

IoT Based Blood Bank Monitoring And iBeacon Donor Finder

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Abstract- A blood bank is a place where collected blood and the data of the blood donors are stored and monitored. The most objectives of the blood banks are providing blood to the patients with minimal transfusion error. Blood is an extremely important medical supply so it should be managed well. As the bank management consists of sort of manual steps, therefore it'll become difficult for the blood banks to provide a high level of accuracy, reliability, automation in the blood storage and transfusion process. The proposed system is of three segments, the first segment consists of humidity and Temperature sensor, IR sensor which is installed in a rack of the blood bank, and everything are interfaced with Microcontroller. The Second segment has a wi-fi module so that the data can be transferred to the server and the third segment consists of a display monitor to show the status of the bloodstock. All the important time status relates to the available bloodstock of the bank are displayed on the website, so that the blood seeker can get the blood from their nearest blood bank. And also, the donor has the iBeacon is an android application developed to assist users to find the proper donor at the proper time. The user's name, age, blood group, address, and other information which are required are stored in the app. This ensures the safety of the app. The app helps users find an appropriate donor when required by checking out the specified blood type within the city/area which they need. This will be really helpful by saving the time taken to find a donor manually and also it helps to save the life of the patient.

Keywords- Blood bank, iBeacon, Microcontroller, Bloodstock.

I. INTRODUCTION

Required unit of blood for a country every year is about 4crore, from which too small amount of 40 lakh units of blood are available. There are multiple blood banks round the world; however none of them offer the potential for an instantaneous contact between the donor and recipient. This is often a big disadvantage notably in cases wherever there's associate pressing would adore of blood. This project aims to beat this communication barrier by providing an instant link between the donor and thus the recipient by victimization has

low price, power Raspberry Pi B+kit. Required only 5V and 2A power supply for Micro USB. All communication takes place via SMS which is compatible with most mobile types. "Automated Blood Bank" proposes to bring voluntary blood donors and other people in need of blood on to a typical platform. The proposed work aims at servicing the persons who search donors who are willing to donate blood and also provide the blood within the time span required. The state needs every year with respect to four crore units of bloods , out of that solely a too small amount of forty lakh units of blood square measure out there. Every two seconds someone needs blood. More than thirty eight thousand blood donations square measure required each day. A total of thirty million blood parts area units transfused annually. More than 1,000,000 new individuals are unit diagnosed with cancer annually. Several of the patients want blood, typically daily, throughout their therapy treatment. One motorized accident victim will required as several as hundred units of blood. Every requirement is met by the planned work. Automated bank tries to assist victims or patients or those in need of blood.

II. RELATED WORKS

Yellanki Banduri Santhosh Kumar proposed the idea of smart bank system using IOT. "Already there are many mobile applications for blood donation. Though smartphones are available it's impossible to seek out a right donor who has 4 compatible blood groups with the patient in right time. We propose an integrated solution which can connect blood banks, donors, and therefore the needy. This solution provides efficiency and convenience for the needy to look for required blood type or platelets in your neighbourhood easy and straight forward. Get instant help from blood banks without log in required. The solution works for the encouragement of blood donation and ensures the supply of blood or platelets accessible to the needy. Quality management programs will also assists for blood platelets transfusion services. Finally, this solution is employed to notify/communicate with the closest bank organizations timely to make sure the supply of safe and quality blood accessible to the needy with minimum effort". Vikkas Kulshreshtra proposed the idea of blood bank

