ARM7 BASED HEALTH MONITORING SYSTEMS USING IOT

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ABSTRACT:

The project aims at designing a system which monitors the health parameters of a patient and send the details through Wi-Fi module to the user android phone.

Most computer systems authenticate users only once at the time of initial login, which can lead to security concerns. Continuous authentication has been explored as an approach for alleviating such concerns. Previous methods for continuous authentication primarily use biometrics, e.g., fingerprint and face recognition, or biometrics, e.g., key stroke patterns. We describe CABA, a novel continuous authentication system that is inspired by and leverages the emergence of sensors for pervasive and continuous health monitoring. CABA authenticates users based on interaction with server platform, and uses an ensemble of biomedical signal streams that can be collected continuously and non-invasively using wearable medical devices.

In this project, we are using temperature sensor and blood pressure sensor. The interface to the server is done through Bluetooth. An android app has been developed on the server side in smart phone, while in PC matlab server is used.

I. INTRODUCTION

Capturing and sharing of vital data of the network connected devices through secure service layer is what defines IOT. In simple terms, Internet of Things (IOT) can be defined as the wireless network of devices which are connected to each other to share information and data in order to communicate and produce new information so as to record and analyze it for future use. Internet of Things gains its full potential by utilizing the key role playing objects i.e. "Smart" objects which use various sensors and actuators that are able to perceive their context, and via built in networking capabilities they could communicate to each other, access the open source Internet services and interact with the human world. This not only makes the world connected but also robust and comfortable. The Internet of things in the field of healthcare also plays a major role in providing ease to patients and doctors. It consists of a system that communicates between network connected systems, apps and devices that can help patients and doctors to monitor, track and record patients' vital data and medical information. Some of the devices include smart meters, wearable health bands, fitness shoes, RFID based smart watches and smart video cameras. Also, apps for smartphones also help in keeping a medical record with real time alert and emergency services.

For example, various medical devices like fitness bands, health monitoring systems, medication boxes has smart sensors embedded into them that allows to collect the raw data, store it, analyze it, and conduct tests which are further used by medical experts to take proper decisions. To take the full advantage of revolutionizing IOT in healthcare, the consumers, patients and other health experts need to think of some innovative and more reliable methods. And with the help of IoT's potential they are now able to collect realtime raw data from unlimited number of patients for a continuous period of time through smart devices connected on an interconnected network. It will take time to fully realize the technology's capabilities. We will be able to see medical experts carrying out diagnosis and critical tasks in a more better and reliable way. This will ensure them not only with reliable results but also time saving which will be of maximum benefit. The possibilities of IOT are truly unlimited and ever growing. This paper proposes an IoT based health monitoring system which would collect all the medical data of a patient including his heart rate, blood pressure and ECG and would send alerts to the patient's doctor regarding his/her full medical information, providing a fast and reliable healthcare service. Moreover, in today's world everyone is busy neglecting their small healthcare problems like high blood pressure, low pulse rate etc. The paper helps to find a better and robust solution to this challenge.

In today's era, health problems are increasing day-by-day at a high pace. The death rate of 55.3 million people dying each year or 151,600 people dying each day or 6316 people dying each hour is a big issue for all over the world. Hence it is the need of hour to overcome such problems. We, therefore, proposing a change in wireless sensors technology by designing a system which included different wireless sensors to receive information with respective human body temperature, blood pressure, saline level, heart rate etc. that will be undoubtedly further transmitted on an IoT platform which is accessible by the user via internet.

In addition to it, new generation mobile phones technologies & their services provides an important impact on the development of network varieties (3G, Bluetooth, wireless LAN, GSM) etc. Various sensors have been used like AD8232 ECG sensor for remote ECG monitoring, blood pressure sensor (4811) is used to measure systolic pressure and diastolic pressure & pulse rate for few seconds. LM35 temperature sensor is used to measure surface temperature of skin. Satisfactory work is done in health monitoring by using raspberry pi as well as IoT, but this project gives embedded concept of both the platform. By using combination of these, the proposed structure will be more effective. In this project, we investigated recent projects related to health monitoring systems & IoT. IoT is nothing but an advanced concept of ICT (Information Communication Technology).

IoT is the interconnecting of devices and services that reduces human intervention to live a better life. This project as showing the advancements in health care management technology, it would save patients from the

future health problems that would arise and would also help doctors to take an appropriate measure or action at a proper time regarding patient's health.

