

Automation of Blood Bank System Using Raspberry Pi Controller and RFID Technology

Dr. Supriya V. G¹, Ali Md. Mohsin², Sara Sultana², Bushra Begum², Al-Hussain Mohd²

¹Professor, Department of ECE, Lords Institute of Engineering and Technology, Hyderabad, Telangana, India

²B. Tech fourth Year Students, Department of ECE, Lords Institute of Engineering and Technology, Hyderabad, Telangana, India

ABSTRACT

Blood is an important aspect of any human-being to survive. Blood is one of the resources to ensure the health services. So preservation, quality, and attendance of the blood donor incoming and outgoing from the health centers like hospitals, Blood NGO'S, Blood centers etc. Automation of this system is a major issue in this era. There are some Autonomous Health Bodies like NACO (National AIDS Control Organization) and NABH (National Accreditation Board for Hospitals and health providers) had introduced some guideline for insuring the Quality of blood ,Identification of right donor blood for right blood sneaker looking for blood. Nowadays manually system are used to ensure the communication channel between Donor and bold sneaker, But lack of surety takes place regarding communication establishment going on within Donor and blood centers to the blood sneaker .To Build the end to end communication and limiting they time delay present in duration of blood transplant from both ends (Donor to Blood center and Blood center' to Blood sneaker). We founded the effective Mechanism and improvised method of communication between these systems.

Keywords: Blood bank system; Blood importance NACO; NABH; Communication between donor and Sneaker via Blood centers.

I. INTRODUCTION

Today Blood is one of the important needs for human body to survive. It relates with health of a human body in different aspects. Major concern regarding Blood bank system Is to deliver efficient Quality blood with an improvised chain of communication this chain of communication implies all facts of requirement as well as storage such as emergency services, Lack of storage arrangement, and Blood Delivery. The Blood monitoring bodies of our nation has lack of communication gap to regulate it. We need to improvise the supply chain between one end to other end. There are many professional Bodies like BTS (Blood Transfusion Council), Ministry of health and family welfare, National Accreditation Board for

Hospitals and Health care providers (NABH). In View of this we proposed a solution regarding the Blood supply chain and how to eliminate the structural Demerits in blood bank system. Blood is necessity and a priority for human body, Blood management should be upgraded time to time more technology supervision and AI(Artificial Intelligence)evolved in this era using every technical mechanism good communication path can be created which will lead us to a better blood bank system. For this we have proposed a solution regarding effective communication between all branches of blood bank supply by introducing a way better Scanning mechanism which can hold much more data as compared to current blood scanning system used in existing system. Using a Implementation of superior

Controller with Advanced features know as Raspberry Pi Controller, we are interfacing RFID Module and Creating a Web server to store data in web page which can be easily accessed online world wide.

II. LITUATURE SURVAY

[1]The paper published by Akashay Raut, Yogesh Salve, Shivshankar Dange, Likhesh Kolhe describes the Smart blood bank as service Cloud which relates the existing Blood bank System with Cloud computation. It is applicable for gathering information form eternal sources and by creating server it is applicable worldwide.

[2] Another Paper Published by Gugulath Devilal, Prof. J.Vijay kumar regarding Automated Blood bank System, using Android Technology blood bank data base is created in an android Application, user to refer it through mobile Application easily.

[3] Another Paper published by Rohini Patil ,Pooja Pawar, Madhu Poi, Tejashre Patil regarding Blood Donor's safety using data mining which was applicable with bold system for reacting of donor in blood chain system. Creating a data base and computing reaction of Donor in web server.

[4]Another paper published by Musthak Ahmed, R.Rajmohan regarding Implementation of Blood Donation System which is applicable for existing blood system using SMS and tracking means for communication using GPS navigation and alerting system using SMS in particular Radius of Data base.

[5]Another paper Published by Ashita jain, Amit Nirmal, Nitish Sapre, Prof Subhada Mone regarding Online Blood Management System Using Android System. It proposed as an application using Android Application by using RESTful Technique using HTTP Protocol.

