International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 03 Issue: 01 | Jan-2016 www.irjet.net p-ISSN: 2395-0072

HI-TECH HOSPITAL

[1] Kalyanee Sharma, [2] Hemendra Singh, [3]Divya Verma, [4] Deepti Modi,

Department of Electronics and Communication Engineering, Poornima College of Engineering, Jaipur, Rajasthan, India

---

ABSTRACT - *Medical care is prime need of every individual. Our project 'Hi-Tech Hospital' is design in order to fulfill this need with more efficiency. Along with efficiency, it provides proper security and easy payment method and automatic door.*

The setup consists of various modules and information sending network. Whenever a patient is admitted in emergency, all doctors on duty are located and nearest doctor is called by sending a message on mobile and cabin by displaying it on LCD and buzzer rings. A smart card is issued to the patient which can be recharged and used to make payments at medical store and other bills of the hospital. It is used to open the automatic doors of the hospital.

Along with ease in making payments, smart cards also verify the user and prohibit unregistered people from entering. These cards can be recharged anytime. Database of the medical store is made in asp.net in names of medicines are already saved. It is used for billing.

The project is easy to install and very feasible. It is beneficial to be used in real life and can be developed in many ways to fulfill the requirement of high security.

1. INTRODUCTION

Hi-Tech hospital is a modification and application of technology in daily life. It will facilitate patients, attendants as well as hospital staff. It will help in providing immediate aid, proper security, easy payment options etc.

Hi tech hospital systems can be a very useful system at hospital at the time of emergence these days. There is use of different technologies such as RFID, GSM, GPS, AVR microcontroller etc.

Each user or doctor holds a unique ID for his entrance in the hospital and different not entrance area; user is prompted to scan his RFID tag. If the identity (serial number of the tag, i.e., 12 byte data) is matched with the one already stored in the system, the gate will open. When the user scans his tag will pass through the gate as it open.

There is also use of RFID card as smart card which is given to each and every patient for the payment of medicines at inbuilt medicine shop of hospital where user is prompted to scan his RFID tag. If the identity (serial number of the tag, i.e., 12 byte data) is matched with the one already stored in the system, a certain amount is deducted from his account. A user may also recharge his account in case of insufficient balance. The project has been developed by interfacing RFID with microcontroller AVR (ATmega16).

The emergency module has a system which helps in the tracking of doctor nearby and by pressing a single button the relevant messages are displayed on a 16x2LCDplaced in doctor room and a message is send to doctor at his mobile phone.

