Design and Development of RFID Based Centralized Patient Monitoring System

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***Abstract*: Radio Frequency Identification (RFID) having many applications within that the patient monitoring system is one. In the present work consisting two main parts, one is patient record maintenance and second is patient monitoring. Sometimes patent maintained many health records 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 system and sharing the information through 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 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.**

***Keywords:* RFID Reader, RFID Tag, GSM Modem, sensors, micro-controller.**

1. Introduction:

RFID stands for Radio Frequency Identification. RFID is one member in the family of Automatic Identification and Data Capture technologies and is a fast and reliable means of identifying objects. There are two main parts in RFID: 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 electromagnetic spectrum to identify objects over a distance of potentially several meters. 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. In this work, we experimentally examine the patient details and track them in the case of an emergency in an indoor environment. The main aim of this paper is on the 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.

2. Block diagram:

Figure 1 shows the block diagram consisting of following components

1. RFID Tag
2. RFID Reader
3. Controller
4. GSM Module
5. Biosensors

The detailed information about block diagram is as follows

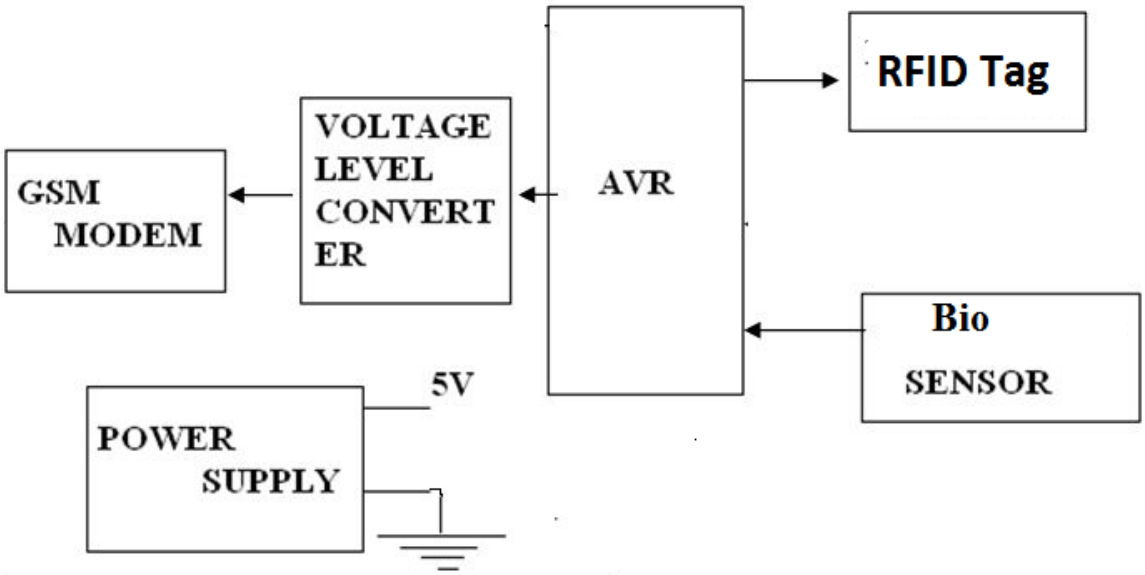

Figure 1: the block diagram of rfid based patient monitoring system.

2.1 RFID TAG:

The tags are transponders that have an identifier of the object with which it is associated. The tags typically consist of an antenna and an electronic microchip (Fig 2). 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 [1].

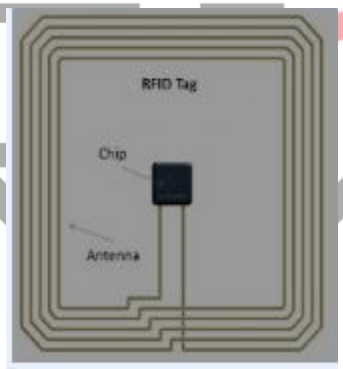

Figure 2: RFID Tag

2.2 RFID Reader:

An RFID Reader (Fig 3) can read through most anything with the exception of conductive materials like water and metal, but with modifications and positioning, even these can be overcome. 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. In addition, readers can be fitted with an additional interface that converts the radio waves returned from the tag into a form that can then be passed on to another system, like a computer or any programmable logic controller [2]. 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.

Figure 3: RFID Reader

2.3 Controller:

The high-performance Microchip picoPower 8-bit AVR RISC-based microcontroller combines 32KB ISP flash memory with read-while-write capabilities, 1024B EEPROM, 2KB SRAM, 23 general purpose I/O lines, 32 general purpose working registers, three flexible timer/counters with compare modes, internal and external interrupts, serial programmable USART, a byte-oriented 2-wire serial interface, SPI serial port, a 6-channel 10-bit A/D converter (8-channels in TQFP and QFN/MLF packages), programmable watchdog timer with internal oscillator, and five software selectable power saving modes [3]. The device operates between 1.8-5.5 volts. By executing powerful instructions in a single clock cycle, the device achieves throughputs approaching 1 MIPS per MHz, balancing power consumption and processing speed.

2.4 GSM Module:

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 [4,5]. 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. The module of GSM is shown in fig.4


Figure 4 : GSM Module

2.5 Biosensor:

Biosensor is an analytical device, used for the detection of a chemical substance, that combines a biological component with a physicochemical detector. The biologically sensitive elements can also be created by biological engineering. The transducer or the detector element, which transforms one signal into another one, works in a physicochemical way: optical, piezoelectric, electrochemical, electrochemical iluminescence etc., resulting from the interaction of the analyte with the biological element, to easily measure and quantify. The biosensor reader device with the associated electronics or signal processors that are primarily responsible for the display of the results in a user-friendly way [6]. This sometimes accounts for the most expensive part of the sensor device, however it is possible to generate a user friendly display that includes transducer and sensitive element (holographic sensor). The readers are usually custom-designed and manufactured to suit the different working principles of biosensors.

3. Patient Tracking:

The tracking section involves the condition and the assistance provided to the patient when he/she is in a closed environment when nobody is around him/her. The patient on the bed is continuously monitored by a temperature and heartbeat sensor. 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 HIGH". But when the heartbeat raises the normal range then a message is sent to the centralized server hospital with the location. Again if the next minute it remains high then the nearest hospital to the patient's location is calculated and a message is sent to the server of that particular hospital and also a SMS to the relative saying "PATIENT CRITICAL". This way the ambulance reaches the patient through the location received, collects the RFID tag and reaches the hospital for the treatment. 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

Conclusion:

Thus we come to a conclusion of our project where our target was to help the patients who are at home all alone and they have got no one beside them. To provide them assistance in the case of an emergency and to reduce the procedure of carrying the bulk of papers and records during every visit to hospital is our objective.

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