

Health Monitoring Systems using IoT

A. Mariya Chithra Mary¹, S. Veerakumar², R. Babu³

Assistant Professor¹, UG Students^{2,3}

Department of Electrical and Electronics Engineering,
Sree Sowdambika College of Engineering, Aruppukottai.

Abstract— Now-a-days health problems like cardiac failure, lung failures & heart related diseases are arising day by day at a very high rate. Due to these problems time to time health monitoring is very essential. A modern concept is health monitoring of a patient wirelessly. It is a major development in medical area. This paper based on the monitoring of the patient that is done by the doctor continuously without actually visiting the patient. Health professionals have developed a brilliant and inexpensive health monitoring system for providing more comfortable living to the people suffering from various diseases using leading technologies like wireless communications, wearable and portable remote health monitoring device. As a result, visits of doctors to the patients constantly are decreased as the information regarding patient's health directly reaches to doctor's monitor screen from anywhere the patient resides. Also, based on this doctors can save many lives by imparting them a quick & valuable service. In this, IoT is becoming a major platform for many services & applications, also using Arduino not just as a sensor node but also a controller here. Paper propose a generic health monitoring system as a step forward to the progress made in this department till now.

Keywords— *Arduino, IoT, GSM, Heart beat sensor, Blood Pressure sensor, Temperature sensor.*

I. INTRODUCTION

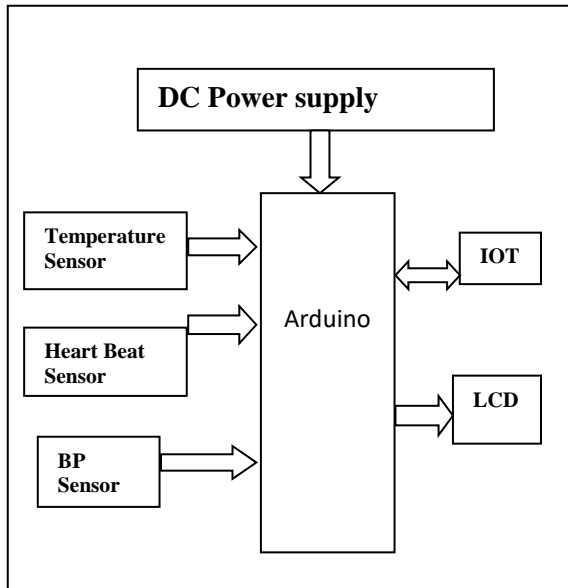
In today's area, health problems are increasing day-by-day at a high pace. The death rate of 55.3 million people dying each year or 1,51,600 people dying each day or 6316 people dying each hour is a big issue for all over the world. Hence it is the need of hour to overcome such problems. We therefore, 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, heart rate etc. That will be undoubtedly further transmitted on an IOT platform which is accessible by the user via internet. An accessible database is created about patient's health history which can be further monitored & analyzed by the doctor if necessary. The data storage can be saved on the server permanently or can be reset via the software. This paper proposes health monitoring system which is capable of detecting multiple parameters of our body such as blood pressure, temperature, heart rate & further transmitting this information on an IOT server. Also in case of emergency, automatically generating alerts will be sent to doctors and family members if any unusual activity is detected by or near the patient.

Various sensors have been used like blood pressure sensor 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 Arduino as well as IoT, but this paper gives embedded concept of both the platform. By using combination of these, the proposed structure will be more effective. In this paper, we investigated recent papers 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 paper 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. THE PROPOSED METHOD

As the system is divided into hardware and software section. Software is responsible for better working of the system, also for interfacing. Both sections work in parallel process. Hardware is again classified into transmitter section and receiver section. Implementation of transmitter is important part, because transmitter section is directly attached to the patient or human body. Arduino is a master device in proposed system. All the other devices like different sensors are connected to it. A DC power supply of 5V is provided for working of Arduino.

IoT server is attached to the system. It allows the connectivity for data exchange with other devices. IoT allows connected objects to identify and control remote access across network. The output of temperature sensor and heartbeat sensor is displayed on LCD at user end too. All the information is first acquired, processed and stored at memory of Arduino. The stored information is then transferred to the receiver by means of IoT server.



system Architecture

III. HARDWARE SPECIFICATIONS

A. 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 calibrate directly in Celsius and it is also suitable for remote applications. It has better efficiency than thermistor.

