International Journal of Innovative Technologies
WWW.IJITECH.ORG
ISSN 2321-8665
Volume.06, Issue.01,
January-June, 2018,
Pages:0093-0097

Android Based Health Monitoring System

K. PAVAN KUMAR[1], M. LAKSHMI NARAYANA[2]
[1]PG Scholar, Dept of ECE (ES), LITAM, Dhullipalla, Guntur, AP, India.
[2]Assistant Professor, Dept of ECE, LITAM, Dhullipalla, Guntur, AP, India.

Abstract: Generally in critical case patients are supposed to be monitored continuously for their $SP0_2$, Heart Rate as well as temperature. In the earlier methods, the doctors need to be present physically or in several cases SMS will be sent using GSM. In the earlier case the history of the patient cannot be displayed, only current data is displayed. In the current paper, we are using a novel idea for continuous monitoring patient's health conditions. The health care scheme is focus on the measurement and Monitoring various biological parameters of patient's body like heart rate, oxygen saturation level in blood and temperature using a web server and android application, where doctor can continuously monitor the patient's condition on his smart phone using an Android application. And also the patient history will be stored on the web server and doctor can access the information whenever needed from anywhere and need not physically present.

Keywords: GSM, Interaction Design Institute Ivrea (IDII), GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL).

I. INTRODUCTION

Arduino is a computer hardware and software company, project, and user community that designs and manufactures microcontroller kits for building digital devices and interactive objects that can sense and control objects in the physical world. The project's products are distributed as open-source hardware and software, which are licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL), permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially in preassembled form, or as do-it-yourself kits. Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards (shields) and other circuits. The boards feature serial communications interfaces, including Universal Serial Bus (USB) on some models, which are also used for loading programs from personal computers. The microcontrollers are typically programmed using a dialect of features from the programming languages C and C++. In addition to using traditional compiler tool chains, the Arduino project provides an integrated development environment (IDE) based on the processing language project as shown in Fig.1.

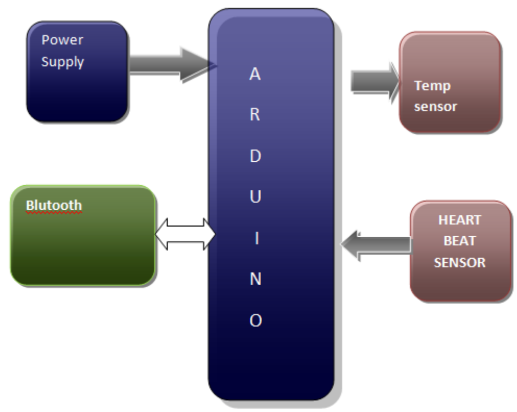

Fig.1. Arduino Diagram.

The Arduino project started in 2005 as a program for students at the Interaction Design Institute Ivrea in Ivrea, Italy, aiming to provide a low-cost and easy way for novices and professionals to create devices that interact with their environment using sensors and actuators. Common examples of such devices intended for beginner hobbyists include simple robots, thermostats, and motion detectors. The name Arduino comes from a bar in Ivrea, Italy, where some of the founders of the project used to meet. The bar was named after Arduin of Ivrea, who was the margrave of the March of Ivrea and King of Italy from 1002 to 1014.

II. HISTORY

The origin of the Arduino project started at the Interaction Design Institute Ivrea (IDII) in Ivrea, Italy. At that time, the students used a BASIC Stamp microcontroller at a cost of $100, a considerable expense for many students. In 2004, Colombian student Hernando Barragán created the development platform Wiring as a Master's thesis project at IDII, under the supervision of Massimo Banzi and Casey Reas, who are known for work on the Processing language. The project goal was to create simple, low cost tools for creating digital projects by non-engineers. The Wiring platform consisted of a printed circuit board (PCB) with an ATmega168 microcontroller, an IDE based on Processing and library functions to easily program the microcontroller.
In 2005, Massimo Banzi, with David Mellis, another IDII student, and David Cuartielles, added support for the cheaper ATmega8 microcontroller to Wiring. But instead of continuing the work on Wiring, they copied the Wiring

