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THE USE OF RFID IN THE PATIENT

TRACKING SYSTEM

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Abstract:

Radio Frequency Identification (RFID) though finds its use in many applications, still has to be accepted in a clear view. Talking in the perspective of a patient the only thing that strikes first is that lots of treatments undergone, many health records to be maintained, and after which remembering the concerned doctor's name and other details. This becomes impossible at a certain point of time when the details have to be conveyed. To make it easier this concept of maintaining a centralized information system and sharing has been proposedthrough the use of RFID technology. RFID is known for its unique ID number.Using this advantage, in the first section the monitoring of a patient is done whenever he arrives at the hospital. In case of any shifts from the hospital the information is still available. Every patient is provided with a unique RFID number and all the details regarding the patient and treatments are stored in a centralized database which is retrieved by the server. The second section is patient tracking where in case of any emergency in a closed environment the patient is provided with assistance in a short span of time. The patient is regularly monitored by the temperature and heartbeat sensor. The moment the value crosses the normal range a message is sent through GSM/GPS to the nearest hospital with its location and also to a relative. Assistance is provided accordingly to the patient. Perceived advantages are the major aspect in promoting RFID use in healthcare. The research concludes that RFID in patient tracking system has barriers like privacy issues. Besides the advantages, there are alsodisadvantages of using RFID technology in the patient tracking system. To make the system more secure, issues related to the patient safety (i.e., security, privacy) need to be resolved.Radio Frequency Identification (RFID) has become popular in so many fieldsfrom military to industry applications. RFID tags have been embedded into manyvarious products especially in logistics sector. A tag stores individual information of its attached object and an RFID reader communicates with the tag in radio frequencies to identify the object. This object to be monitored may also be a human. In our work, RFID technology is applied in health care systems. The system supports wireless mobile communication between the RFID tags and readers. Each patient available in the system is inherently mobile and wears a bracelet integrated with a unique tag, and the readers are mobile PDA devices each including a wireless RFID reader card. The proposed application can be used to identify and monitor the patients.

KEYWORDS: GSM Modem, MAX 232 IC, PIC micro-controller, RFID Reader, RFID Tag.

I. INTRODUCTION:

RFID stands for Radio Frequency Identification. RFID is one member in thefamily of Automatic Identification and Data Capture (AIDC) technologies and is a fast and reliable means of identifying objects. There are two main components: The Interrogator (RFID Reader) which transmits and receives the signal and the Transponder (tag) that is attached to the object. RFID leverages electromagnetic or electrostatic coupling in the radio frequency portion of the electromagneticspectrum to identify objects over a distance of potentially several meters. While its origins can be traced back to 1940s its commercial applications have started expanding significantly recently as a replacement or supplement to barcode technology, thanks in part to standardization, availability of commercial off-the- shelf (COTS) components, and their reducing cost.RFID systems are employed to track shipments and manage supply-chains and to automate toll collection on highways, and are being deployed for many new application areas (e.g., passports, airline boarding passes, luggage tags, etc.). In this work, we experimentally examine the patient details and track them in the case of an emergency in an indoor environment. Our focus is on the people(patients) who do not have any assistance at home particularly the oldies who are totally on bed. Our implementation highlights the monitoring techniques in RFID technology. We have structured our paper in two sectionsRFID has recently been used in hospital administration. In the hospital, the RFID is useful for promptly retrieving and tracking the situations of patients.

Creating a more secure healthcare system might reduce the incidence of medical mistakes.

Medical mistakes may be grouped into five categories: bad decision making, poor communication, insufficient patient monitoring, patient misidentification, and failure to react swiftly and poor patient tracking (Abugabah et al., 2020b). The current trend in boosting patient safety is to use novel information technology to eliminate these flaws and achieve the Joint Commission on Accreditation of Healthcare Organization (JCAHO) patient safety standards (Wu, 2019).