III. GAP IDENTIFICATION

[1] In this system used to store the data of Donor and Seeker is save in cloud device. Demerit of this blood bank system is the cloud computation security problems may arise due to application bugging; we need satellite device to have perfect security reform, Algorithm used for this systems is low we need a higher Algorithm for Security as well as Traffic Control for Web server.

[2] This System uses the android application to conclude the output of stored data in android body itself if also requires more space and better Algorithm which cannot be achieved by simple user based server, Storage of data and accessing problem.

[3] This system is applicable to capture the reaction of donor during blood donation and record the data in web server using data mining it has a demerit like this, there is no such a technology admiring the blood packets details it is dependent on pervious source of information it can't conclude total reliable information about donor, this system cant store data of blood packets and there is less chances of reliable information provide back to web server.

[4] This system is also one of the existing systems used in blood bank system which relates with tracking down the donor by GPS and SMS modules. A problem rises here is the correct positioning of donor during emergency he GPS relies on internet connectivity if donor doesn't have internet if is not possible to target him. Range of this system is typically less that is 5 to 10 km. which is less so communication problem also arises.

[5]In this System the implemented the blood bank system using Android system with HTTP code page as well, it is visible in mobile and pc also. The server here which they used is only user based platform which concludes problems like over traffic, HTTP page website can easily get crashed and stuck during the data uploading it can be cleared by using user as

well as client based server platform to eliminate the over traffic on both android as well as server.

IV. NECESSARY FACTS ABOUT BLOOD NEEDS

Every year our nation requires about 5 Crore units of blood, out of which only a meager 2.5 Crore units of blood are available. The gift of blood is the gift life. There is no substitute for human blood. Every two seconds someone needs blood. More than 38,000 blood donations are needed every day. A total of 30 million blood components are transfused each year. The average red blood cell transfusion is approximately 3 pints. The blood type most often requested by hospitals is Type O. Sickle cell patients can require frequent blood transfusions throughout their lives. More than 1 million new people are diagnosed with cancer each year. Many of them will need blood, sometimes daily, during their chemotherapy treatment. A single car accident victim can require as many as 100 units of blood.

V. FACTS ABOUT THE BLOOD SUPPLY

Blood cannot be manufactured – it can only come from generous donors. Type O-negative blood (red cells) can be transfused to patients of all blood types. It is always in great demand and often in short supply. Type AB-positive plasma can be transfused to patients of all other blood types. AB plasma is also usually in short supply

Static Analysis of Blood bank System in India:

In our nation right now we require 35 tankers of blood for medical procedures, yet some areas of our countries (states) are wasting blood because there having blood units beyond their capacity. In percentage terms India has 9% shortage of its Actual blood needs. In year 2013-2014 Blood supply chain storage reduced to 17%. In reply of an RTI statics realized from Asian agency in behalf of Mumbai District AIDS control society, 63 blood banks across Mumbai wasted 130,000 liters of blood reason was the blood was contained from too longer period. We need

1.30 crore units of blood every year. But capacity of blood collection is 90 lakhs of blood unit. Unfortunately this short fall is increasing day by day. These are the figures released by Blood Transfusion Council of India in May 2017.

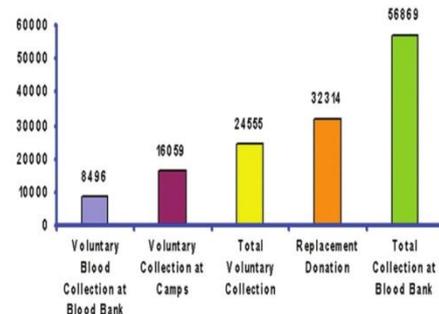


Figure 1. Collection Statics of Blood banks

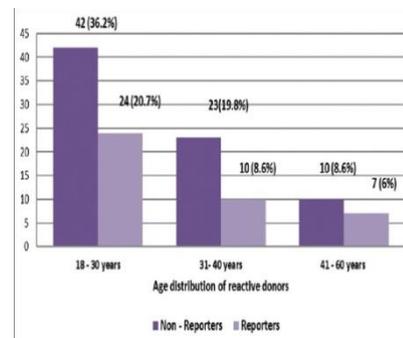


Figure 2. Age Relevancy of Blood Donation

On Blood Collection Side

- A] Many parts in the country still have problem of too few voluntary donors.
- B] The other problem is that blood donation camps do not happen all year round the blood banks face periodic shortage.