2. BLOCK DIAGRAM

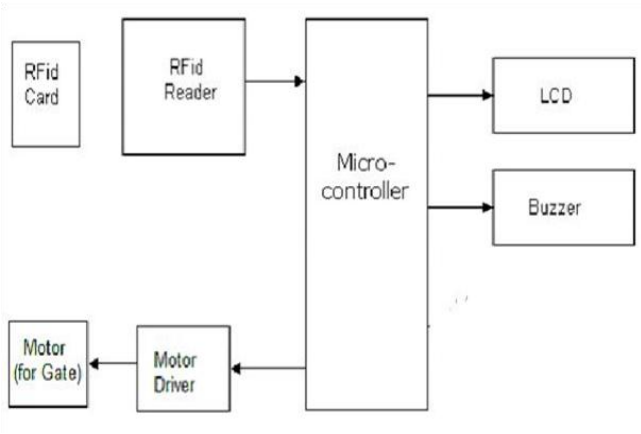

Fig 1: Module of Entrance

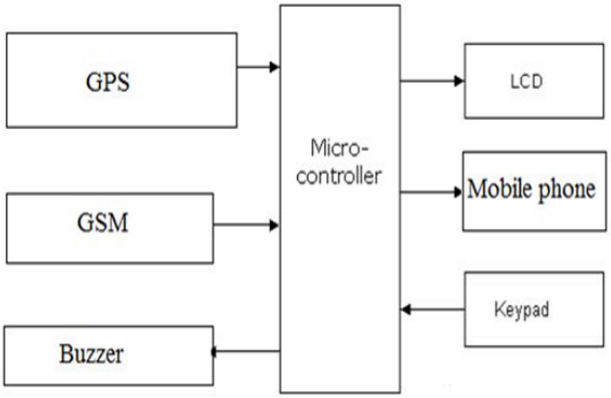

Fig 2: Module of Emergency

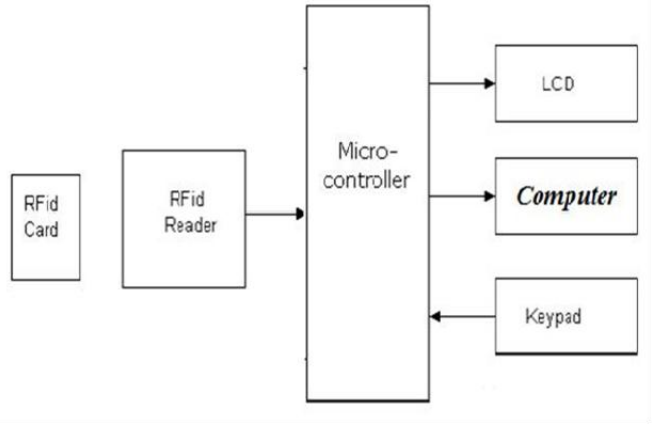

Fig 3: Module of Billing

The project contains 3 sections:

1. Module for entrance
2. Module for emergency
3. Module for billing

There is an Android cell phone which is having GPS locator application. It is used to track the doctors and locate them at the time of emergency.

3. CIRCUIT DIAGRAM

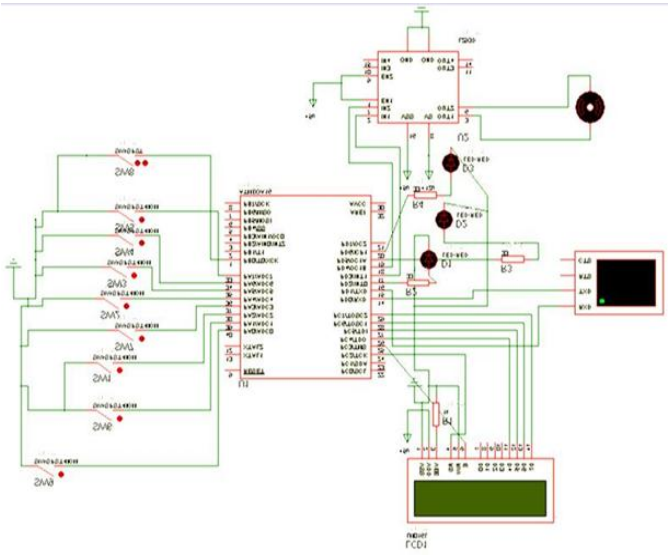

Fig 4: Circuit for Emergency and Entrance

The circuit has an Atmega16 Micro controller IC, RFID module, GSM module, LCD displays, keypads and an array of SPST switches. In **Emergency Module and Entrance Module,** LCD display, GSM Module, GPS tracker are used along an with an array of SPST switches. A buzzer is fixed in the cabins of all the doctors along with individual LCD displays. When any emergency case arrives, GPS tracker is used to locate the doctors on duty and find the nearest doctor. A message is sent on the mobile of the doctor using GSM module and it appears on the LCD display in the cabin of doctor as well and buzzer makes the sound. A RFID reader is used which reads the RFID tags issued to the patients and automatically opens the door if the card is valid, else buzzer makes sounds and "invalid card" message appears. DC motor is used to open the door. After some delay, the door s closed again automatically when the DC motor rotates in opposite direction.

For the controlling of motor, motor driver IC L293D and Atmega16 micro controller is used. The input signal or controlling signal is given from the controller when card is accepted, which is interfaced with the microcontroller by a RFID module.

The program is so written i.e., while executed it sends commands to the motor driver IC as per its requirement for running the motor for opening and closing the door as explained in the subject above in L293D.

