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Hospital services Management system using Internet of Things (IoT) Techniques

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ABSTRACT

A hospital patient tracking system using RFID technology is a web application developed for medical personnel (doctors and nurses) to monitor the movement of hospitalized patients. A RFID reader placed in each room will detect a patient wearing a registered tag when entering and leaving the room. It is designed to address the problems of long queues, overcrowding, delayed treatments and insufficient beds for patients. The tracking process is used to track all registered patients. At the same time, the duration of the patient process in each room will be recorded and calculated to obtain the range processing times in each room. It can be used to refer to and address the bottlenecks they face at the hospital. All medical personnel must register and be approved by the system administrator before access the system.

Keywords: RFID, Tracking, system administrator

1 Introduction

RFID stands for Radio Frequency Identification. RFID is one of the members of the AIDC (Automatic Identification and Data Capture) family of technologies and is a fast and reliable means of object identification. There are two main components: an interrogator (RFID Reader) that sends and receives a signal, and a transponder (tag) that is attached to the object. RFID uses electromagnetic or electrostatic coupling in the radio frequency portion of the electromagnetic spectrum to identify objects over a distance of potentially several meters. In this work, examine the details of the patient and monitor them in case of an emergency in the indoor environment. Focus on people (patients) who have no assistance at home, especially old people who are completely bedridden.

2 Proposed Approach

During registration, an RFID-enabled smart bracelet can be used for identification patients and expose personal information such as date of birth, name, insurance information, allergies, blood type and prescribing needs as part of a positive patient identification system. RFID tags that are attached to the patient the body can store personal information, including the patient's



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name, gender, residential address, but also health information. This information is highly mobile and extremely sensitive. Similarly smart RFID technology can help reduce patient identification errors. Patients are identified by RFID, which can be used to search and collect relevant medical data diversity of current health information systems, possibly reducing the number of errors in patient care. RFID can also be used to identify surgical patients to verify that the treatment is done on the right person. RFID is currently seen as a technology that can improve medical care and safety by tracking vulnerable patients rather than tracking assets. Tracking movements by long-term old or confused patients as well as juveniles to prevent infant abduction is an example of this. For immediate patient detection and identification, RFID tracking of patients was also used to quickly initiate the provision of medical assistance. This means that RFID technologies for patient monitoring have the ability to automatically reduce waiting times showing what stage the patient is in as well as providing transparency for patients and staff surgical trajectory and improving patient flow. Identifying patients who are ready to be hospital discharge can also be done using RFID tagging. This helps to reduce unnecessary hospital stays and better allocation of resources.

3 Objectives

The goal of the project is to design and build a portable RFID reader with data storage for the purpose of recording patient details. It also includes a database, monitoring and an interface for connecting RFID to the database. Computerization of all patient and hospital details. Scheduling patient appointments with doctors for mutual convenience. Implement workflow automation. Secure hospital data and enhance recovery capabilities as it contains sensitive patient, staff and hospital information. Reduce hospital operating costs. Provide reports and analytics to management at any time for better decision making

4.1 Hardware and Software Requirements

Required hardware used should be easy to maintain, implement and easily available. The required hardware is as follows;

- Arduino Uno
- RFID Reader MFRC522
- RFID tags
- Arduino IDE
- NODE MCU

Radio Frequency Identification (RFID) refers to a wireless system composed of two components: tags and readers. A reader is a device that has one or more antennas that emit radio waves and receive signals back from the RFID tag. Tags that use radio waves to communicate their identity and other information to nearby readers can be passive or active. Passive RFID tags are powered by the reader and do not have a battery. Active RFID tags are powered by batteries. RFID tags can store a range of information from a single serial number



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to several pages of data. Readers can be mobile, so they can be carried in the hand, or they can be mounted on a post or overhead. Reading systems can also be built into the architecture of a closet, room or building.

RFID tags are a type of tracking system that uses radio frequency to locate, identify, track and communicate with objects and people. RFID tags are essentially smart tags that can store a variety of information from serial numbers to a short description to pages of data. Some RFID tags include cryptographic security features for a high level of verification and authentication. RFID block diagram shown in figure1.

