

**PATIENT MONITORING SYSTEM BASED ON WIRELESS SENSOR NETWORK USING
ARDUINO AND ZIGBEE****Health-Care System**Prof. Uttara Gogate¹, Udhav Velnekar², Jyoti Sakure³, Varun Badgajar⁴¹Department of Computer Engineering, Shivajirao S. Jondhale College of Engineering, Dombivli, India²Department of Computer Engineering, Shivajirao S. Jondhale College of Engineering, Dombivli, India³Department of Computer Engineering, Shivajirao S. Jondhale College of Engineering, Dombivli, India⁴Department of Computer Engineering, Shivajirao S. Jondhale College of Engineering, Dombivli, India

ABSTRACT-With the increasing development of wireless technology, wireless devices have conquered the medical areas with wide range of capability. We are dealing with the advantage of wireless sensor network over wired alternatives and portable devices like blood pressure, temperature and stress monitoring. The advancement of wireless technologies in sensor, power has resulted into development of miniature lightweight low cost and smart physical sensor node. Further node for health monitoring they can be used in wireless personal area network or wireless body sensor networks (WBSNs).

KEYWORDS- Healthcare, ZigBee, Arduino, wireless body sensor networks, Wireless patient monitoring

I. INTRODUCTION

WSN, sometimes called wireless sensor and actuator network (WSAN), are spatially distributed autonomous sensors to monitor physical or environmental conditions, such as temperature, stress, heart beat etc. and to co-operatively pass their data through the network to a main location [1]

The WSN is built of 'nodes'-from a few to several hundred or even thousands, where each node is connected to one (or sometimes several) sensors. Each such sensor network node has typically several parts; a radio transceiver with an internal antenna or connection to an external antenna, a microcontroller and an electronic circuit for interfacing with sensors [2]. These systems do not require the patient to be limited to his bed and allow him to move around but require being within a specific distance from the bedside monitor. Remote and wireless healthcare at home or in the hospital is an important technology with many advantages

- 1) With the help of this multiple patients can monitor their physiological parameter at home without the necessity to go to the hospital from time to time
- 2) Doctors in the remote server center can watch the patient health conditions closely and hence provide real-time advice to them. [3]
- 3) The vital body signs like heart rate, temperature and stress of the patient are monitored continuously.

II. EXISTING SYSTEM

Table No.1:- Existing system

Sr No.	Paper Name	Author Name	Year	Parameters	Wireless option	Merits	Demerits
1	Networking Strategies for Structural Health Monitoring in WSN	Yujin Lim, Jaesung Park	2015	ECG, Temperature	ZigBee	Reliable Data Transfer, Time Synchronization	-
2	An Advanced Wireless Sensor Network For Health Monitoring	Nitya, Pushpam, Maninder Kaur	2013	ECG, Temperature, GSR, Blood Pressure	ZigBee	Power Efficiency, Security	Big Database

3	Wireless Sensor Network for Wearable Physiological Monitoring	K. P. Safeer, Prgati Gupta, D.T. Shakunthala	2008	ECG, SpO2	ZigBee	Easy access to patient's information. Current and Past data is stored	Cables woven in the fabrics pick up noise such as power line interference, signal from radiating sources
4	HealthGear: A real-time wearable system for monitoring and analyzing physiological signals	Oliver, Flores Msngas.	2006	ECG, SpO2	Bluetooth	Good Performance	Devices are too big and heavy to carry