On Blood Bank Management Side

- A] Lack of uniform, consistent and up-to-date regulation and policies from the Government with the Department of Drugs and Cosmetics Standard and Control on one end and National AIDS Control organization on the other.
- B] Struggle to compete with blood banks running with commercial motives which tend to influence the organizers of camps - especially in colleges in public blood donation drives by money and incentives.

C] Inability to transfer blood units between blood banks which sometimes leads to units expiring on shelf.

D] The difficulty in maintaining quality with low costs - especially in the context of recruiting and retaining professionals who get poached easily

VI. PRAPOSED SYSTEM

Transmitter:

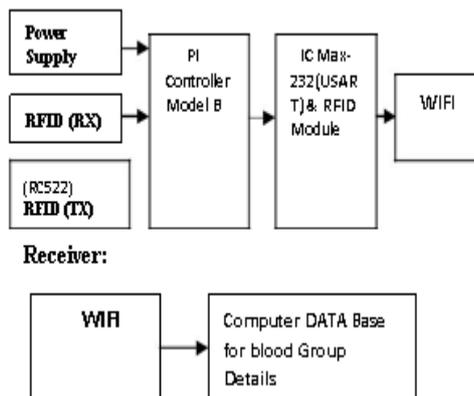


Figure 3. Transmitter And Receiver Section

This System is proposed based on the design considerations required to improve security features in various Blood bank system. To meet the design constraints such as

1. To reduce the complexity of the system.
2. To make it cost effective.
3. To reduce the time to implement.
4. To increase the speed of execution.
5. To improve security to the data.

Automation systems and information technology can greatly help medical facilities to improve their working efficiency and optimize the whole workflow. This article(paper) surveys electronic information management in blood donation(donor) and transfusion service, and explores the rationale and archetype of blood bank information systems, from this will explore the possibility of establishing a mechanism where people can check online the availability of required blood groups in blood banks across the country(state). Blood banks use automation

to decrease errors in delivering safe blood for transfusion. An automated tool to verify that satisfies safety properties. Our methodology started by understanding and gathering information about blood bank procedure. Then we mapped all procedures into processes in a workflow engine. Then we used the verification packages provided by the workflow engine to check the safety properties. Especially, as to the issue challenging blood banks, namely, the complete documentation for possible backward inspection, the introduction of information and computer technology can effectively relieve workload of blood banks and reduce the incidence of “wrong blood” episodes. It entails the rigorous controlling, monitoring and the complete documentation of the whole procedure from blood collection to blood infusion. However, in face of the tremendous amount of data and information in a daily interval, various errors inevitably lead to significant risks in the mentioned procedure of blood donation and transfusion service. Errors at the time of administration of blood or blood components are the most frequent documented site of error cumulating in the transfusion of the wrong blood. Furthermore, preceding errors in blood sampling, laboratory testing and especially inventory management of blood components were found to be an important contributory factor in many of such incidents too. Information and computer technology has been widely deployed in medicine, and reveals the great potential to improve efficiency as well as quality. In terms of blood donation and transfusion service, combined with various automation apparatus, it can obviously ease and secure most procedures of blood bank management.

The key component of healthcare systems all over the world is blood service operations. This blood for the transfusion is obtained from human donors. This article (paper) aims in providing automation, security and digitalization of blood banks.