4.2 Passive and Active Tags

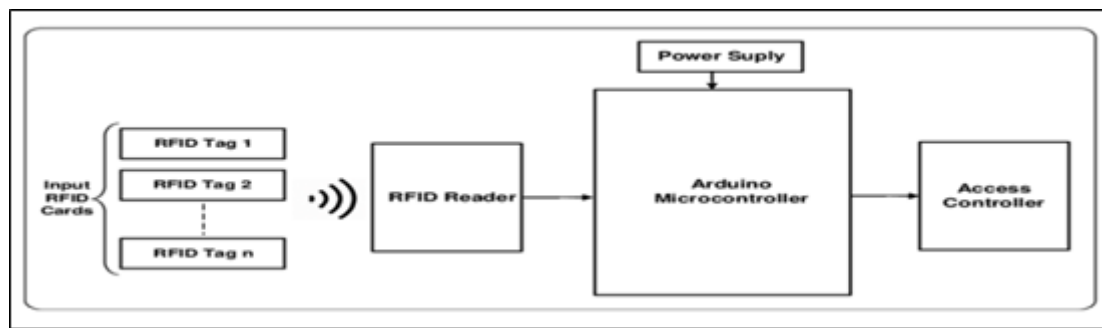


Figure 1: *RFID Functional block diagram*

There are two types of RFID tags – passive and active. The most common are passive RFID tags; they do not require direct line of sight to the reader, but have a much shorter reading range and are smaller and lighter. Active RFID tags are less common and require their own transmitter and power source. These labels tend to be bulkier, more robust, more durable and more expensive. An example of an active RFID tag is a beacon used for RTLS, continuous medical monitoring or amusement park attendance.

4.3 RFID Transmitter

The RFID transmitter has two basic tasks. In the download phase, it must provide power to trigger the passive tags and modulate its signal to send commands and data to the tags. In the uplink phase, the transmitter must provide an unmodulated signal that the tag can backscatter to return data to the receiver. A transmitter must be able to operate on any of the many radio channels with an accuracy of a few parts per million frequencies and switch rapidly from one channel to another to meet the requirements for unlicensed use.

4.4 RFID Receivers

RFID receivers face a unique set of requirements, quite different from those encountered in most other radio systems, especially when passive tags are used. The received signal and the local oscillator signal have exactly the same frequency, the absolute phase of the received



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signal affects the amplitude of the down-converted signal, so some phase diversity must be provided to ensure the visibility of the tag signal. The circuit diagram shown in figure4

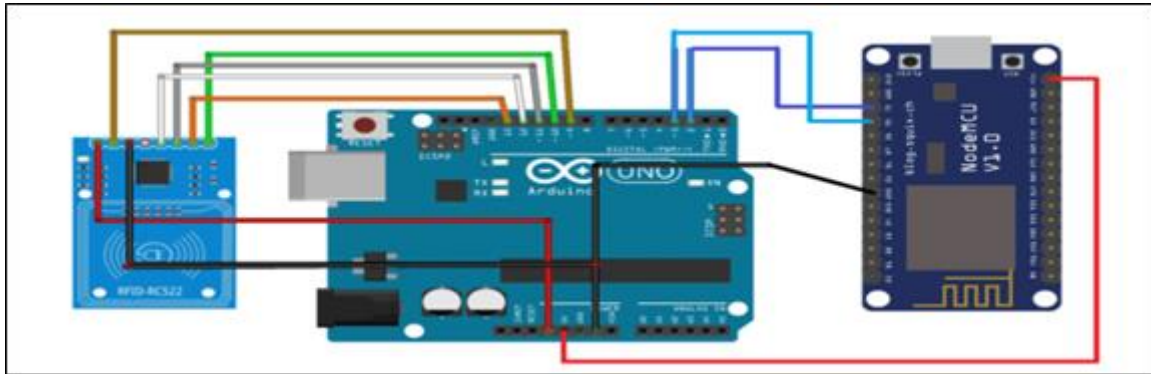


Figure 2: *Circuit diagram*

The magnetic signal is transmitted by the loop antenna connected along with this circuit which is used to read and write the information on the RFID card. Then the card is valid the microcontroller transfer the card information to PC. Through PC access the application which will display the information about that person. The information held by the chips is the same as that on the first page of a patient health condition, via name, date-of-birth, gender, place-of-birth, date-of-issue and treatment already done. Arduino and RFID scanner scans the RFID cards and then logs the data to the Adafruit IO cloud platform with the help of the ESP8266 Wi-Fi module. This information can be displayed in the Adafruit IO dashboard and can be accessed by the required authorities to view and analyze the patient details from anywhere at any time.