B. Blood pressure sensor

The blood pressure sensor is designed to measure human blood pressure. It also measures the systolic and diastolic pressure and pulse rate is also recorded by this sensor. It is more accurate and reliable than the sphygmomanometer, the instrument attached to inflatable air bladder cuff and used with a stethoscope for measuring blood pressure in an artery. In simple word, pressure of blood against blood vessels walls or arteries is measure using blood pressure sensors.

C. Heartbeat Sensor

It is used to measure the heartbeat of the patient. It gives a digital output of heart beat when a finger is placed on it. It is compressed in size. The working voltage of heart beat sensor is +5V DC. It works on the principle of light modulation by blood flow through finger at each pulse. Heart beat sensor is used to measure heart beat which normally lies between 60-100 bpm.

D. Communication network

In health monitoring system, wireless network is used to forward measurement through a gateway towards cloud. The main network used here is IoT. The meaning of IoT is Internet of Things, simply called as Internet of everything. Different wireless communication technologies can be used for (i) connecting the IoT device as

local networks, and connecting these local networks (or individual IoT devices) to the Internet. The connectivity technologies are NFC, Bluetooth, zigbee, cellular network etc. In this paper, we use cellular network connectivity because of it has widespread mobile networks like 4G and LTE provide reliable high-speed connectivity to the Internet.

E. Arduino

In this chapter, we will learn about the different components on the Arduino board. We will study the Arduino Uno board because it is the most popular board in the Arduino board family. In addition, it is the best board to get started with electronics and coding. Some boards look a bit different from the one given below, but most Arduino have majority of these components in common.

F. Working

Arduino is a master device in proposed system. All the other devices like different sensors are connected to it. A DC power supply of 5V is provided for working in Arduino. IOT server is attached to the system. It allows the connectivity for data exchange with other devices. IOT allows connected objects to identify and control remote access across network. The output of sensor is sent to the receiver or doctor end. All the information is first acquired, processed and stored. The stored information is then transferred to the receiver by means of IOT server. The Receiver section, all the information is received. Webpage displays the result of each sensor which is attached to arduino.

IV. CONCLUSION:

In this paper, we have analyzed Arduino based health monitoring system using IoT. Any abnormalities in the health conditions can be known directly and are informed to the particular person via internet. The proposed system is simple, power efficient and easy to understand. It acts as a connection between patient and doctor. The heartbeat was measured with the help of photodiode and bright LED while the temperature was measured by using precision integrated temperature sensor LM35. The hardware for the project is implemented and the output results are verified successfully.