II. DESIGN OF HARDWARE

2.1 LPC2148 (ARM7) MICROCONTROLLER:

The LPC2148 microcontrollers are based on a 32 bit ARM7TDMI-S CPU with real time emulation and embedded trace support, that combines the microcontroller with embedded high speed flash memory of 512kB. For critical code size applications, the alternative 16-bit Thumb mode reduces the code by more than 30 % with minimal performance penalty.

Due to their tiny size and low power consumption, LPC2148 microcontrollers are ideal for the applications where miniaturization is a key requirement, such as access control and point-of-sale. A blend of serial communications interfaces ranging from a USB 2.0 Full Speed device, multiple UARTS, SPI, SSP to I2Cs and on-chip SRAM of 8 kB up to 40 kB, make these devices very well suited for communication gateways and protocol converters, soft modems, voice recognition and low end imaging, providing both large buffer size and high processing power. Various 32-bit timers, single or dual 10-bit ADC(s), 10-bit DAC, PWM channels and 45 fast GPIO lines with up to nine edge or level sensitive external interrupt pins make these microcontrollers particularly suitable for industrial control and medical systems.

2.2. BLOCK DIAGRAM OF LPC2148 MICROCONTROLLER:

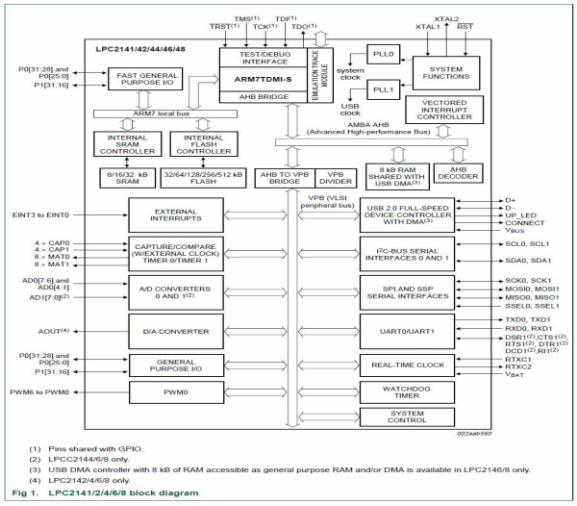

Fig:1. Block Diagram Of Lpc2148 Microcontroller

2.2.1 PIN DIAGRAM OF LPC 2148 MICRO CONTROLLER:

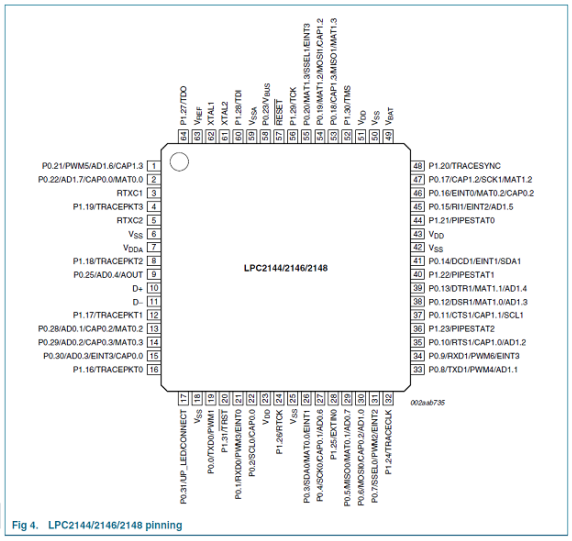

Fig:2. Pin Diagram Of Lpc2148 Microcontroller

2.3. Temperature Sensor-LM35

It is an IC sensor that is used to measure temperature with an output voltage linearly proportional to the Centigrade temperature. The LM35 sensor has an advantage over linear temperature sensor, as the user has not to make the conversion of Kelvin to Centigrade. This is major significance of LM-35 that it calibrates directly in Celsius and it is also suitable for remote applications. It has better efficiency than thermistor.

Temperature is one of the most commonly measured parameter in the world. They are used in your daily household devices from Microwave,fridges, AC to all fields of engineering. Temperature sensor basically measures the heat/cold generated by an object to which it is connected. It then provides a proportional resistance, current or voltage output which is then measured or processed as per our application. Temperature sensor are basically classified into two types

- Non Contact Temperature Sensors: These temperature sensors use convection & radiation to monitor temperature
- Contact Temperature Sensors: Contact temperature sensors arethen further sub divided into three type
    1. Electro-Mechanical(Thermocouples).
    2. Resistive Resistance Temperature Detectors (RTD).
    3. Semiconductor based. (LM35, DS1820 etc).