5 Results and Discussion

Medical and human errors caused by patient misidentification, poor decision-making, inadequate monitoring, poor follow-up, failure to respond quickly, and medication no adherence can all be reduced with RFID technology. However, there are several issues with RFID that hospitals and other healthcare facilities should be aware of before using this technology to improve patient safety. These difficulties include technology, data management, security and privacy, as well as organizational and financial issues. Globally, medical errors are now the largest cause of death. By reducing the drug Misidentifications, but also nonadherence, RFID-enabled patients, and prescription identification systems appear to improve patient care. As previously mentioned, there are a number of patient-related uses of RFID that offer significant gains in both efficiency and security. The output is shown in the Figure 3 and Figure 4



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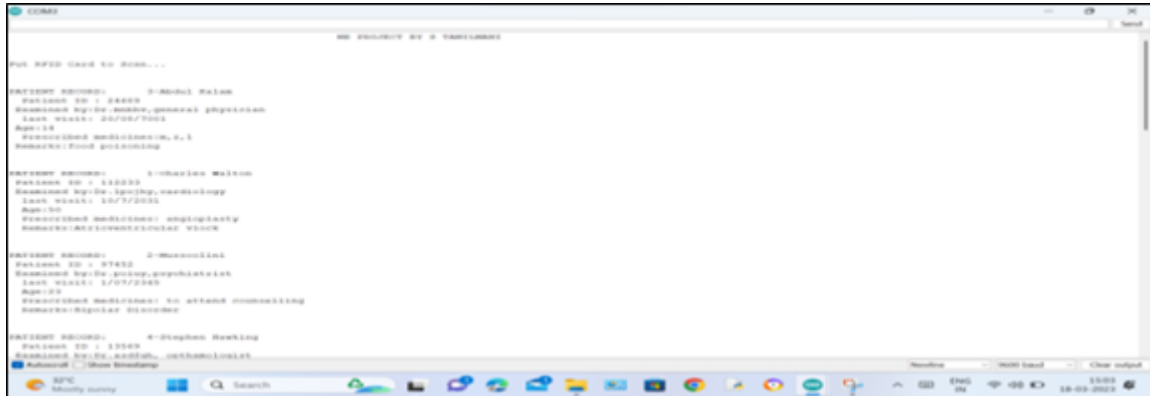


Figure 3: Adafruit output1



Figure 4: output

6 Future Scope

RFID (Radio Frequency Identification Device) is an emerging technology that enables identification and tracking. It can help hospitals find expensive equipment quickly. Helps improve patient care; maintenance of logistics, pharmaceutical stores by effective management of movable property. RFID readers are placed at the entrance, door frame or anywhere in the rooms or hospital. Whenever an object moves, the reader automatically reads the stored information, decodes it and transmits it to remote computers. The more the number of receivers, the more precisely the device can be located. Special wristbands are designed for patients that track their movement, treatment details and medical history. Persons authorized to control the system monitoring all technology can easily locate the location of hospital staff; the time spent by nurses with patients can also be tracked. A person can find RFID library books tagged with RFID tags using an RFID reader to identify and locate the book. Expired medicines can also be checked using RFID tags. Hospitals and the medical care industry in general are adopting asset tracking technology to monitor equipment, track patients including tracking children, track staff, and ensure patients receive the right medications and care—all in an effort to reduce costs and save patients lives.



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7 Conclusion

Patients suffered severe injuries due to medical interventions and the primary goal was to reduce and eliminate such incidents as much as possible. Acquiring medical expertise is obviously time-consuming and difficult. Variables such as construction materials and zoning layout can affect the accuracy of patient localization and the distribution of access points. For this reason, much of the system design and development must be unique the context in which the system will actually be put into operation. Previous research supports three aspects of the construct: more efficacy, less human engagement and real-time patient location information. Streamlined processes have also proven to be a key benefit of RFID in healthcare. This idea is consistent with the common need for process improvement that is heard in various places. This study found that RFID adoption was hindered by the high cost of new tags, which is consistent with the findings of other researchers. The results indicate that the adoption and implementation of RFID requires a high level of organization preparedness.

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