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USING RFID TO TRACK PATIENT'S HEALTH

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ABSTRACT

When we hear the word patient, the first thing that strikes our mind is a hospital and lots of treatments and tests that are being done on him/her by doctors. In a hospital, there are many patients and these patients have different health problems. A hospital has to maintain all the health records, all the information about the doctors who are treating the patients and what all medications have been prescribed to the patient. This generally becomes very difficult at a certain point of time, especially when all the minute details have to be passed on. To manage the whole process of maintaining, updating and sharing the patient's archives with doctors and families of patients, we have designed a centralized system by making the use of RFID technology. RFID stands for Radio Frequency Identification and is known for its unique ID number. Using this technology, firstly the patient is monitored as soon as he/she arrives at the hospital. Every patient who is admitted to the hospital is provided with a Unique RFID number and all the details about the respective patient is stored and maintained at a centralized location. When the patient leaves the hospital or has to be transferred to another hospital, the information is still stored in the hospital's database. In the second part of this system, the patient's health is continuously tracked. The patient's body temperature and his/her heartbeat is continuously monitored. If there is a case of emergency, the patient is provided with assistance immediately. The normal range has been defined in the system and as soon as the normal range is deviated, a SOS message is sent to the closet hospital with its location and also to a relative with the help of GSM/GPS module.

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

INTRODUCTION

Radio-frequency identification (RFID) is the wireless use of electromagnetic fields to transfer data, for the purposes of automatically identifying and tracking tags attached to objects. The tags contain electronically stored information. Some tags are powered by electromagnetic from magnetic fields produced near the reader. Some types collect energy from the interrogating radio waves and act as a passive transponder. Other types have a local power source such as a battery and may operate at hundreds of meters from the reader. Unlike a barcode, the tag does not necessarily need to be within line of sight of the reader and may be embedded in the tracked object. RFID is one method for Automatic Identification and Data Capture (AIDC).

In the following work, the main objective is to provide assistance to the senior citizens, who do not have any kind of assistance at home or to the totally bed ridden persons.

OBJECTIVES

- To reduce the paper work involved with the patients.
- To develop a centralized system for storing and sharing the information.

- To provide assistance and help to patients in case of emergency.
- To alert the nearest hospital and a relative of the concerned person.

TERMINOLOGIES & TECHNOLOGIES USED IN THE PROPOSED SYSTEM

A. RFID Tag

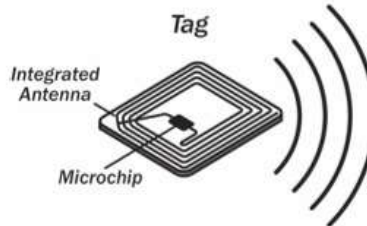


Fig.1 RFID Tag

An RFID tag is an object that can be applied to or incorporated into a product, animal, or person for the purpose of identification and tracking using radio waves. Some tags can be read from several meters away and beyond the line of sight of the reader. The tags typically consist of an integrated antenna and an electronic microchip. The antenna is responsible for making communication between the tag and the reader. There are two main energy classifications of a tag. They can be passive, obtaining energy through the magnetic field generated by readers through antennas, or they can be active, with a battery that provides the energy required to perform processing and modulation of the signal.

B. RFID Reader

RFID Reader is a scanning device that detects the tags that attached to or embedded in the selected items. It varies in size, weight and may be stationary or mobile. The RFID Reader emits a low-power radio wave field which is used to power up the tag so as to pass on any information that is contained on the chip. Passive tags are generally smaller, lighter and less expensive than those that are active and can be applied to objects in harsh environments, are maintenance free and will last for years.

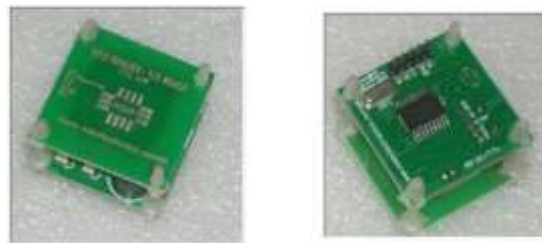


Fig.2 RFID Reader with built in Microcontroller.