management information system in India." Blood is universally recognized as the most precious element that sustains life. It saves innumerable lives across the planet during a sort of conditions. A bank may be a place designed especially for the storage of blood and blood products. The term "blood bank" typically refers to a division of a hospital laboratory where the storage of blood product and result are stored and also where proper testing is performed to scale back the risk of blood transmission related events. Large coolers hold these products at a continuing temperature and that they are available at a moment's notice. The bank management data system offers functionalities to quick access to donor records collected from various parts of the country. It enables monitoring of the results and performance of the blood donation activity such relevant and measurable objectives of the organization are often checked. They are providing the effective search who needs the blood in their own city or area as fast as possible". Ashlesha C. Adsul proposed a rapid advancement in Internet of Things (IoT) empowers the solutions to say new and intriguing applications. The smart Healthcare system is one of the key IOT applications that connect smart sensors, patients, doctors, systems and other smart devices to the online. In best manner, the IOT smart healthcare system has provided the likelihood for doctors to observe their patients at a far off location continuously. Internet of things comprises different technologies like frequency identification, smart mobile innovations mart mobile innovations, wireless sensor network (WSN) which are interacting with one another through the Coap, 6LoWPAN, REST and other protocols. Various architectures which support IOT for the patient healthcare monitoring system have been discussed during this paper. The paper proposes the patient continuous healthcare monitoring system which consists of varied sensors, web applications and a connected device Raspberry Pi. The continual healthcare monitoring system will supervise patient's body temperature, sign, and heartbeats continuously. The doctors are going to be ready to grasp patient's related information anytime from any locations. K.Sravani proposed a Blood could also be a saver of all existing lives just in case of emergency needs. The task of "Automated Blood Bank" is to collect the knowledge from the donors, to observe the blood group database and to send the required Blood for the receiver just in case of emergency. we would like to create a network of individuals who can help one another during an emergency. Low cost and low power Raspberry Pi kit are used and it requires Micro USB of 2A and 5V power supply only. Entire communication takes place via SMS (Short Messaging Service) which is suitable among all mobile phone types without internet. This server timely updates the insight regarding the donors. Donor are getting to be prompted to entire a personal details like name, phone number, blood type."Automated Blood Bank" is a project that brings

voluntary blood donors and people in need of blood on to a standard platform. Automated bank tries to assist victims/patients/those in want of blood. It's an effort to understand bent these people in want of blood and connect them to those willing to donate. The proposed work explores to hunt out blood donors by using GSM based revolving credit Page 1 CPU Raspberry Pi B+ Kit. The idea of vision is to be "Each Indian should have hope in search of a voluntary donor". Lau JyeHui proposed a wireless temperature monitoring system has been designed and fabricated for the monitoring of bank temperature. The protection of blood is completed by marking of blood components and stored at refrigerator temperature of 4°C. Hence, it's important to observe the temperature of bank to make sure the blood is stored properly to avoid the shortage of blood supply. This study involve both hardware and software implementation. A circuitry model is produced and is kept at the bank which involves thermistor, ZigBee as transmitter and a buzzer as alarm. The temperature data is transmitted for every one second to rock bottom station. As for the monitoring system, it'll display the temperature data also as time that received by another ZigBee at rock bottom station. By using LabVIEW, the monitoring system was published to the online by creating an online site which can reduce the work load without involvement of labour. The combing of both software and hardware is completed, where activation of the alarm and indicators for both circuit and monitoring system happen simultaneously supported by the temperature condition of the blood bank . Norlaili Mat Safri proposed a wireless temperature monitoring system has been planned the design and fabricated for the monitoring of blood bank temperature. The protection of blood is completed by marking of blood components and stored at refrigerator temperature of 4°C.

III. PROPOSED SYSTEM

The proposed system is an embedded system which can closely monitor the available status of the blood and temperature of the refrigerator which is present inside the bank. There are two domains in proposed system which includes service and administration domains respectively. Service domain has blood bank that has sensing unit installed to it which has array IR sensor, temperature and humidity sensor nodemcu as a gateway with WiFi module using wireless protocol for wireless communication between blood bank and cloud, ibeacon app for nearest donor finding.