This article (paper) focuses an automatic counting of blood packets by scanning a barcode which is present

on the packets. The barcode on the packets is also linked with adhar card of the donors which helps to keep record of all the donors donating the blood. We proposed a new architecture that provides automatic availability of blood packets with its groups from blood banks for hospitals or other information like where it available and the exact distance or location of availability.

VII. HARDWARE REQUIREMENTS

1. Raspberry Pi 3 Model B
2. Power Supply 5v
3. RFID Reader (EM-18 module)
4. Max-232 IC (Interfacing)

7.1 Raspberry Pi 3 Controller



Figure 4. Raspberry pi3 controller

The Raspberry Pi controller is an Advanced Microcontroller used for various AI (Artificial Intelligence) applications. Main purpose to choose this controller over Different Arduino and ARM controller is This PI controller is Assembled using SMD(Surface Mountable Device) Technology has maximum external components inbuilt such as USB, Ethernet, and HDMI cable it also consists of Inbuilt Bluetooth, WIFI wireless networks. It is combination of multiple components together on one board which makes it unique and more compatible compared then other available processor and controllers. The major Advantage to choose this processor is the inbuilt features. Best part of this Controller is it has inbuilt server called as “Raspbian”

which is owned by Raspberry Pi controller and it is free of cost t access through web.

7.2 Power supply

The power supply section is the section which provide +5V for the components to work. IC Raspberry Pi is used for providing a constant power of +5V.

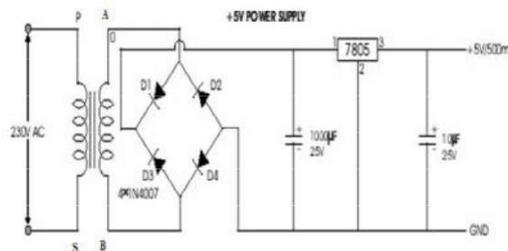


Figure 5. Circuit Diagram of Power Supply

The ac voltage, typically 220V, is connected to a transformer, which steps down that ac voltage down to the level of the desired dc output. A diode rectifier then provides a full-wave rectified voltage that is initially filtered by a simple capacitor filter to produce a dc voltage. This resulting dc voltage usually has some ripple or ac voltage variation. A regulator circuit removes the ripples and also retains the same dc value even if the input dc voltage varies, or the load connected to the output dc voltage changes. This voltage regulation is usually obtained using one of the popular voltage regulator IC units.

7.3 RFID.

RFID is a tracking technology used to identify and authenticates tags that are applied to any product, individual or animal. **Radio frequency Identification and Detection** is a general term used for technologies that make use of radio waves in order to identify objects and people. RC522 Reader also supports NFC Commnication.

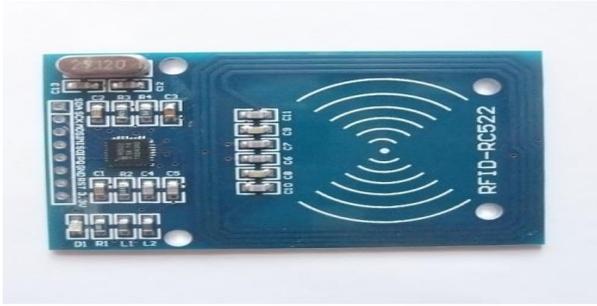


Figure 6. RFID RC522 Module

7.4 Introduction to RFID

Purpose of Radio frequency Identification and Detection system is to facilitate data transmission through the portable device known as tag that is read with the help of **RFID** reader; and process it as per the needs of an application. Information transmitted with the help of tag offers location or identification along with other specifics of product tagged – purchase date, color, and price. Typical **RFID** tag includes microchip with radio antenna, mounted on substrate.

The RFID tags are configured to respond and receive signals from an RFID transceiver. This allows tags to be read from a distance, unlike other forms of authentication technology. The RFID system has gained wide acceptance in businesses, and is gradually replacing the barcode system

7.5 How RFID Works

Basic RFID consists of an antenna, transceiver and transponder. To understand the working of a typical RFID system, check the following animation.