C. Microcontroller

The micro-controller used here is the PIC16F877A. The special features of using this micro-controller are mentioned below:

- 100,000 erase/write cycle Enhanced Flash program memory typical
- 1,000,000 erase/write cycle Data EEPROM memory typical
- Data EEPROM Retention > 40 years
- Self-reprogrammable under software control
- In-Circuit Serial Programming™ (ICSP™) via two pins
- Single-supply 5V In-Circuit Serial Programming
- Watchdog Timer (WDT) with its own on-chip RC oscillator for reliable operation
- Programmable code protection
- Power saving Sleep mode
- Selectable oscillator options

- In-Circuit Debug (ICD) via two pins

D. GSM Modem

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. A GSM modem can be a dedicated modem device with a serial, USB or Bluetooth connection, or it may be a mobile phone that provides GSM modem capabilities. When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. While these GSM modems are most frequently used to provide mobile internet connectivity, many of them can also be used for sending and receiving SMS messages.



Fig.3 GSM Modem

E. GPS Module



Fig.4 GPS Module

GPS receiver module is a device that is to be used in the vehicles. A GPS receiver determines just four variables: longitude, latitude, height and time. Additional information like speed, direction can be derived from these four components. They arrive at a calculated value of exact 3-D position by evaluating signals from minimum 4 satellites. Establishing points of interest in real-time and transmitting them via GSM cellular telephone networks using the Short Message Service (SMS) is referred to as Gps2sms. Some vehicles and vessels are equipped with hardware that is able to automatically send an SMS text message when a particular event happens, such as theft, anchor drift or breakdown or even collision.

PROPOSED MODEL

This prototype for our project is divided into two parts-

1. The Supervising section
2. The tracking section

A. SUPERVISING SECTION**WORKING**

The supervising section involves assigning the patient with a new RFID tag if he/she is a new patient; otherwise the RFID reader is used to read the patient's tag and the details of the patient are updated in the login. The details include a unique RFID number, name of the patient, age, blood group, medication details, name of all the doctors who have attended the patient, previous hospital visited etc. In case the patient has to be shifted to another hospital or he/she goes to another hospital on his own, then the centralized server shares the information of the patient with the new hospital so that they can get to know about the patient's complete medical history. This is a hassle-free approach in sharing the information.