1. Block Diagram

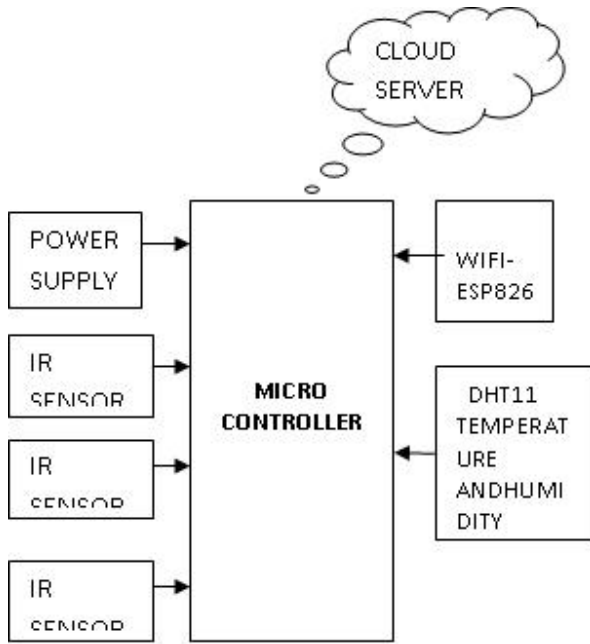


Fig.1 Hardware section

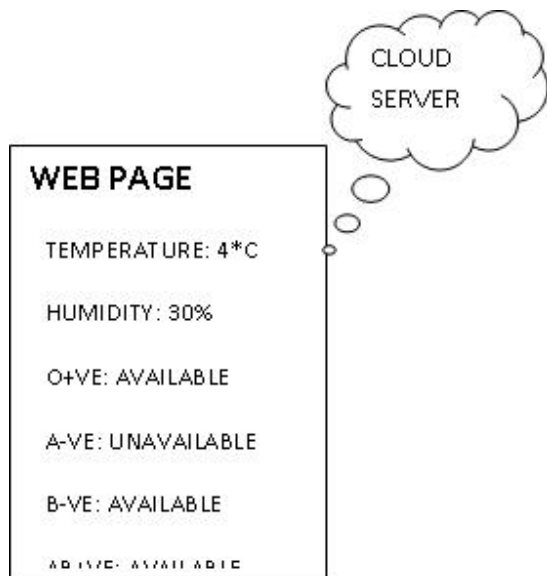


Fig.2 Monitoring Webpage Section

IV. HARDWARE DESCRIPTION

1. Arduino

Arduino is an open source or project in which hardware and software company and user community that designs and manufactures Singleboard microcontrollers and it's kits for building digital devices and collective objects that can sense and control objects within the physical world. Arduino is an opensource electronics platform where hardware and software are supported for easy use. Arduino boards are able to read inputs like light on a sensor, a finger on a button,

or a media message and switch it into an output like start a motor, turning on an LED, posting something online respectively. The Arduino Uno could also be a microcontroller board supported the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 are often used as PWM outputs), 6 analog inputs, a 16 MHz quartz oscillator, a USB connection, an influence jack, an ICSP header, and a reset button. Arduino is an open source project that created microcontroller based kits for building digital devices and interactive objects which may sense and control physical devices. The project is based on microcontroller board and these systems provide sets designs, produced by several vendors, using various microcontrollers of digital and analog input/output (I/O) pins that can interface to various extension of boards and other circuits. The boards feature serial communication interfaces, including such as Universal Serial Bus (USB) on some prototype, for loading programs from personal computers. For programming the microcontrollers, the Arduino project provides an integrated development environment (IDE) supported a programming language named Processing, which also supports the languages C and C++. Arduino Uno could even be a better performance microcontroller board supported by the ATmega328P. It has 14 digital input and output pins (of which 6 are often used as Pulse Width Modulation outputs) which are, 6 analog inputs, a 16 MHz quartz , a USB connection, an effective jack and an ICSP header and a reset button. It consists of everything that needs to support the 13 microcontroller by simply connect it to a personal computer with a USB cable or power it with a AC to DC adapter. Arduino Uno features a number of facilities for communicating with a computer, another Arduino board, or other microcontrollers.



2. IR Sensor

An infrared sensor is a device that emits so as to sense some aspects of the environment. An IR sensor can measure the heat of an object also as it detects the motion. These sorts of sensors measure only infrared, instead of emitting it that's

called as a passive IR sensor. Usually within the spectrum, all the objects radiate some kind of thermal radiations. These sorts of radiations are invisible to our eyes, which will be detected by an infrared sensor. The emitter is just an IR LED and therefore the detector is just an IR photodiode which is sensitive to IR light of an equivalent wavelength as that emitted by the IR LED., The resistances and the output voltages will change in proportion to the magnitude of the IR light which is received when IR light falls on the photodiode . The emitter is an IR LED and thus the detector is an IR photodiode. The IR photodiode is responsive to the IR light which is emitted by an IR LED. The photodiode’s resistance and output voltage as change in proportion to the IR light received. This is the underlying working rule of the IR sensor. When the IR transmitter emits radiation, it reaches the thing and a few of the radiation reflects back to the IR receiver. The output of the sensor defines based on the intensity of the reception by the IR receiver.