Antenna emits the radio signals to activate tag and to read as well as write information to it. Reader emits the radio waves, ranging from one to 100 inches, on the basis of used radio frequency and power output. While passing through electronic magnetic zone, RFID tag detects activation signals of readers.

Powered by its internal battery or by the reader signals, the tag sends radio waves back to the reader. Reader receives these waves and identifies the

frequency to generate a unique ID. Reader then decodes data encoded in integrated circuit of tags and transmits it to the computers for use. Get in-depth about RFID tag and its working through exclusive images at the Insight about RFID tags

7.7 RFID frequencies

RC522 - RFID Reader / Writer 13.56MHz with Cards Kit includes a 13.56MHz RF reader cum writer module that uses an RC522 IC and two S50 RFID cards. The MF RC522 is a highly integrated transmission module for contact-less communication at 13.56 MHz RC522 supports ISO 14443A/MIFARE mode.

RC522 - RFID Reader features an outstanding modulation and demodulation algorithm to serve effortless RF communication at 13.56 MHz The S50 RFID Cards will ease up the process helping you to learn and add the 13.56 MHz RF transition to your project.

The module uses SPI to communicate with microcontrollers. The open-hardware community already has a lot of projects exploiting the RC522 – RFID Communication, using Arduino.

VIII. IC MAX-232(USART)

Here the interfacing between pi3 controller and RFID Module is based on IC max-232

IC max232 is connected to pi controller using DB9 connector.

It works on Serial communication with Pi3 controller. This IC is widely used in RS232 Communication systems in which the conversion of voltage level is required to make TTL devices to be compatible with PC serial port and vice versa.

This chip contains charge pumps which pumps the voltage to the Desired Level.

It can be powered by a single +5 volt power supply and its output can reach +_7.5 volts

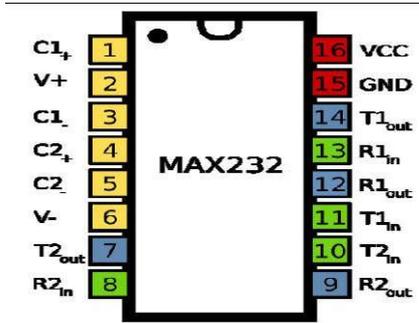


Figure 7. Pin Diagram of Max 232

8.1 Pin description of IC MAAX-232:

Pins and LCDs with 2 controller has 16 Pins (two pins are extra in both for back-light LED connections).

8.2. SYSTEM SOFTWARE REQUIREMENTS

- a. Rasp-bean Server
- b. HTTP Web Page.

8.3. FEATURES OF CONTROLLER

SOC: Broad Com BCM2387 chipset
 Processor: Quad core ARM -53
 LAN: 802.11b/g/h
 Bluetooth: Classic 4.1(10-30m)
 GPU: Dual core Video core IV Multimedia Co-Processor.
 Memory: 1GB LP DDR2
 Power: Micro USB Socket 5v, 2.5A
 Dimensions: 85×56×17mm
 Video Output: HDMI (version 1.3&1.4)
 Audio Output: 3.5mm Jack, HDMI,4 USB 2.0 Connector.
 Ethernet: 10/100 TE Based Ethernet socket
 DSI (Digital serial Interface): Inbuilt
 CSI (Camera serial Interface): Inbuilt

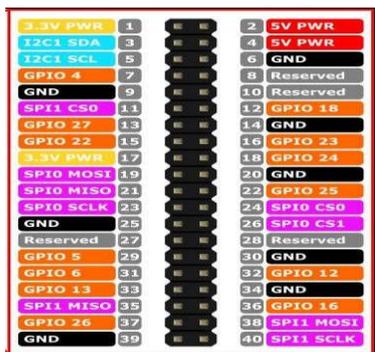


Figure 8. pin diagram

The GPIO Header is nothing but the external access of BMC2387 which is the main processor of Pi controller. Main purpose of designing the GPIO Header in Pi controller is to have external Access to the Pi controller with different I/O sensors Control system and ground connection.