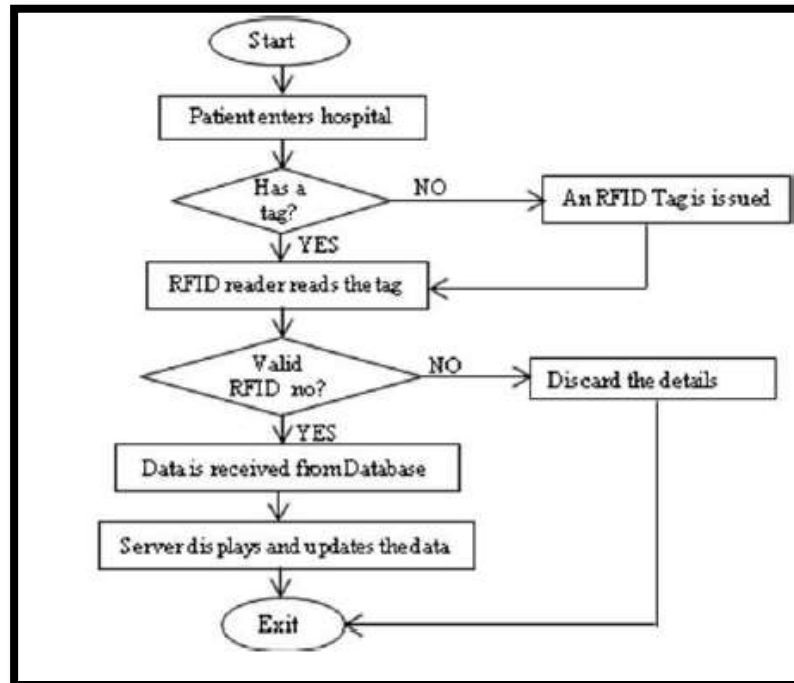
1. FLOWCHART

Fig. 5: Flowchart for Supervising Section

B. TRACKING SYSTEM**WORKING**

After the supervising section comes the tracking section. This system is used to check patient's health condition and is used to provide medical assistance in case of an emergency when nobody is around him/her. Patient's body temperature and heartbeat count is checked all the time. This is done using a temperature and heartbeat sensor. The normal range of human body's temperature and heartbeat count is predefined in the system. If the normal range is crossed for any of the two parameters, then an SOS message is sent to the relative of patient or the hospital along with the location. When the value of the temperature rises than the normal body temperature then a SMS is sent to the close relative of the patient along with its location saying the message "TEMPERATURE IS HIGH". But when the heartbeat raises the normal range then a message is sent to the centralized server hospital with the location. But if the next minute, the temperature still remains high, then the nearest hospital with respect to the patient's location is determined and a message is sent to the particular hospital. Also a SMS is sent to the patient's relative saying "PATIENT IS CRITICAL". Using this system, the ambulance can reach to the exact location of the patient (through the location received), and can reach the hospital for the treatment in time. When the patient is being taken to the ward the doctor with the RFID tag reads the previous details and treatments undergone and the medications are done accordingly.

FLOWCHART

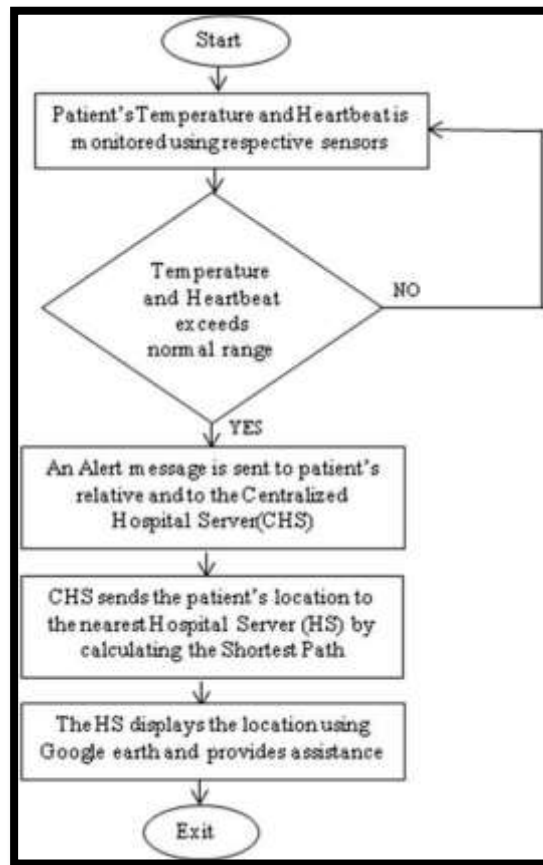


Fig. 6: Flowchart for Tracking System

**FINAL OUTPUT AND RESULTS
SUPERVISING SECTION**



Fig. 7: Central Database of all patients

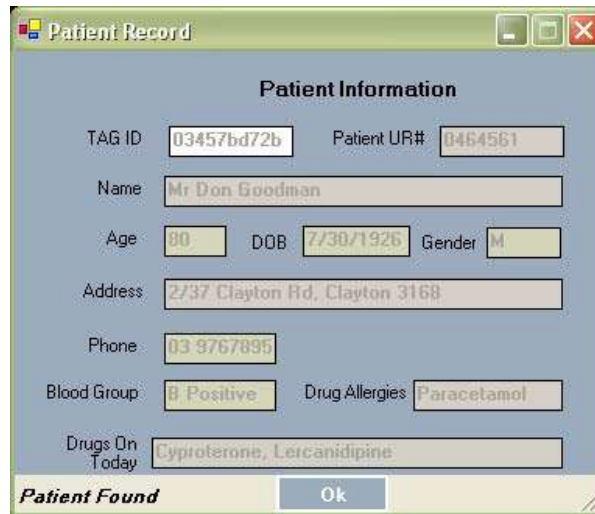


Fig. 8: Patient's Database

TRACKING SYSTEM



Fig. 9: Working Model of tracking System

ESTIMATED COST

The total cost of the project is divided into two parts and then arriving at the total amount.

- Supervising Section - 2000/-
- Tracking Section - ` 4700/-

Total cost of the project - ` 6700/-

CONCLUSION

The main target of this project was to provide assistance to patients who are in a closed environment and are all alone and have no one beside them. With the help of this project, we will be able to provide assistance in the case of an emergency. The supervising section and tracking section of this project can be very helpful when used together and will also reduce the hassle of maintain lots of papers and patient records.