hospitals is shown in Fig. 2. Before the patient is catch to the hospital, a file is opened, which is related to the patient and the information about patient are controlled. If the patient is recorded in the system, newly receive information is updated in the database; otherwise, the patient is given an RFID-tagged anklet and information related the unique tag number in this anklet is recorded in the database. Then, the patient can be directed to the applicable health official.

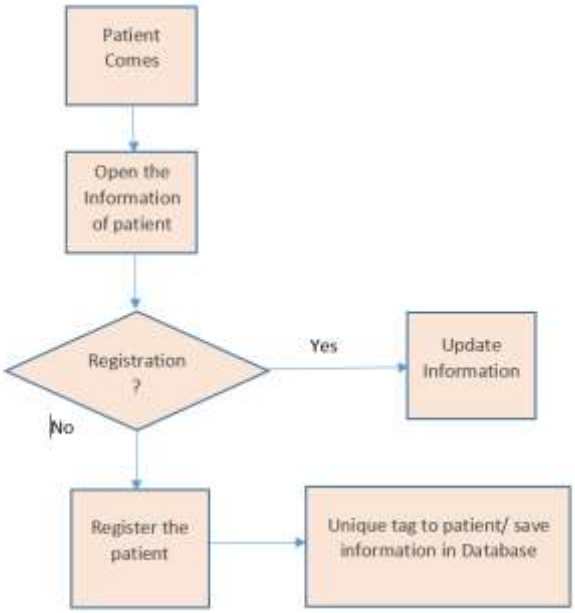

Figure 2: The process of patient entrance into system

The doctor first gets the related RFID tag information from bracelet of the patient by a PDA. After having examined the patient, the doctor records the related information updates within the PDA. Finally the updates are saved in the database server through the background communication between the PDA and the server.

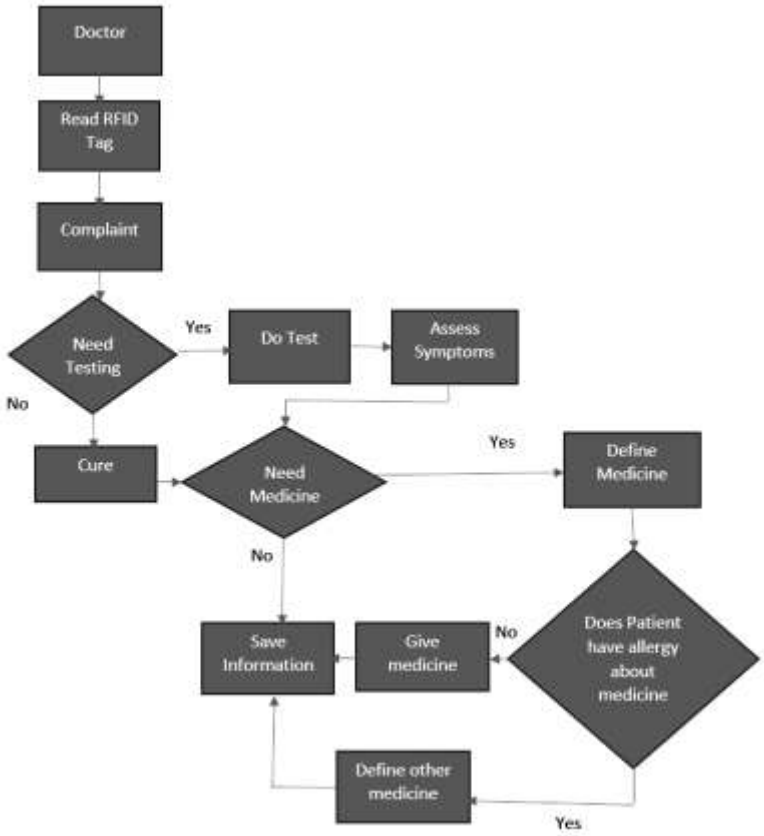

Figure 3: Representative use of system by a doctor owning a PDA (Personal Digital assistant)

IV. Conclusion

In this study, concepts in RFID technologies are described and applicable level is inspected. Elements considered in the design of RFID systems are identified and as an example application, RFID transmission is used for patient monitoring purposes in the hospital system. As regards the proposed system, the qualifications of the software and the structure designed for communication at radio frequencies to be performed between anklets that include RFID tag and a PDA device which includes RFID reader are reported. Encrypted transmission during transport of tag information read by PDA in the system to the server is performed fast and easily. However, in terms of system protection, using encryption in both-way transmission between the server and PDA and making this encryption algorithm would be more secure. Its success may be examined by the system designer by taking account the system resources. It may be a future work to develop another patient monitoring application code in that direction for mental asylum.

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