II. LITERATURE SURVEY

UNDERSTANDING THE MONITORING AND TRACKING:

Remote tracking and monitoring is a healthcare delivery practice that uses thelatest developments in information technology to collect patient data outside the normal healthcare setup. Most effective remote patient monitoring systems arebasic systems that use devices that are tech consumer –friendly. The technologies used in most of the health monitoring systems are made in such a way that the patients using them are comfortable. Remote and tracking system for a medical centre that seamless tracked patient's biomedical vitals online without human interactions.

TECHNOLOGIES COMMONLY USED IN HEALTHCARE INDUSTRY:

Modern developments in ICT and the emergence of Internet of Things (IoT) have unlocked up new avenues for research and exploration in the all fields including medical and healthcare industry. Hospitals have started using the mobile devices for communication intent and for this intent internet of things (IoT) hasbeen used and fused with Wi-Fi sensor node reminiscent of RFID, NFC tag and small sensor nodes.The usage of a cellular agent in healthcare technique underneath Wi-Fi community environment gives a chance to suggest improved services for patients and staffs reminiscent of medical professionals and nurses given that of its mobility. Advancements in Internet of Things (IoT) are mostly used for connecting the different devices like as sensors, appliances, vehicles and other objects. All these devices may equip with radio-frequency identification (RFID) tag, sensors, actuators, mobile phones and many other. By using IoT all these devices are connected to establish the communication between them

and efficiently access the information. The main support of IoT is to swell the profit of Internet with remote control talent, data sharing, 18 eternal connectivity and many more. The healthcare servers keep electronic medical records of registered users and provide different services to patients, medical consultants and informal caregivers. The patient's consultant can access the data from office via internet and examine the patients' history, current symptoms and patient's response to a given treatment. The current evolution of the traditional medical model toward the participatory medicine has been boosted by the Internet of Things (IoT) paradigm involving sensors (environmental, wearable and implanted) spread inside domestic environments with the purpose to monitor the user's health and activate remote assistance. Radio Frequency Identification (RFID) technology has matured to provide part of the IoT physical layer for the personal healthcare in smart environments through low-cost, energy-autonomous and disposable sensors. It is here presented a survey on the state of the art of RFID for application to body centric systems and for gathering information (temperature, humidity and other

gases) about the user's living environment.

RADIO FREQUENCY IDENTIFICATION(RFID) TECHNOLOGY:

Radiofrequency identification (RFID) uses electromagnetic fields to automatically identify and track tags attached to objects. RFID belongs to a broad category of technologies called automatic identification technologies (auto-id). According to Wyld and Budden, auto-id technologies provide rapid and reliable object identification and tracking capabilities. Auto-id systems attach an identifier to a physical object by some means that may be automatically read. The auto-id may be represented optically, electromagnetically, or even chemically. Other technologies that fall under the auto-id classification include bar codes, magnetic links, optical character recognition, voice recognition, touch memory, smart cards and biometrics. A Scottish physicist, Alexander Watson-Watt, discovered how to use radio waves to detect objects. This discovery directed to the invention of radars in 1935. Through World War II, radars were heavily used to detect inbound plane.

III. PURPOSE

This system aims to eliminate and in some cases, reduce the hardships faced by the prevailing manual system. This system is designed for the sole purpose that the company can run its other important operations in a smooth and effective manner. This application can lead to an error-free, secure, reliable and fast management system. Therefore, it can help an organization in better utilization of resources. The prevailing system is considered to be tedious and time consuming and can lead to faults and errors almost all the time. The Secure Election App intends to minimize all these drawbacks by providing a simple, yet efficient solution to the problem. This system calculates the results of the user's attempt and it does so automatically by using the in-built algorithm to give us the exact result, without any miscalculation or counting error. By using this application, we tend to save a lot of time and energy in just a few taps on a touchscreen. This application will be made an open-source software, so that all can use this application at any given time and will also be available for free of cost.