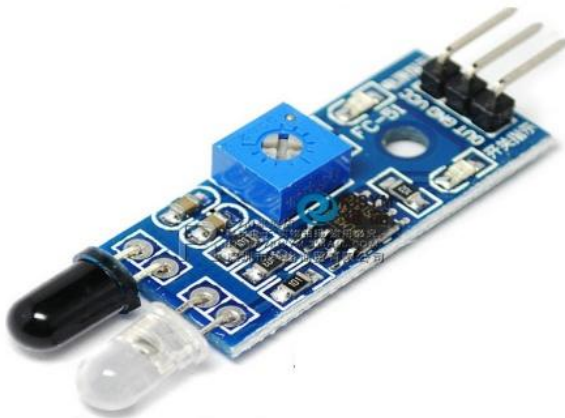


Fig.4 IR Sensor

3. Temperature Sensor

A temperature sensor may be a device, typically, a thermocouple or RTD, that gives for temperature measurement through an electrical signal. A thermocouple is formed from two various types of metals that generate electrical voltage in directly proportional to change in temperature. The LM35 series are preciseness integratedcircuit temperature devices with an output voltage linearly or equally proportional to the celcius temperature. The LM35 device has a gain over linear temperature sensors calibrated in Kelvin, because the user isn't required to subtract an outsized constant voltage from the output to obtain appropriate Centigrade scaling. LM35 device doesn't require any external calibration or trimming to supply typical accuracies of $\pm 1/4^{\circ}\text{C}$ at temperature and $\pm 3/4^{\circ}\text{C}$ above a full -55°C to 150°C temperature range. When the lowoutput impedance, linear output, and precise inherent calibrates the LM35 device. The LM35 device makes interfacing to readout

or control circuitry mostly easy. LM35 could also be a precision IC temperature sensor with its output proportional to the temperature (in $^{\circ}\text{C}$). The sensor circuitry is sealed and therefore it's not exposed to oxidation and other processes. With LM35, temperature is often measured more accurately than with a thermistor. It also possesses low self-heating and doesn't cause quite 0.1°C temperature rise in still air.

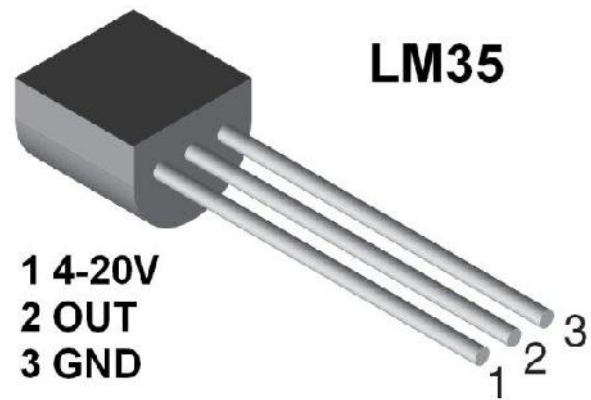


Fig.5 Temperature Sensor

4. Humidity Sensor

A humidity or hygrometer sensor senses, calculates and describes the report of the ratio within the air. It therefore measures both moisture and air temperature. Relative humidity is that the ratio of actual moisture within the air to the very best amount of moisture which will be held at that air temperature. A humidity sensor senses and measures both the moisture and air temperature. The sensor consists of two metal plates and it has a nonconductive polymer film between the metal plates. This film collects moisture from the air, which causes the voltage between the 2 plates to vary . These voltage changes are converted into digital readings showing the extent of moisture within the air.



Fig.6 Humidity Sensor

5. WIFI

WiFi or Wireless networking may be a technology for wireless local area networking with devices supported the IEEE 802.11 standards. WiFi could also be a trademark of the

WiFi Alliance, which restricts the utilization of the term WiFi Certified to products that successfully complete interoperability certification testing. WiFi most commonly uses the two .4 gigahertz (12 cm) UHF and 5 gigahertz (6 cm) SHF ISM radio bands. Having no physical connections, it's more vulnerable to attack than wired connections, like Ethernet. On the technical side, WiFi usable wireless devices, including wireless routers and wireless access points are enables the communications through the IEEE 802.11 standard. Wireless access points support different types of IEEE standards in which each standard is an amendment that was ratified by given extra time. The standards operate varying frequencies, deliver different bandwidth, and support different numbers of channels.