source code and renamed it as a separate project, called Arduino. The initial Arduino core team consisted of Massimo Banzi, David Cuartielles, Tom Igoe, Gianluca Martino, and David Mellis, but Barragán was not invited to participate. Following the completion of the Wiring platform, lighter and less-expensive versions were distributed in the open-source community. Adafruit Industries, a New York City supplier of Arduino boards, parts, and assemblies, estimated in mid-2011 that over 300,000 official Arduinos had been commercially produced, and in 2013 that 700,000 official boards were in users' hands.

III. HARDWARE

Arduino is open-source hardware. The hardware reference designs are distributed under a Creative Commons Attribution Share-Alike 2.5 license and are available on the Arduino website. Layout and production files for some versions of the hardware are also available. The source code for the IDE is released under the GNU General Public License, version 2. Nevertheless, an official Bill of Materials of Arduino boards has never been released by Arduino staff. Although the hardware and software designs are freely available under copyleft licenses, the developers have requested that the name Arduino be exclusive to the official product and not be used for derived works without permission. The official policy document on use of the Arduino name emphasizes that the project is open to incorporating work by others into the official product. Several Arduino-compatible products commercially released have avoided the project name by using various names ending in -duino as shown in Fig.2. An Arduino board consists of an Atmel 8-, 16- or 32-bit AVR microcontroller (ATmega8, ATmega168, ATmega328, ATmega1280, ATmega2560), but other makers' microcontrollers have been used since 2015. The boards use single-row pins or female headers that facilitate connections for programming and incorporation into other circuits.

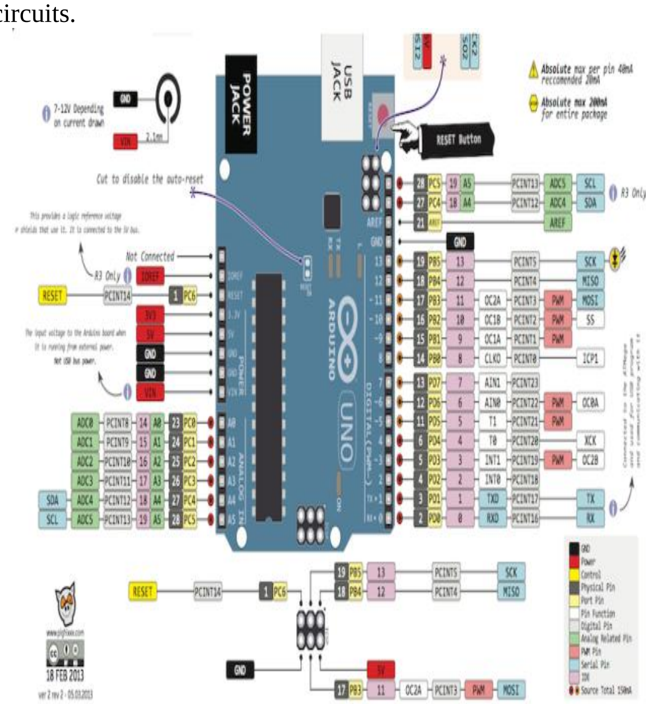

Fig.2. Control Diagram.