In this project, we will be discussing about LM35 Temperature Sensor which is a semiconductor based sensor. LM35 is an integrated analog temperature sensor whose electrical output is proportional to Degree Centigrade. LM35 Sensor does not require any external calibration or trimming to provide typical accuracies. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy.

2.3.1 Features of LM35 Temperature Sensor

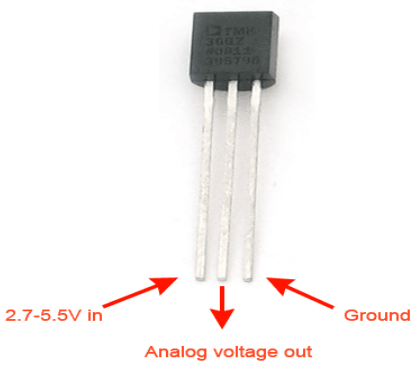

Fig 3: Pin diagram of LM35

- Calibrated directly in Degree Celsius (Centigrade)
- Linear at 10.0 mV/°C scale factor
- 0.5°C accuracy guarantee-able (at a25°C)
- Rated for full -55°C to a 150°C range
- Suitable for remote applications
- Low cost due to wafer-level trimming
- Operates from 4 to 30 volts
- Less than 60 mA current drain

2.4 Bluetooth

Bluetooth is a wireless technology standard for exchanging data over short distances (using short-wavelength UHF radio waves in the ISM band from 2.400 to 2.485 GHz from fixed and mobile devices, and building personal area networks (PANs). It was originally conceived as a wireless alternative to RS-232 data cables.

Bluetooth is managed by the Bluetooth Special Interest Group (SIG), which has more than 30,000 member companies in the areas of telecommunication, computing, networking, and consumer electronics. The IEEE standardized Bluetooth as **IEEE 802.15.1**, but no longer maintains the standard. The Bluetooth SIG oversees development of the specification, manages the qualification program, and protects the trademarks.[3] A manufacturer must meet Bluetooth SIG standards to market it as a Bluetooth device.[4] A network of patents apply to the technology, which are licensed to individual qualifying devices

2.5. POWER SUPPLY:

The power supplies are designed to convert high voltage AC mains electricity to a suitable low voltage supply for electronic circuits and other devices. A power supply can by broken down into a series of blocks, each of which performs a particular function. A d.c power supply which maintains the output voltage constant irrespective of a.c mains fluctuations or load variations is known as “Regulated D.C Power Supply”.

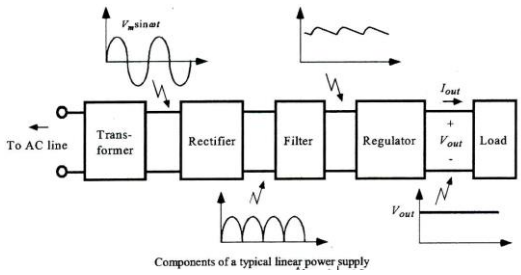

Fig:6 Block Diagram of Power Supply

2.6. LCD SCREEN:

LCD screen consists of two lines with 16 characters each. Each character consists of 5x7 dot matrix. Contrast on display depends on the power supply voltage and whether messages are displayed in one or two lines. For that reason, variable voltage 0-Vdd is applied on pin marked as Vee. Trimmer potentiometer is usually used for that purpose. Some versions of displays have built in backlight (blue or green diodes). When used during operating, a resistor for current limitation should be used (like with any LE diode).

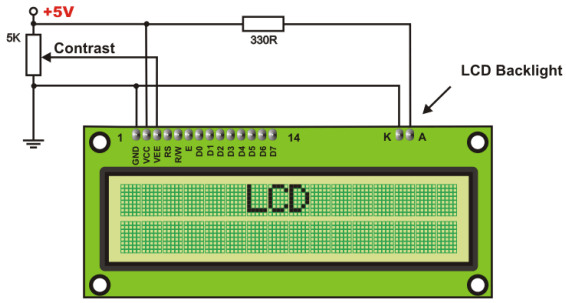

Fig:7.LCD Screen Circuit Diagram

2.7 BP SENSOR

Blood pressure (**BP**) is the pressure of circulating blood on the walls of blood vessels. Most of this pressure is due to the work done by the heart in pumping blood round the circulation. Used without further specification, "blood pressure" usually refers to the pressure in large arteries of the systemic circulation. Blood pressure is usually expressed in terms of the systolic pressure(maximum during one heartbeat) over diastolic pressure (minimum in between two heartbeats) and is measured in millimeters of mercury (mmHg), above the surrounding atmospheric pressure.