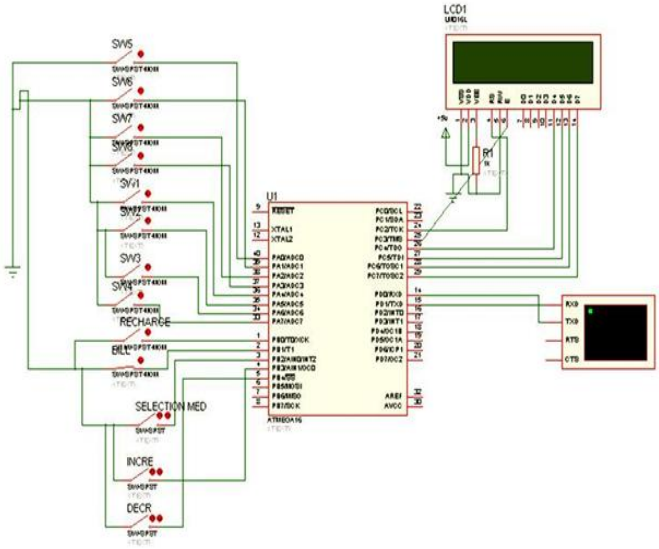

Fig 5: Circuit for Billing and Medicine

In **Billing and Medicine Module**, patient has the facility to recharge the card to make payments. Medicines, injections etc. can be bought by making payments through the RFID Tags/cards. It has an array of switches which are used to give command to recharge a card and make deductions. If there is no enough balance in the card, "recharge the card" message appears on the LCD

The circuits shown above have virtual terminals for indicating RFID modules and GSM modules. Coding of the Microcontroller is done in Embedded C language in a software namely, Atmel Studio. Virtual terminal shows the working of GSM module and RFID module.

3.1. COMPONENTS REQUIRED

(1) ATMEGA16A Microcontroller: To define the task of the modules, motor etc. micro controller is used.. to send message through GSM module, taking action on reading RFID tag by reader and taking action is done by micro controller.
(2) RFID Module: 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
(3) GSM Module: GSM (Global System for Mobile communication) is a digital mobile telephony system. It is used to send message on doctors' cell phone.
(4) L293D motor driver IC: It is a motor driving IC. We are using two L293D which opens the gate when any valid or registered user swipes the card.
(5) LCD Display: it is a 14 pin display which is used to display desired message. It is being used to show emergency message, card status here.
(6) 7805, 5V regulator IC: The various components used in the circuit operate at a voltage 5V but the input supply may be of either 12V or 9V. Hence, we use a 7805 voltage regulator IC to convert the input voltage into desired voltage.
(7) Resistors 10-kilo-ohm
(8) Capacitors - 0.1µF , 33pF
(9) 16.0MHz Crystal Oscillator: It provides oscillation frequency to the microcontroller.
(10) 30 rpm DC Motor: it being used here to open and close the door.

3.2 GSM MODULE

GSM (Global System for Mobile communication) is a digital mobile telephony system that is widely used in the world. GSM uses a variation of time division multiple access (TDMA) and is the most widely used of the three digital wireless telephony technologies (TDMA, GSM, and CDMA).

GSM module is interfaced with microcontroller but before interfacing, it is necessary to check that either the transmit (TXD) and receive (RXD) pins of GSM module and microcontroller are compatible with each other or not. Maximum input voltage to receive (RXD) pins of GSM module is is 3 volt and maximum output voltage of transmit (TXD) pins of GSM module is about 2 volt. But the voltage at transmit (TXD) and receive (RXD) pins of pic microcontrollers is about 4 to 5 volt. The transmit pin voltage of pic microcontroller is about 4.5 to 5 volt which is too high for RXD pin of GSM module and voltage at receive (RXD) pin of pic microcontroller is about 4.5-5 volt but transmit (TXD) pin of GSM module have maximum output voltage is 2 volt which is logic zero for microcontroller. There should be voltage converter circuit between microcontroller and GSM module. GSM modem duly interfaced to the MC through the level shifter IC Max232. The SIM card mounted GSM modem upon receiving digit command by SMS from any cell phone send that data to the MC through serial communication