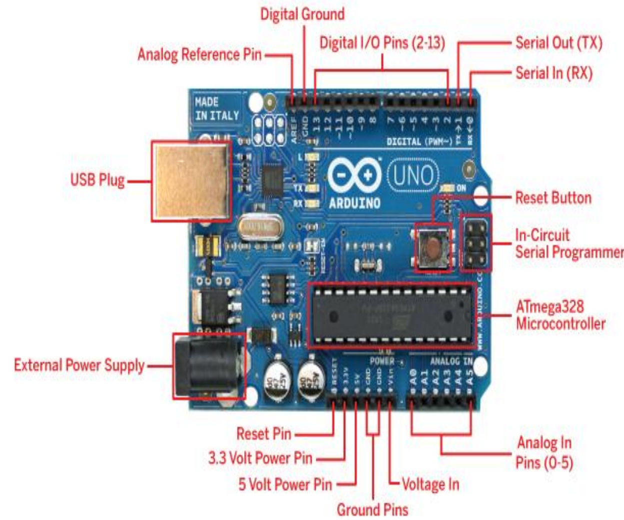

Fig.3. Arduino board.

These may connect with add-on modules termed shields. Multiple, and possibly stacked shields may be individually addressable via an I²C serial bus. Most boards include a 5 V linear regulator and a 16 MHz crystal oscillator or ceramic resonator. Some designs, such as the LilyPad, run at 8 MHz and dispense with the onboard voltage regulator due to specific form-factor restrictions. Arduino microcontrollers are pre-programmed with a boot loader that simplifies uploading of programs to the on-chip flash memory. The default bootloader of the Aduino UNO is the optiboot bootloader. Boards are loaded with program code via a serial connection to another computer. Some serial Arduino boards contain a level shifter circuit to convert between RS-232 logic levels and transistor–transistor logic (TTL) level signals as shown in Fig.3. Current Arduino boards are programmed via Universal Serial Bus (USB), implemented using USB-to-serial adapter chips such as the FTDI FT232. Some boards, such as later-model Uno boards, substitute the FTDI chip with a separate AVR chip containing USB-to-serial firmware, which is reprogrammable via its own ICSP header. Other variants, such as the Arduino Mini and the unofficial Boarduino, use a detachable USB-to-serial adapter board or cable, Bluetooth or other methods, when used with traditional microcontroller tools instead of the Arduino IDE, standard AVR in-system programming (ISP) programming is used.

A. BLUE TOOTH Module

'Bluetooth', the short-range radio link technology designed to "connect" an array of devices including mobile phones, PC's, and PDA's, and the strategic decisions that Motorola should make in incorporating this nascent technology into its product portfolio. The purpose of this paper will be to provide a high-level overview of the technology to the head of Motorola's Communications Enterprise, and prepare this corporate officer to be strategically and functionally conversant in the technology with subordinates that have direct responsibility for integrating Bluetooth into Motorola's product lines. The first sections of the paper detail the background of the Bluetooth technology and its associated Special-Interest Group, or SIG, (a conglomeration of firms that has sought to reduce market uncertainty, thereby expediting the diffusion of Bluetooth devices). Bluetooth’s perceived strengths over other wireless connectivity technologies are also discussed and some macro-level threats that may impede Bluetooth diffusion are outlined. The remainder of the paper details potential Bluetooth markets (in terms of consumer and corporate applications) and examines Motorola's current Bluetooth product offerings (a cell phone battery and computer PCMCIA card each enabled with a Bluetooth chip). Finally, the paper provides guidance for Motorola's Bluetooth application development strategies regarding the applications outlined in the SIG's specifications, namely emphasizing those applications that leverage existing complementary assets, and those that are critical to Bluetooth adoption regardless of prior expertise.

B. Advantages

Bluetooth has the potential to improve personal communications (consumer and corporate) and productivity by creating personal networks between all of a user's electronic devices. It operates in the unlicensed, internationally available 2.45GHz band and is a much more robust technology than other wireless technologies used for similar applications, most notably infrared-- which requires a line of sight link between communicating devices. Bluetooth’s multidirectional capability makes the technology adaptable to a multitude of applications. Additionally, Bluetooth can enable up to eight devices at one time, forming a ‘piconet’, communicating amongst themselves (See Exhibit 2). Additionally, Bluetooth-enabled devices have greater computing power devoted to communications compared to previous generations of devices, allowing for the power to translate between internal languages of all sorts of devices thought to be previously incompatible. As an example, a Bluetooth-enabled portable CD player would be able to play with Bluetooth-enabled speakers in the absence of headphones. Accordingly, as that example shows, Bluetooth’s most important hurdle is adoption, which is a function of the demonstrated benefit being offered by a sufficient number of enabled devices.