Blood pressure is one of the vital signs, along with respiratory rate, heart rate, oxygen saturation, and body temperature. Normal resting blood pressure in an adult is approximately 120 millimetres of mercury (16 kPa) systolic, and 80 millimetres of mercury (11 kPa) diastolic, abbreviated "120/80 mmHg".

III. PROJECT DESCRIPTION

This chapter deals with working and circuits of "**HEALTH MONITORING SYSTEMS USING IOT BASED ON ARM 7**". It can be simply understood by its block diagram &circuit diagram.

3.1. BLOCK DIAGRAM:

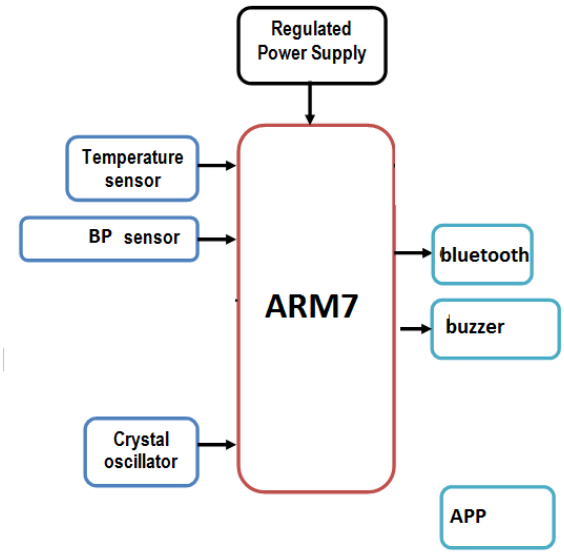

Fig 8 block diagram

3.2. WORKING:

We have proposed a robust health monitoring system that is intelligent enough to monitor the patient automatically using IOT that collects the status information through these systems which would include patient's heart rate, blood pressure and ECG and sends an emergency alert to patient's doctor with his current status and full medical information. This would help the doctor to monitor his patient from anywhere and also to the patient to send his health status directly without visiting to the hospital. Our model can be deployed at various hospitals and medical institutes. The system uses smart sensors that generates raw data information collected from each sensor and send it to a database server where the data can be further analyzed and statistically maintained to be used by the medical experts. Maintaining a database server is a must so that there is even track of previous medical record of the patient providing a better and improved examining.