IV. EXISTING SYSTEM

Patient identification:

According to Amondola et al, the use of RFID in hospitals and medical facilities can improve the patients' care, optimize the workflows, reduce the operating costs, help avoiding severe mistakes (such as patients' misidentification) and reduce costly thefts. J best stated that RFID has the potential to be used not just for the monitoring of patients' physiological parameters, but also for management of medical equipment, dangerous medical substances and drugs, inventory control, and the identification and locating of patients. Nichols et al describe a RFID chip enabled card that allows patients to have their medical information read and even written to by physician even if the patient has undergone medical treatment in another hospital. Change presents a solution where RFID is used for patient appointment where a card is used for making appointment at hospital and patients

served based on priority. Jacobi Medical Centre in New York, in the Birmingham Heartlands Hospital is among some of the hospitals that have rolled out this technology. To implement such a system Birmingham hospital installed RFID readers around the hospital. Patients admitted to the hospital were given an RFID-based wristband resembling a watch with a passive RFID chip in it. The chip stored a unique patient ID number and some relevant medical information such as the patient's blood type, in order to speed treatment. To ensure patient privacy and to avoid that medical records are improperly disclosed, further medical data were not stored on the devices but are rather stored in a secure database that links the unique patient's ID with its data. The caregiver here was given a handheld computer with an RFID interrogator (an RFID enabled PDA) to read the data encoded on the patient's ID bracelets. Over a wireless LAN connection, the hospital staffs were able to access the patient's encrypted confidential medical history as well as treatment record and can obtain information on which drugs and what dosages the patients required. Patients were able to check their own records by scanning their wristbands using information terminals.

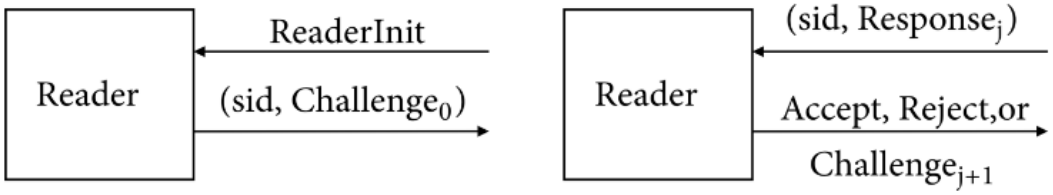
V. SCOPE

The proposal in this dissertation focuses on the main scope as mentioned below:

- The project will mainly focus on developing a system that will track and monitor patients.
- The proposed system will focus on tracking patients by using a RFID sensor and tag. The patient's information will be captured and stored in the database using an RFID reader.
- To reduce the carrying load of the treatment details and the records.
- To develop a centralized and distributed server and database where the information is shared between different servers.
- To provide assistance to patients at home when there is no one beside them.
- To also intimate the relative of the patient and the nearest hospital so that they are there when needed.

VI. METHODOLGY:

Radio-frequency identification (RFID) technology is used to track patients by generating a unique ID. Patient information will be retrieved from the database using this ID. The system will provide a cost-effective means of increasing reliability, privacy and security in the management of healthcare records. RFID systems usually use symmetric encryption algorithms. The execution of the protocol is usually started by a reader, and the authentication result will be output by the reader. The reader will refresh the related data in the background database. The type of privacy indicated in the abstract mainly includes the position of the electronic tag carrier and personal information. No personal information is stored in the rom of electronic tags; rather, all personal information is stored in the background database. Only when the reader conducts the identity authentication of the electronic tag will the background database return the specific items of the reader.