C. Disadvantages

First and foremost, for Bluetooth to become widely adopted, the incremental costs for enabling Bluetooth technology need to decline significantly. As mentioned, Bluetooth’s success is network constrained - if it is not widely adopted, its usefulness and capabilities are limited, much like applications like ICQ. Unlike ICQ, the cost for manufacturers to incorporate Bluetooth chipsets into devices and the subsequent costs to consumers are presently quite high--at its current cost levels, wide-scale adoption is not likely. While prices are anticipated to drop to the $5 per device level, industry analysts believe that the $1 price point is needed for the technology to become truly ubiquitous (i.e. in a variety of CE products, not simply limited to cell phones and PDAs). In the software and hardware industries, certain companies have been known to take open, clearly defined standards, and modify them slightly, and then claim that the modified standard was proprietary. In this way, standards have fragmented and products that should be compatible have not been. New applications have also failed to be correctly aligned with the traditional and ‘revised’ standards, leading to compatibility and design confusion concerns.

A positive for the Bluetooth platform is its capability to support the robust, versatile TCP/IP platform. Bluetooth is currently operating in an unlicensed spectrum- 2.45 GHz. This is potentially a problem if other technologies using the spectrum will interfere with Bluetooth devices. While 2.45GHz is not presently heavily congested, neither were phone lines in 1993 with data transmission. The point is that growth can be explosive with technologies that grow geometrically. Bluetooth’s 79-channel architecture helps to curb cross-interference problems, as each time it transmits a packet of information, it hops to a new frequency. Any problem transmissions are re-transmitted on new frequencies. Nonetheless, despite the unique technology, the possibility for problems exists. It should be noted that this paper will not attempt to address the threats that extend somewhat beyond Motorola's operational parameters (in the sense that Motorola cannot dictate the usage parameters of unlicensed spectrum, nor control the development activities of independent business entities). The paper assumes that most companies will adhere to the SIG specifications and that the Bluetooth architecture will withstand bandwidth congestion; it then focuses on the potential markets and immediate development strategies that Motorola should undertake to effectively incorporate Bluetooth into the company's product portfolio and speed Bluetooth on its way to widespread adoption.

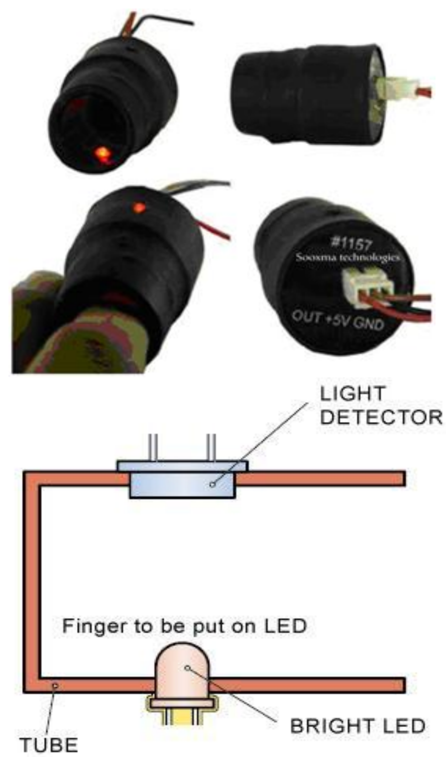

Fig.4. Sensor Construction.

D. Heart Beat Sensor

This heart beat sensor is designed to give digital output of heat beat when a finger is placed inside it. When the heart detector is working, the top-most LED flashes in unison with each heart beat. This digital output can be connected to microcontroller directly to measure the Beats Per Minute (BPM) rate. It works on the principle of light modulation by blood flow through finger at each pulse as shown in Fig.4.