GPIO Header is used to access the communication using BCM2385.

8.5 Pin Interfacing:

Here we are using Pin No.14, Pin No 15 that is GPIO14, GPIO15 (TXD0, RXD0)

Pin no.02 is used for +5v DC supply, Pin No.39 is used for Ground.

IX. FLOW CHART

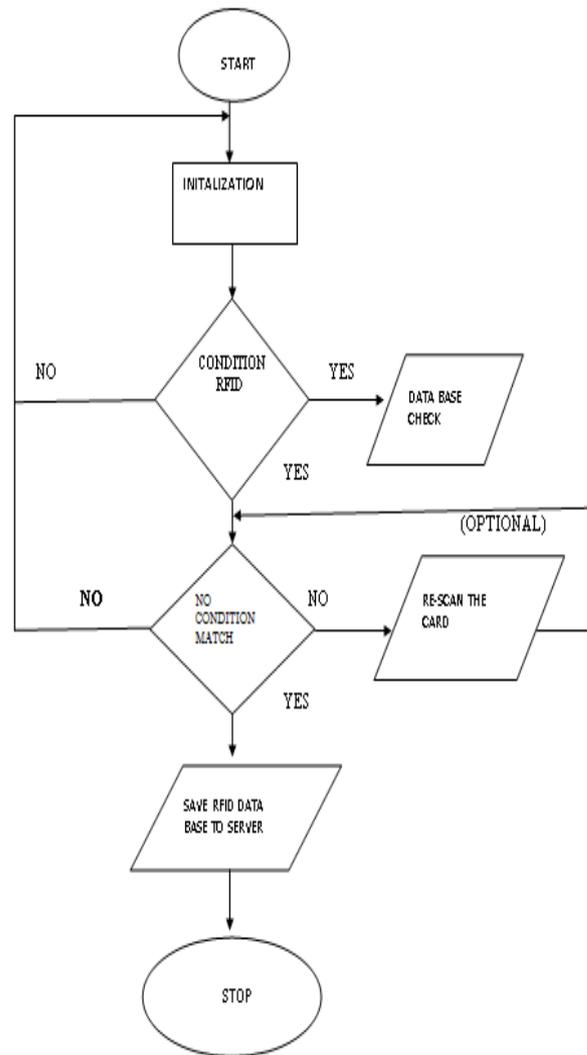


Figure 9. Flow chart

XI. RESULT AND ANALYSIS

X. SOFTWARE REQUIRREMENTS

Language used:

1. PYTHON:

Python is a widely used general-purpose, high level programming language. It was initially designed by Guido van Rossum in 1991 and developed by Python Software Foundation. It was mainly developed for emphasis on code readability, and its syntax allows programmers to express concepts in fewer lines of code. Python is a programming language that lets you work quickly and integrate systems more efficiently. There are two major Python versions- Python 2 and Python 3.

SOFTWARE USED:

2. GCC Compiler:

The **GNU Compiler Collection (GCC)** is a compiler system produced by GNU collection. It is a standard Tool chain and Standard Compiler linux like Operating system.

PROTEUS: Proteus combines ease of use powerful features to help you design, test and layout professional PCBs like never before. With nearly 800 micro controller variants ready for simulation straight from the schematic, one of the most intuitive professional PCB layout packages on the market and a world class shape based auto route included as standard, proteus design suite 8 delivers the complete software package.

ADVANTAGES:

- a. It is simple and cost effective
- b. More Security

APPLICATIONS:

- a. It is used in medical field.
- b. It can be used for various security purposes.