V. REFERENCES

- [1] V. Shnyder, B.-r. Chen, and K. Lorincz, "Sensor networks for medical care", in *SenSys*, pp. 314–314, 2005.
- [2] 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.
- [3] Media Aminian1 and Hamid Reza Naji2, "A Hospital Healthcare Monitoring System Using Wireless Sensor Networks", Aminian and Naji, *J Health Med Inform* 2013, 4:2
- [4] 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.
- [5] Rajalakshmi.S S.Nikilla, "Real Time Health Monitoring System using Arduino", South Asian Journal of Engineering and Technology Vol.2, No.18(2016) 52–60 ISSN No: 2454-9614
- [6] Harshavardhan B.Patil, Prof.V.M.Umale, "Arduino Based Wireless Biomedical Parameter Monitoring System Using Zigbee", International Journal of Engineering Trends and Technology (IJETT) – Volume 28 Number 7 - October 2015 ISSN: 2231-5381.
- [7] Ali, A. Nazar. "Cascaded Multilevel Inverters for Reduce Harmonic Distortions in Solar PV Applications." Asian Journal of Research in Social Sciences and Humanities 6.Issue : 11 (2016): 703-715.
- [8] Ali, A. Nazar. "A Single phase Five level Inverter for Grid Connected Photovoltaic System by employing PID Controller." African journal of Research 6.1 (2011): 306-315.
- [9] ali, A.Nazar. "A SINGLE PHASE HIGH EFFICIENT TRANSFORMERLESS INVERTER FOR PV GRID CONNECTED POWER SYSTEM USING ISPWM TECHNIQUE." International Journal of Applied Engineering Research 10.ISSN 0973-4562 (2015): 7489-7496.
- [10] Ali, A. Nazar. "Performance Enhancement of Hybrid Wind/Photo Voltaic System Using Z Source Inverter with Cuk-sepic Fused Converter." Research Journal of Applied Sciences, Engineering and Technology 7.ISSN: 2040-7459; (2014): 3964-3970.
- [11] Ali, A. Nazar. "Ride through Strategy for a Three-Level Dual Z-Source Inverter Using TRIAC." Scientific Research publication 7.ISSN Online: 2153-1293 (2016): 3911-3921.
- [12] Ali, A. Nazar. "An ANFIS Based Advanced MPPT Control of a Wind-Solar Hybrid Power Generation System." International Review on Modelling and Simulations 7.ISSN 1974-9821 (2014): 638-643.
- [13] Nazar Ali, A. "Performance Analysis of Switched Capacitor Multilevel DC/AC Inverter using Solar PV Cells." International Journal for Modern Trends in Science and Technology 3.05 (2017): 104-109.
- [14] Ali, A.Nazar. "FPGA UTILISATION FOR HIGH LEVEL POWER CONSUMPTION DRIVES BASED ON THREE PHASE SINUSOIDAL PWM - VVVF CONTROLLER." International Journal of Communications and Engineering 4.Issue: 02 (2012): 25-30.
- [15] ali, A.Nazar. "A SINGLE PHASE HIGH EFFICIENT TRANSFORMERLESS INVERTER FOR PV GRID CONNECTED POWER SYSTEM USING ISPWM TECHNIQUE." International Journal of Applied Engineering Research 10.ISSN 0973-4562 (2015): 7489-7496.
- [16] JAIGANESH, R. "Smart Grid System for Water Pumping and Domestic Application using Arduino Controller." International Journal of Engineering Research & Technology (IJERT) 5.13 (2017): 583-588.
- [17] Pau11, M. Mano Raja, R. Mahalakshmi, M. Karuppasamyandian, A. Bhuvanesh, and R. Jai Ganesh."Classification and Detection of Faults in Grid Connected Photovoltaic System."
- [18] Ganesh, Rajendran Jai, et al. "Fault Identification and Islanding in DC Grid Connected PV System." Scientific Research Publishing 7.Circuits and Systems, 7, 2904-2915. (2016): 2904-2915.
- [19] Jaiganesh, R., et al. "Smart Grid System for Water Pumping and Domestic Application Using Arduino Controller." International Journal for Modern Trends in Science and Technology 3.05 (2017): 385-390.
- [20] Kalavalli,C., et al. "Single Phase Bidirectional PWM Converter for Microgrid System." International Journal of Engineering and Technology (IJET) ISSN : 0975-4024 Vol 5 No 3 Jun-Jul 2013.
- [21] Lilly Renuka, R., et al. "Power Quality Enhancement Using VSI Based STATCOM for SEIG Feeding Non Linear Loads. " International Journal of Engineering and Applied Sciences (IJEAS) ISSN: 2394-3661, Volume-2, Issue-5, May 2015.
- [22] Karthikeyan,B. JEBASALMA. "RESONANT PWM ZVZCS DC TO DC CONVERTERS FOR RENEWABLE ENERGY APPLICATIONS ."International Journal of Power Control and Computation(IJPCSC)Vol 6. No.2 – Jan-March 2014 Pp. 82-89@gopalax Journals, Singapore available at :www.ijcns.com ISSN: 0976-268X.
- [23] Gowri,N, et al. "Power Factor Correction Based Bridgeless Single Switch SEPIC Converter Fed BLDC Motor." ADVANCES in NATURAL and APPLIED SCIENCES. ISSN: 1995-0772 AENSI Publication EISSN: 1998-1090 [http://www.aensiweb.com/ANAS2016_March_10\(3\):_pages_190-197](http://www.aensiweb.com/ANAS2016_March_10(3):_pages_190-197).
- [24] Ramkumar,R., et al." A Novel Low Cost Three Arm Ac Automatic Voltage Regulator" ADVANCES in NATURAL and APPLIED SCIENCES ISSN: 1995-0772 AENSI Publication EISSN: 1998-1090 [http://www.aensiweb.com/ANAS2016_March_10\(3\):_pages_142-151](http://www.aensiweb.com/ANAS2016_March_10(3):_pages_142-151).
- [25] Kodeeswaran, S., T. Ramkumar, and R. Jai Ganesh. "Precise temperature control using reverse seebeck effect." In Power and Embedded Drive Control (ICPEDC), 2017 International Conference on, pp. 398-404. IEEE, 2017.
- [26] Subramanian, AT Sankara, P. Sabarish, and R. Jai Ganesh. "An Improved Voltage follower Canonical Switching Cell Converter with PFC for VSI Fed BLDC Motor." *Journal of Science and Technology (JST)* 2, no. 10 (2017): 01-11.
- [27] Murugesan,S, R. Senthilkumar."DESIGN OF SINGLE PHASE SEVEN LEVEL PV INVERTER USING FPGA."International Journal of Emerging Technology in Computer Science & Electronics, 2016, Vol.20, No.2, pp.207-2012.
- [28] S. Murugesan, C. Kalavalli, " FPGA Based Multilevel Inverter With Reduce Number of Switches For Photovoltaic System", International Journal of Scientific Research in Science, Engineering and Technology(IJSRSET), Print ISSN : 2395-1990, Online