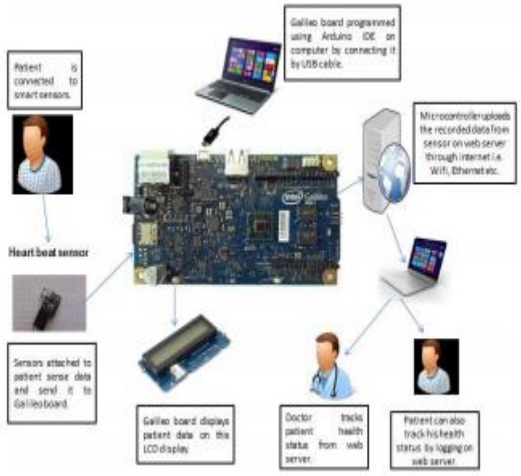

Fig9: System Architecture

4.1 RESULTS

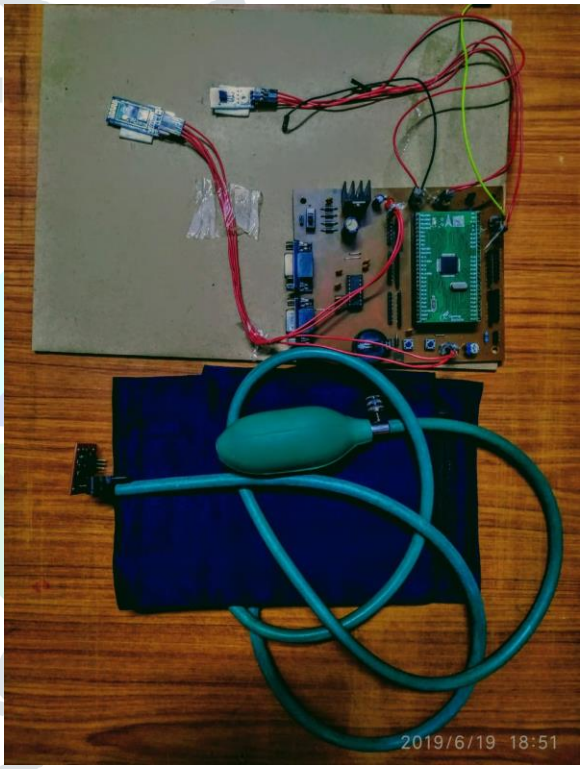

Fig10: Hardare kit

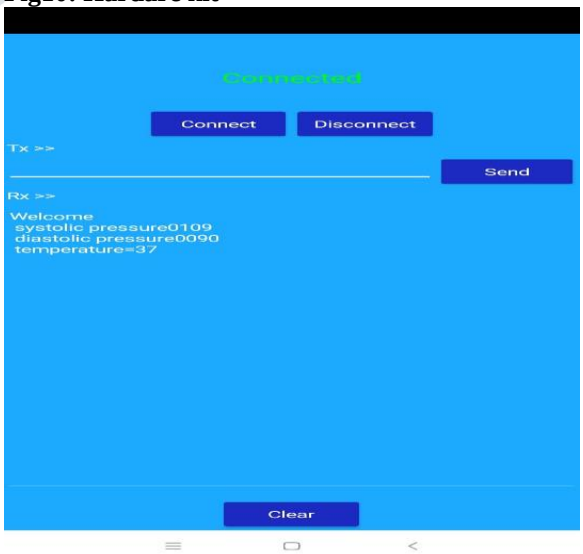

Fig11: Output results

IV. CONCLUSION

In this project, The main idea of the proposed system is to provide better and efficient health services to the patients by implementing a networked information cloud so that the experts and doctors could make use of this data and provide a fast and an efficient solution. The final model will be well equipped with the features where doctor can examine his patient from anywhere and anytime. Emergency scenario to send an emergency mail or message to the doctor with patient's current status and full medical information can also be worked on.

REFERENCES

[1]. K. Navya, Dr. M. B. R. Murthy, "A Zigbee Based Patient Health Monitoring System", Int. Journal of Engineering Research and Applications Vol. 3, Issue 5, Sep-Oct 2013, pp.483-486

[2]. Matthew D'Souza, Montserrat Ros, Adam Postula, "Wireless Medical Information System Network for Patient ECG Monitoring" Digital System Design:Architectures, Methods and Tools, 2006, DSD 2006, 9th EUROMICRO Conference, 2006, pp.617-624.

[3]. C.C.Gavimath, Krishnamurthy Bhat, C.L. Chayalakshmi , R. S. Hooli and B.E.Ravishankera, "Design and Development of versatile saline flow rate measuring system and GSM based remote monitoring device", International Journal of Pharmaceutical Applications ISSN 0976-2639. Vol 3, Issue 1,2012, pp 277-281.

[4]. NakulPadhye and Preet Jain, "Implementation of ARM Embedded Web Server for DAS using Raspberry pi", VSRD IJEECE April 2013.

[5]. Ch. Sandeep Kumar Subudhi and S. Sivanandam, "Intelligent Wireless Patient Monitoring and Tracking System(Using Sensor Network and Wireless Communication)", International Journal of Interdisciplinary and Multidisciplinary Studies,2014,Vol 1,No.3,97-104.

[6]. Hossein Fotouhi, Aida Causevic, Kristina lundqvist, Mats bjorkman," Communication and Security in Health monitoring System – A Review", 2016 IEEE 40th Annual computer software and application conference, DOI 10.1109/COMPSAC.2016.8.

[7]. M. U. Ahmed, M. Bj ̈orkman, and A. Cau ̆sevic, et al. An overview on the internet of things for health monitoring systems. In IoT Technologies for HealthCare, 2015.

[8]. [9] F. Samie and L. Bauer and C.-M. Hsieh et al. Online binding of applications to multiple clock domains in shared fpgabased systems. InDATE, pp. 25–30, 2015.

[9]. C. Perera and A. Zaslavsky and P. Christen et al. Context aware computing for the Internet of Things: A survey. IEEE Communications Surveys & Tutorials, 16(1):414–454, 2014.

[10]. Farzad Samie, Lars Bauer, Jörg Henkel, "IoT Technologies forEmbedded Computing: A Survey", ESWEEK'16, October 2-7 2016, Pittsburgh, PA, USA.