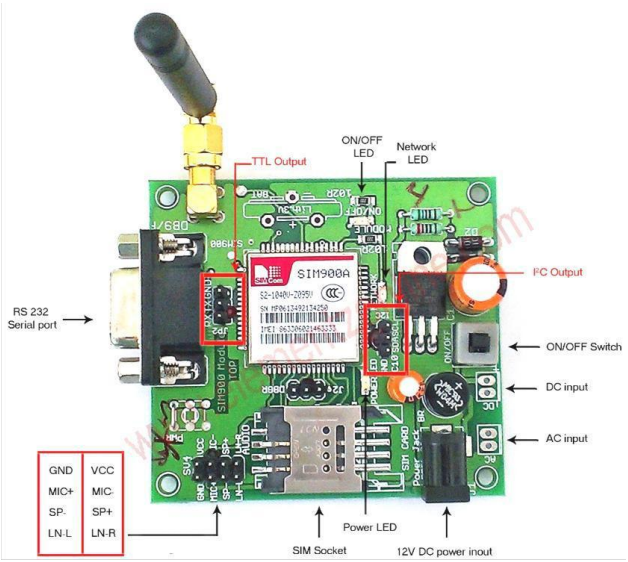

Fig 6: GSM Module

Some of the features of the GSM module are:

(1) Serial TTL interface with programmable baud rate
(2) With antenna
(3) Supply voltage range 5 - 25VDC
(4) SIM interfaces: 3V/1.8V Power consumption:
[4.1] Sleep mode 3.0 mA
[4.2] Idle mode 10.0 mA
[4.3] Power down 100 Ma
[4.4] Speech mode
[4.4.1] 300 mA (average)
[4.4.2] 1.8 A (peak)

3.3 L293D MOTOR DRIVER IC

(1) L293D is a dual H-bridge motor driver integrated circuit (IC). Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher-current signal. This higher current signal is used to drive the motors.

(2) L293D contains two inbuilt H-bridge driver circuits. In its common mode of operation, two DC motors can be driven simultaneously, both in forward and reverse direction. The motor operations of two motors can be controlled by input logic at pins 2 & 7 and 10 & 15. Input logic 00 or 11 will stop the corresponding motor. Logic 01 and 10 will rotate it in clockwise and anticlockwise directions, respectively.

(3) Enable pins 1 and 9 (corresponding to the two motors) must be high for motors to start operating. When an enable input is high, the associated driver gets enabled. As a result, the outputs become active and work in phase with their inputs. Similarly, when the enable input is low, that driver is disabled, and their outputs are off and in the high-impedance state.

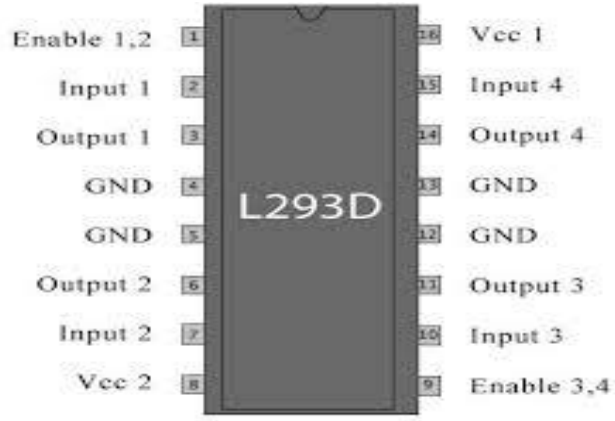

Fig 7: Pin Diagram of L293D IC

3.4 RFID MODULE

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 induction 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).

A radio-frequency identification system uses tags, or labels attached to the objects to be identified. Two-way radio transmitter-receivers called interrogators or readers send a signal to the tag and read its response. The tag uses the radio energy transmitted by the reader.

An RFID reader is a circuit that transmits an encoded radio signal to interrogate the tag. The RFID tag receives the message and then responds with its identification and other information. This may be only a unique tag serial number. Since tags have individual serial numbers, the RFID system design can discriminate among several tags that might be within the range of the RFID reader and read them simultaneously. The advantage of RFID is that it does not require direct contact or line-of-sight scanning.