VII. SOURCE CODE:

```
#include <Wire.h>
#include <PulseSensorPlayground.h>
#include <OneWire.h>
#include <DallasTemperature.h>
#include <ESP8266WiFi.h>
#include <WiFiClient.h>
// Define the pin for the pulse sensor
#define PULSE_SENSOR_PIN A0
// Define the pin for the temperature sensor
#define TEMPERATURE_SENSOR_PIN 2
// Define the baud rate for the serial communication
#define SERIAL_BAUD_RATE 9600
// Define the WiFi credentials
#define WIFI_SSID "THAYA"
#define WIFI_PASSWORD "Athryan@741"
// Define the Thingspeak channel and API key
#define THINGSPEAK_CHANNEL_ID "1992419"
#define THINGSPEAK_API_KEY "KTOB4T3XX5DRLPAC"
// Create an instance of the PulseSensorPlayground class
PulseSensorPlayground pulseSensor;
// Create an instance of the OneWire class
OneWire oneWire(TEMPERATURE_SENSOR_PIN);
// Create an instance of the DallasTemperature class
DallasTemperature temperatureSensor(&oneWire);
#define SERIAL_BAUD_RATE 9600
// Define the WiFi credentials
#define WIFI_SSID "THAYA"
#define WIFI_PASSWORD "Athryan@741"
// Define the Thingspeak channel and API key
#define THINGSPEAK_CHANNEL_ID "1992419"
#define THINGSPEAK_API_KEY "KTOB4T3XX5DRLPAC"
```

```
// Create an instance of the PulseSensorPlayground class
PulseSensorPlayground pulseSensor;
// Create an instance of the OneWire class
OneWire oneWire(TEMPERATURE_SENSOR_PIN);
// Create an instance of the DallasTemperature class
DallasTemperature temperatureSensor(&oneWire);
void setup() {
// Initialize the serial communication
Serial.begin(SERIAL_BAUD_RATE);
// Initialize the pulse sensor
pulseSensor.analogInput(PULSE_SENSOR_PIN);
// Initialize the temperature sensor
temperatureSensor.begin();
// Connect to WiFi
WiFi.begin(WIFI_SSID, WIFI_PASSWORD);
while (WiFi.status() != WL_CONNECTED) {
delay(1000);
Serial.println("Connecting to WiFi...");
}
```

VIII. CONCULSION & FURTHER ENHANCEMENT

Patients have suffered severe injuries because of medical interventions, and the primary goal has been to reduce and eliminate such incidents as much as feasible. An extensive financial investment in hardware devices (tags, readers, and access points) is required for the system's development and implementation. This cost is related both to the scale of the functioning area but also to the entities (patients or medication) that need to be tracked. Expertise acquisition in the medical field is clearly a time-consuming and difficult organization. Furthermore, in this scenario, the developed models cannot be applied to other healthcare facilities or services. The RFID component providers don't provide adequate information on how to construct these projects.

As a final consideration, care units and hospitals have varying needs when it comes to patient tracking systems. Variables like building materials and zone layouts may impact the accuracy of patient localization and access point distribution. Because of this, a large portion of the system's design and development must be tailored to the unique context in which the system will indeed be put into use. This research examines how RFID may be used in healthcare, as well as the existing obstacles that healthcare providers must overcome in order to use RFID for patient monitoring. When these issues are resolved, new possibilities for RFID data processing and administration become apparent, and advice is provided for large-scale deployment and worldwide acceptance. According to this research study, the health care industry's overall rganizational climate has a significant impact on whether or not RFID is used. This research uncovered four distinct aspects of an organization's culture, structure, managerial backing, and financial commitment That have been previously documented

FURTHER ENHANCEMENT:

In our project we concentrated on the patients who are inside four walls i.e. in a closed environment. In our future work we would develop an application which would be helpful for the people who have got to travel for their work. This would make sure that they are provided assistance on the spot not relying on anyone. Hence reducing the risk of losing their lives in an open environment. Inside Hospital, The RFID tags communicate with the RTLS and workflow software over the Wi-Fi network every two to three seconds. When patients move, sensors strategically placed in rooms and hallways detect their location, allowing hospital staff to know where patients are at all time to provide more safety. But this invade their privacy but only for their goodness.

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