Features:

- Heat beat indication by LED
- Instant output digital signal for directly connecting to microcontroller
- Compact Size
- Working Voltage +5V DC

Applications:

- Digital Heart Rate monitor
- Bio-Feedback control of robotics and applications
- Exercise machines

Fig.5. Signal View.

Fig.5 shows actual heart beat received by detector (Yellow) and the trigger point of sensor (Red) after which the sensor outputs digital signal (Blue) at 5V level.

E. Working

The sensor consists of a super bright red LED and light detector. The LED needs to be super bright as the light must pass through finger and detected at other end. Now, when the heart pumps a pulse of blood through the blood vessels, the finger becomes slightly more opaque and so less light reached the detector. With each heart pulse the detector signal varies. This variation is converted to electrical pulse. This signal is amplified and triggered through an amplifier which outputs +5V logic level signal. The output signal is also indicated on top by a LED which blinks on each heart beat. Following fig.6 shows signal of heart beat and sensor signal output graph. For amplification, we use IC LM 358. Pulse rate is sensed by using a high intensity type LED and LDR. The finger is inserted in probe and red light from high intensity LED is allowed to fall on the finger. The amount of red light absorbed by finger varies according to the pulsatile blood flow in the finger. Therefore the amount of light transmitted varies according to the blood flow.

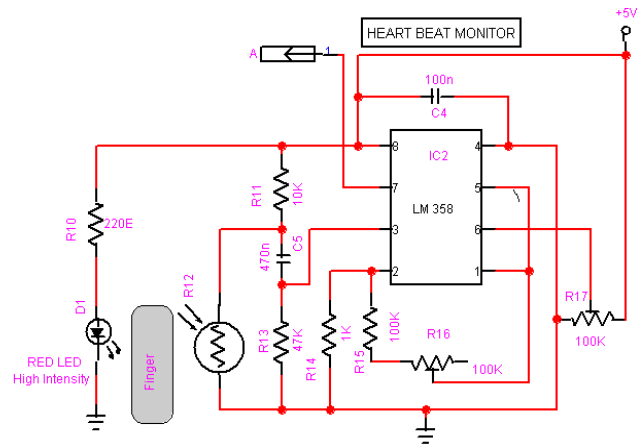

Fig.6. circuit diagram.

The LDR placed on opposite side of LED detects the transmitted light. With increase in transmitted light its resistance decreases and vice-versa. A voltage divider circuit is employed to get a voltage signal proportional to the resistance of the LDR. This voltage signal consists of AC and DC components. Non-moving structures (veins, blood capillaries, bones, soft tissues, non-pulsatile blood) absorb constant amount of light and hence contribute to the DC component of voltage signal. As it provides no information about the blood pulses, DC components are not needed. Pulsatile blood absorbs varying amount of light and hence contributes to AC component of voltage signal. AC components are our required signal. The magnitude of the DC components is almost 100-1000 times higher than the AC components. Hence they need to be removed in order for the AC components to be conditioned properly further on. Therefore, a high pass filter circuit is employed after the voltage divider network to block the DC components of the signal as shown in Fig.7. The AC signal is now amplified from mV range to V range. The amplified signal is given to a comparator where it is compared against a set threshold value. The comparator o/p consists of positive pulses corresponding to blood pulses. The comparator output is given to the PIC. The PIC calculates the time duration between 2 successive pulses and then computes the instantaneous heart rate. The PIC then proceeds to display the calculated heart rate on the LCD display.

F. Temperature sensor

The Temperature Sensor LM35 sensor series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature.

LM 35: (Temperature /Fire Sensor): The LM35 sensor series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. To detect the heat produced during fire occurrence we use temperature sensor. The Temperature Sensor LM35 sensor series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature.