- ISSN : 2394-4099, Volume 3 Issue 6, pp.628-634, September-October 2017.
- [30] Vikram, A. Arun, R. Navaneeth, M. Naresh Kumar, and R. Vinoth. "Solar PV Array Fed BLDC Motor Using Zeta Converter For Water Pumping Applications." *Journal of Science and Technology (JST)* 2, no. 11 (2017): 09-20.
- [31] Nagarajan, L. Star Delta Starter using Soft Switch for Low Power Three Phase Induction Motors. *Australian Journal of Basic and Applied Sciences*, 9(21), 175-178.
- [32] Vinusha, S., & Nagarajan, L. (2015). CURRENT SOURCE INVERTER FED INDUCTION MOTOR DRIVE USING MULTICELL CONVERTER WITH ANFIS CONTROL.
- [33] Nagarajan, L., & Nandhini, S. (2015). AN EFFICIENT SOLAR/WIND/BATTERY HYBRID SYSTEM WITH HIGH POWER CONVERTER USING PSO.
- [34] Subramanian, AT Sankara, P. Sabarish, and R. Jai Ganesh. "An Improved Voltage follower Canonical Switching Cell Converter with PFC for VSI Fed BLDC Motor." *Journal of Science and Technology (JST)* 2.10 (2017): 01-11.
- [35] Compensator, D. S. (2015). AN ADAPTIVE CONTROL AND IMPROVEMENT OF POWER QUALITY IN GRID CONNECTED SYSTEM USING POWER ELECTRONIC CONVERTERS.
- [36] Sabarish, P., Sneha, R., Vijayalakshmi, G., & Nikethan, D. (2017). Performance Analysis of PV-Based Boost Converter using PI Controller with PSO Algorithm. *Journal of Science and Technology (JST)*, 2(10), 17-24.
- [37] T.Vishnu Kumar, V. Suresh Kumar, T. Sumeet, M.Srimaha "Hybrid Front end Interface DC-DC Converter with ANFIS Based Control of EMS System". *International Journal of Scientific Research in Science and Technology*, Volume 3, Issue 8, Print ISSN: 2395-6011, 2017.
- [38] T. Vishnu kumar, V. Suresh Kumar, A new approach to front end interface DC-DC converter" *International Journal of Multidisciplinary Research and Modern Education (IJMRME)* ISSN(online): 2454-6119 Volume I, Issue II, 2015
- [39] V.Suresh kumar, T. Vishnu kumar, A certain investigation for the battery charging system" *International Journal of Multidisciplinary Research and Modern Education (IJMRME)* ISSN(online): 2454-6119 Vol.1 Issue.1 2015.
- [40] S.Enimai, S.Jayanthi, T.Vishnu kumar Isolated Power System Design Using Modified P&O Technique" *Middle-East Journal of Scientific Research* 24 (S2): 150-156, 2016, ISSN 1990-9233