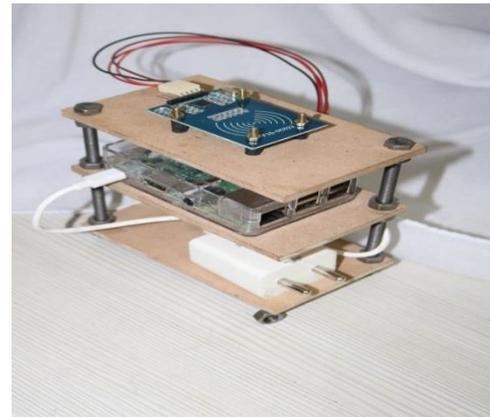


Figure 10. Project Output

Analysis

Project is implemented on the server and client model, Raspberry pie is working as a server which holds the information of the blood bank Server in the raspberry pie is configured as Apache server and which is loaded on to the SD card with the Raspbian OS. Web pages is built on word press which is separately installed on the raspberry pie Raspbian is the operating system which is driving the raspberry pie on 5v power supply; the system uses very limited power which is a huge cost factor to run the server in the real time when compared to bother bigger models The proposed system is cost efficient fast and accurate which make the system more stable and accurate

XII. CONCLUSION

The knowledge and application of new techniques in electronics and telecommunication has made our life more secured and comfortable. This Mechanism will build and effective communication chain between Blood Donor to Blood Center and From Blood Centers to Blood Sneaker

XIII. REFERENCES

- [1]. Bharathwaj Muralidaran¹, Akshay Raut², Yogesh Salve³, Shivshankar Dange⁴, Likhesh Kolhe as 'Smart Blood Bank as a Service on Cloud' IOSR Journal of Computer Engineering (IOSR-JCE) e-ISSN: 2278-0661,p-ISSN: 2278-

8727, Volume 18, Issue 2, Ver. I (Mar-Apr. 2016), PP 121-124 www.iosrjournals.org

- [2]. Gugluth Devilal¹, Prof J. Vijay Kumar² as 'Automated Blood bank System' ISSN NO.2348-4845. International Journal and research magazine of engineering and tech management and research Volume NO.3 (2016) Issue No: 11 (November) www.ijmetmo.com
- [3]. Rohini Patil¹, Pooja Pawar², Madhu Poi³, Tejashre Patil⁴ as 'Blood Donor's safety using data mining. 2015 IEEE explorer Volume No.9 (2015).
- [4]. Musthak Ahmed¹, R.Rajmohan² as 'Design and implementation of Blood Donation and Alerting System. ISSN No.2348-8549 SSRG International journal of electronic and communication engineering –(2'ICEIS-2017)-Special-Issue April 2017.www.internationalJournalSSRG.org
- [5]. Ashita jain¹, Amit Nirmal², Nitish Sapre³, Prof Subhada Mone⁴, as 'online blood bank management System using Android. International journal of Innovative studies in science and engineering and technology (IJISSET) ISSN 2455-4863, Volume No.02 Issue:2-February 2016. www.ijisset.org
- [6]. <http://www.bharatbloodbank.com>
- [7]. <http://ijcsi.org/papers/IJCSI-8-5-2-159-163.pdf>
- [8]. N. A. C. Organization. Standards for blood banks and transfusion services. 2007.
- [9]. https://en.wikipedia.org/wiki/Raspberry_pi
- [10]. www.friends2support.org.blood.aspx

Ali MD Mohsin presently pursuing B.Tech 4th Year in Lords Institute of Engineering and Technology, Hyderabad, Telangana India.



Hyderabad, Telangana India.

Sara Sultana presently pursuing B.Tech 4th Year in Lords Institute of Engineering and Technology,



Hyderabad, Telangana India.

Bushra Begum presently pursuing B.Tech 4th Year in Lords Institute of Engineering and Technology,



Hyderabad, Telangana India.

Al-Hussain Ali Mohammad presently pursuing B.Tech 4th Year in Lords Institute of Engineering and Technology, Hyderabad, Telangana India.



BIOGRAPHY:

Author's Profile

DR. Supriya V.G currently works as a Professor in ECE Dept. of Lords Institute of Engineering and Technology, Hyderabad, Telangana, India. She is having 12 years of industrial experience and field of Teaching in Digital Image Processing and Crypto technology.