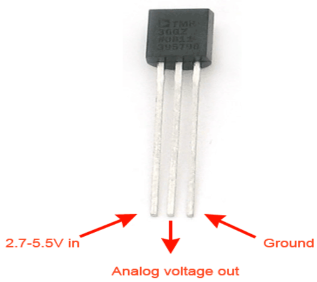

Fig.7. temperature control.

IV. CONCLUSION

This current designed system provides low complexity, low power consumption and highly portable to monitoring the patient's health and can eliminate the need for the utilization of expensive facilities. The doctor can easily access patient information anywhere with the help from the Android web server. In the future, we can develop a large database of all the patients of any hospital and these health parameters can be supervised continuously, and also the information is loaded to the hospital server These servers keep the information of the patients in the database, and doctors can have access to patient's history, when any additional consulate happens with the doctor.

V. FUTURE SCOPE

The home based health monitoring application is presented which allows doctor to view his patient's medical parameter remotely and dynamically in a Web page in real time and does not need to have any special requirement on his PC or mobile; all he needs is an internet access. In future we can create and save the database of the patient, if patient could come after 1, 2 years then doctor can treat the patient very well.

VI. REFERENCES

[1] Sang-Joong Jung, Ristro Myllyla, and Wan-Young Chung "Wireless Machine-to-Machine Healthcare Solution Using Android Mobile Devices in Global Networks" IEEE Sensors , vol. 13, no.5, pp.1419-1424, may 2013.

[2] MathiasWager, Benjamin, CarlosCabrera, Peter Enoksson and Arne Sieber "Android based body area Network for evalution of medical parameters" Intelligent Solutions in Embedded Systems (WISES) ,pp. 33-38, jul. 2012.

[3] Shyr-Kuen Chen, Tsair Kao, Chia-Tai Chan, Chih NingHuang, ChinYenChiang, Chinu-Yu Lai,Tse-Hua Tung and Pi-chung Wang, "A reliable Transmission protocol for Zigbee based wireless patient's monitoring"IEEE transactions on Information Technology In Biomedicine, Vo1.l6, No.1, pp. 6-16, Jan 2012.

[4] Bingchuan Yuan and John Herbert "web based real time remote monitoring for pervasive healthcare" IEEE International Conference on Pervasive Computing and Communications Workshops, pp. 625- 629, march 2011.

[5] Yuanyuan Du,Yu Chen,Dan Wang,Jinzhao Liu and Yongqiang "An Android based emergency alarm and health care management system" IT in Medicine and Education (ITME), vo1.1, pp. 375-379, Dec.2011.

[6] Maziar Tavakoli and Lorenzo Turicchia and Rahul Sarpeshkar "An Ultra low power pulse oximeter implemented with an energyefficient transmission impdence amplifier "IEEE transaction on biomedical circuits and systems, vol.4, No. I, pp. 27-38, feb 2010.

[7] Mangal Sain, HoonJae Lee and Wan-Young Chung "Personal Healthcare Information System" International Joint Conference on INC, IMS and IDC, pp. 1540-1545, Aug 2009.

[8] Zhou Yan and Zhu Jiaxing "Design and Iplementation of ZigBeee Based Wireless Sensor Network for Remote Sp02 Monitor" International Conference on Future Computer and Communication(ICFCC), vol.2, pp. 278-281, May 2010.

[9] Md.Manirul Islam, Fida Hasan Md. Rafi, Mohiuddin Ahmad, Abu Farzan Mitul. T.M.N.Tunku Mansur and M.A.Rashid "Microcontroller Based Health Care Monitoring System Using Sensor Network" International Conference on Electrical & Computer Engineering (ICECE), PP. 272-275, Dec. 2012.

[10] Santiago Lopez "Pulse oximeter fundamentals and design" in Free scale semiconductor , 2012.

[11] Android programming and application development Avilable: http://developer.android.com/index.html