6. Power supply unit

A power supply unit converts mains AC to the low-voltage regulated DC power for the internal parts of a computer. Modern personal computers globally use switched-mode power supplies. Some power supplies have a manual switch for selecting input voltage, while others automatically adapt to the mains voltage. A power supply is used to reduce the mains electricity at 240 volts AC down to something more usable, say 12 volts DC. There are two sorts of power supply, linear and switch mode. A linear power supply uses a transformer to scale back the voltage. The AC signal is rectified and regulated to produce a high DC voltage. An AC adapter, AC/DC adapter, or AC/DC converter is a type of external power supply, often enclosed in a case similar to an AC plug. Adapters for battery powered equipment could also be described as chargers or rechargers (see also battery charger). AC adapters can be used with electrical devices that need power but don't contain internal components to derive the specified voltage and power from main power. The internal circuitry of an external power supply is extremely almost like the planning that might be used for a built in or internal supply.



Fig.7 Adapter

V. SOFTWARE DESCRIPTION

1. iBeacon

iBeacon is introduced by the Apple at 2013 in a Worldwide Developers Conference and it is a protocol designed and developed by the Apple. Various vendors have since made iBeacon compatible hardware transmitters which is typically called as beacons, it is a class of Bluetooth Low energy (BLE) devices that transmit their identifier to nearby portable electronic devices. When the technology is proximity to an iBeacon then it enables the smartphones, tablets and other devices to perform actions. iBeacon is based or depend on Bluetooth low energy proximity sensing by transmitting a globally individual identifier picked up by a compact app or operating system. The identifier and a four other bytes sent with it are often want to find the device's physical location, track customers, or trigger a location based action on the device like a sign in on social media or a push notification. smartphones can determine their approximate location or context by using iBeacon also, which can be used by an application as an inside positioning system. With the assistance of an iBeacon, a smartphone's software can approximately find its comparative location to an iBeacon during a store. Brick and mortar retail stores use the beacons for essential purposes like mobile commerce, offering customers special deals through mobile marketing, and can permit mobile payments through Point of sale (POS) systems. Another application is sharing or distributing messages at a selected Point of Interest, for such as a store, a stop, and an area or a more specific location sort of a piece of woodwork or a vending machine. It is based on GPS which is previously used as geo push technology, but with a more reduced impact on battery life and better precision.

2. Embedded C Programming

Embedded C is an attractive programming language in software field for developing electronic gadgets. Each processor utilized in electronic system is related to embedded software. Embedded C programming plays a essential role in performing certain function by the processor. In day today life we used many electronic devices like mobile, washer, camera, etc. These all device working is predicated on microcontroller that are programmed by embedded C. It is also preferred over other languages due to the following reasons such as easy to understand, high reliability, portability and scalability. The C language programming is meant for function with variables, list, data types, keywords, expression then on are used for writing a C program. The extension in C language is understood as embedded C programming language. As compared to above the embedded programming in C is

additionally have some additional features like data types, keywords and header file etc. It is extended to deal with the commonality issues that exist between C extensions for various embedded systems. Historically, embedded C programming requires nonstandard extensions to the C language so as to support exotic features like fixedpoint arithmetic, multiple distinct memory banks, and basic I/O operations. Modern embedded systems are often supported microcontrollers (i.e. CPU's with integrated memory), but ordinary microprocessors (using external chips for memory) also are common, especially in more complicated systems. In either case, the processor(s) used could also be types starting from general purpose to those specialized in certain class of computations, or maybe bespoke for the appliance at hand. A common standard class of dedicated processors is that the digital signal processor (DSP). Since the embedded system is assigned to a specific tasks, design engineers can improvise it to scale back the dimensions and cost of the merchandise and increase the reliability and performance. Some embedded systems are produced in large scale, therefore taking advantage of economies of scale.