Fig 8: RFID Module

An RFID system consists of three components: an antenna and transceiver (often combined into one reader) and a transponder (the tag). The antenna uses radio frequency waves to transmit a signal that activates the transponder. When activated, the tag transmits data back to the antenna. The data is used to notify a programmable logic controller that an action should occur. The action could be as simple as raising an access gate or as complicated as interfacing with a database to carry out a monetary transaction. Low-frequency RFID systems (30 KHz to 500 KHz) have short transmission ranges (generally less than six feet). High-frequency RFID systems (850 MHz to 950 MHz and 2.4 GHz to 2.5 GHz) offer longer transmission ranges (more than 90 feet). In general, as the frequency increases, expense of the system also increases.

3.5 LCD Display

LCD accepts two types of signals, one is data, and another is control. These signals are recognized by the LCD module from status of the RS pin. Now data can be read also from the LCD display, by pulling the R/W pin high. As soon as the E pin is pulsed, LCD display reads data at the falling edge of the pulse and executes it, same for the case of transmission.

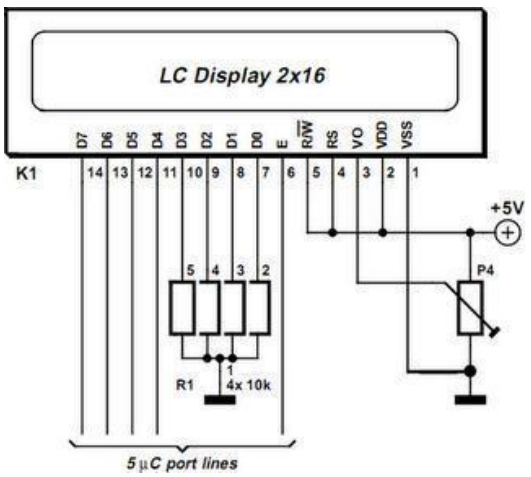

Fig 9: LCD

LCD display takes a time of 39-43µS to place a character or execute a command. Except for clearing display and to seek cursor to home position it takes 1.53ms to 1.64ms. Any attempt to send any data before this interval may lead to failure to read data or execution of the current data in some devices. Some devices compensate the speed by storing the incoming data to some temporary registers.

LCD displays have two RAMs, naming DDRAM and CGRAM. DDRAM registers in which position which character in the ASCII chart would be displayed. Each byte of DDRAM represents each unique position on the LCD display. The LCD controller reads the information from the DDRAM and displays it on the LCD screen. CGRAM allows user to define their custom characters. For that purpose, address space for first 16 ASCII characters are reserved for users. After CGRAM has been setup to display characters, user can easily display their custom characters on the LCD screen.

4. DATABASE

A **database** is a collection of information that is organized so that it can easily be accessed, managed, and updated. In one view, databases can be classified according to types of content: bibliographic, full-text, numeric, and images.

MySQL is a popular choice of database for use in web applications, and is a central component of the widely used LAMP open source web application software stack (and other "AMP" stacks). LAMP is an acronym for "Linux, Apache, MySQL, and Perl/PHP/Python." Free-software-open source projects that require a full-featured database management system often use MySQL.

Fig 10: Screenshot of Database

ASP.NET is an open-source, server-side Web application framework designed for Web development to produce dynamic Web pages. It was developed by Microsoft to allow programmers to build dynamic web sites, web applications and web services.

5. GPS Application

The **Global Positioning System** (**GPS**) is a space-based navigation system that provides location and time information in all weather conditions, anywhere on or near the Earth where there is an unobstructed line of sight to four or more GPS satellites. The system provides critical capabilities to military, civil, and commercial users around the world.

Long before **Global Positioning System (GPS)** arrived, researchers worked hard to arrive at a feasible solution to aid travelers from getting lost. Earlier, travelers used to rely on elaborate maps to track and monitor the route to their destination. But today, **GPS technology** has ensured hassle – free trips and increased safety for vehicle owners. The figure below illustrates a **GPS satellite** in orbit

The Global Positioning System (GPS) is a satellite-based navigation system made up of a network of 24 satellites placed into orbit by the U.S. Department of Defense. GPS was originally intended for military applications, but in the 1980s, the government made the system available for civilian use. GPS works in any weather conditions, anywhere in the world, 24 hours a day. There are no subscription fees or setup charges to use GPS.