3. Arduino IDE

The Arduino Integrated Development Environment or Arduino Software (IDE), has contains a text editor for code writing, a message area, a control and switches of a text, a toolbar with buttons for common functions and a sequence of menus. It connects to the Arduino hardware to sync programs and communicate with them. The sketches are which uses arduino software to write programs. These sketches are written within the text editor and it is saved with the file called extension.ino. The editor has features like cutting or pasting and also for searching or replacing text. The message area sends feedback while saving and sending and also shows errors. The console displays text output like overall error messages and other information by the Arduino Software (IDE). The configured board and interface are shown at the bottom right hand corner of the window display. The toolbar buttons permit you to verify and upload programs, create, open, and save sketches, and open the serial monitor. On Mac, the link is perhaps something like /dev/tty.usbmodem241 (for an Uno or Mega2560 or Leonardo) or /dev/tty.usbserial1B1 (for a Duemilanove or earlier USB board), or /dev/tty.USA19QW1b1P1.1 (for a serial board connected with a Keyspan USB board to Serial adapter). On Windows, it's probably COM1 or COM2 for a serial board or COM4, COM5, COM7, or higher for a USB board to seek out and to search for USB serial device within the ports section of the Windows Device Manager. On Linux OS, it should be /dev/ttyACMx, /dev/ttyUSBx or similar. Once you've selected the right interface and board, press the upload button 50 within

the toolbar or select the Upload item from the Sketch menu. Current Arduino boards will reset automatically and start the upload. With older boards (preDiecimila) that lack auto reset, you will need to press the push button on the board just before starting the upload. On most boards, you will see the RX and TX LEDs blink because the sketch is uploaded. The Arduino Software (IDE) will displays a message like when the upload is complete, or shows a error and mistake.

VI. RESULT AND DISCUSSION

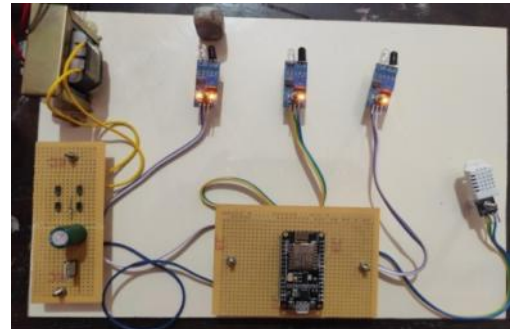


Fig. 7 Blood Bank Monitoring Circuit

This circuit has 3 led which indicate the rack of blood quantities. Where only one rack blinks and other two doesn't due to shortage of blood. So, after that we check the blood bank portal for list of quantity of blood which is available or not. Then the portal shows the available and unavailable blood list. After that we will check the donor list available for the unavailability of blood at the nearest surrounding of the hospital. It can be identified only when the donors are ready to donate the blood by logging in to the GPS Logger app.

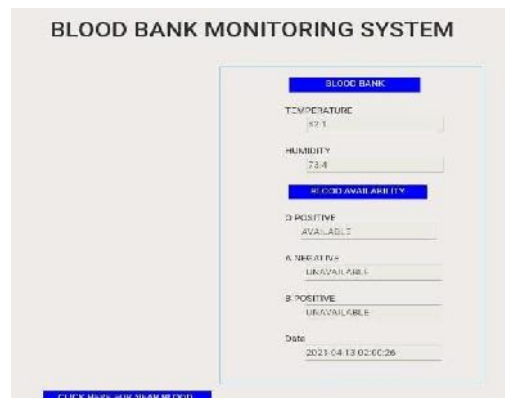


Fig.8 Blood Bank Panel

The details of the quantity of blood available and unavailable in their banks .After seeing the unavailable blood click the “click here for near blood”.

Fig. 9 Blood Bank Panel 2nd Page

Here we can get contact details and distance from the hospital details so that we can contact the nearer donor if any blood needed for emergency.



Fig. 10 GPS Logger App

If the donor is ready to donate blood then the person can open the GPS logger app and start logging. So that the last login detail will be shown in the blood bank portal.

VII. CONCLUSION

Growing population has increased the requirement for the blood supply for numerous diseases. In every two seconds, some people need transfusion and presently India facing problem of the blood insufficiency. So, to deal with the subject an effective system is meant using the web of things. The system provides a idea to fulfill the requirement of blood to the patients or victims without rushing to the bank to understand the supply of the blood. An IR Sensors are connected to the controller board which constantly monitors the status or level of the available bloodstock. In this work, the output data supplied by the controller is presented on the webpage using the WiFi module so anyone accesses the web site and obtained the knowledge of acquirable bloodstock in real time. It'll reduce the manpower required at the bank to update or modify the web data and also reduces the efforts of blood seeker of searching bloodstock at each bank. When

bloodstock reaches to zero system and then it helps to send an invitation message to the donor and nearest bank. By using IoT the realtime available bloodstock is displayed on the web site, so it minimizes the efforts of blood seeker.

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