An app (Life360 locator) is being used to locate the doctor and call the nearest doctor at the time of emergency. This Locator App not only tells where all of the registered members are, but also help in quick communication and even sends alerts when members reach specified locations. Location can be turned on and off by the members.

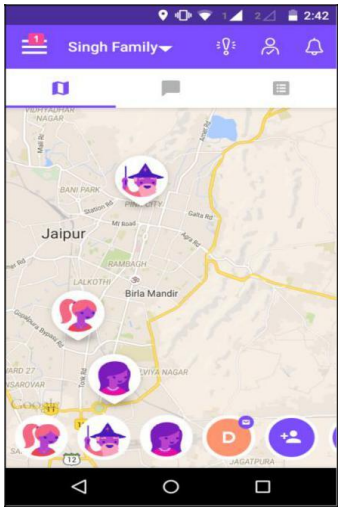

Fig 11: Screenshot of Locator Application

Today's GPS receivers are extremely accurate, thanks to their parallel multi-channel design. Our 12 parallel channel receivers are quick to lock onto satellites when first turned on, and they maintain strong locks, even in dense foliage or urban settings with tall buildings. Certain atmospheric factors and other sources of error can affect the accuracy of GPS receivers. Garmin GPS receivers are accurate to within 15 meters, on average

6. APPLICATIONS

(1) It can be easily installed in hospitals and its time saving advantage can save lives.
The project has a separate module of emergency and entrance. When any emergency case arrives, GPS tracker is used to locate the doctors on duty and find the nearest doctor. A message is sent on the mobile of the doctor using GSM module and it appears on the LCD display in the cabin of doctor as well and buzzer makes the sound. Immediate action is taken without wasting time which makes the project highly applicable.

(2) It can be used for easy billing.
There is a separate module for billing. It has software support too. Smart cards are issued to the patients which can be recharged and used for making cashless payments in the hospital as well as at the medical store of hospital. They can be recharged any time.

(3) It can be used for high security purpose.
The entrance module has automatically opening doors on swiping the smart cards. Registered people having valid smart cards are only allowed to enter as door opens only when valid cards are swiped. If any invalid card is swiped, buzzer rings and message is displayed on the LCD. In case of emergency conditions, doors can be opened by using password which can be entered through the keypad.

7. MODEL OF HOSPITAL

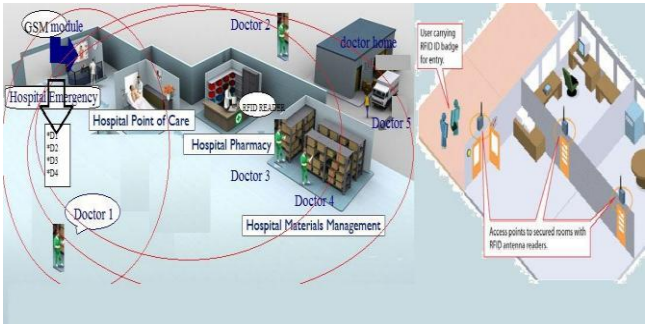

Fig 12: Model of Hi-Tech Hospital

8. CONCLUSION

The project is designed in order to solve the problems of the hospital and improve its performance. It is an effort to integrate engineering with medical science. In this project, of different technologies such as RFID, GSM, GPS, AVR microcontroller etc are used. RFID reader and tags are used in entrance module. GSM is major part of emergency module along with GPS tracker. Microcontroller ATmega16 (AVR) is used.

We worked on various softwares for circuit designing, PCB layout and coding of microcontroller such as Proteus, Diptrace and Atmel Studio. Database is made for medical store for the purpose of billing. It is made using MySQL and form is made using asp.net and a GPS locator is also used.

REFERENCES

[1] "GSM Interfacing" by Ackruti Chambers.
[2] Atmel AVR Microcontroller Primer: Programming and Interfacing by:- Steven F.Barret, Daniel J. Pack
[3]" RFID research: An academic literature review" by Karen K.L. Moon, Frederick J. Riggins, C