III.PROPOSED ARCHITECTURE

In this system wireless health monitoring body area sensor network is integrated with broader multitier tele-medicine which is explained in Figure 1. At the top of the network hierarchy this tele medical system comprised of individual health monitoring system connected to internet. The medical server located on top tier provides an optimized service for large no. individual users and is a complex network of different interconnected services and medical personnel and health professionals. Now the user needs to wear some number of sensors in a predefined pattern on their body. The main functions of these sensor nodes is to unobtrusively sample vital signs and transfer the resultant data to a personal server using wireless personal network and this is implemented using ZigBee(802.15.4). The medical server provides various services to the users, medical personnel, and informal caregivers by keeping electronic medical records of registered users. The medical server is responsible to authenticate users, accept health monitoring session uploads, format and insert this session data into corresponding medical records, analyze the data patterns, recognize serious health anomalies in order to contact emergency care givers, and forward new instructions to the users, like physician prescribed exercises. The collected data is integrated into research database and then the analysis of conditions and pattern could prove invaluable to the researchers who are trying to link symptoms and diagnoses with historical changes in health status, physiological data, or other parameters. The personal server that was implemented on a personal patient recovery and long term care digital assistant (PDA), cellphone, sets up and controls the WBAN provides graphical or audio interface to the user. Then it transfers the information about the health status using internet or mobile phone to the medical server.

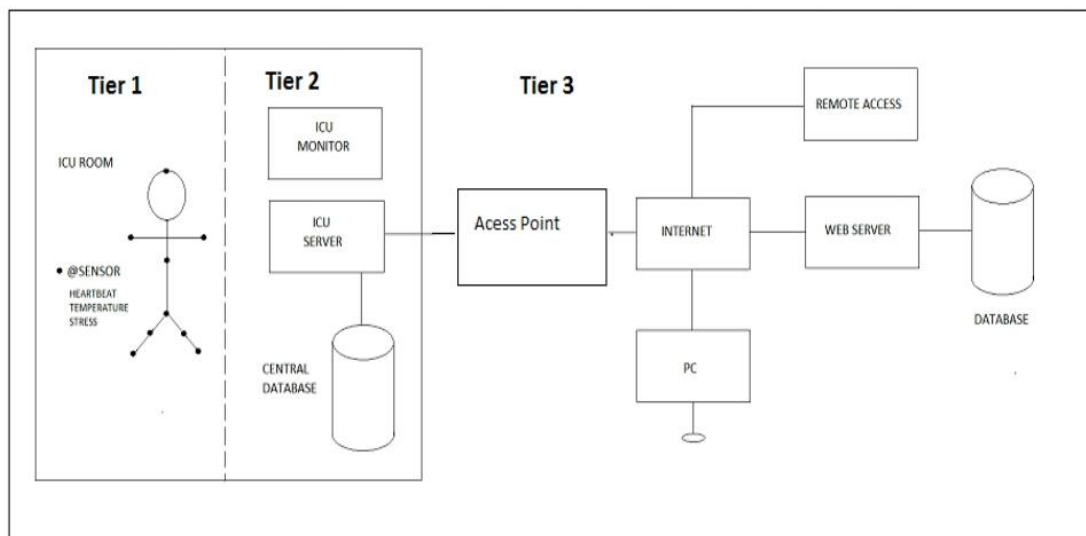


Figure2.1:Proposed architecture.

IV. REQUIREMENTS

For implementation, we've made use of 3 sensors, GSR stress sensor, LED LDR Blood pressure sensor, and Lm35 Temperature Sensor. Network module used is ZIGBEE XB-24. Also Arduino Uno board was used for interfacing the sensors and the ZIGBEE module. For the purpose of fetching the data, code was written in Embedded C and Processing 3 was used to process, and displays the data. The acquired data is stored on MS-Access sheet for the purpose of storage. The software stated can be run on a system with OS Windows 7 & up/ IOS 8 & up/ Android 4.1 & up.

V. WORKING

Attach the sensory device to the body of the patient and turn on it. The sensors, namely temperature sensor and pulse rate sensor, will collect the data and transmit it through the ZigBee module attached on the Arduino board. The receiving end on the laptop, again consisting of a ZigBee module will receive the transmitted data. The received data will be processed using custom software which is developed on Processing 3. All the parameters viz. body temperature and the pulse rate of the patient would be displayed using specially developed Software. The processed data will be stored in the Ms-Access database. If the received values exceed the medically predefined thresholds, threshold will be displayed on the monitor.

VI. RESULT

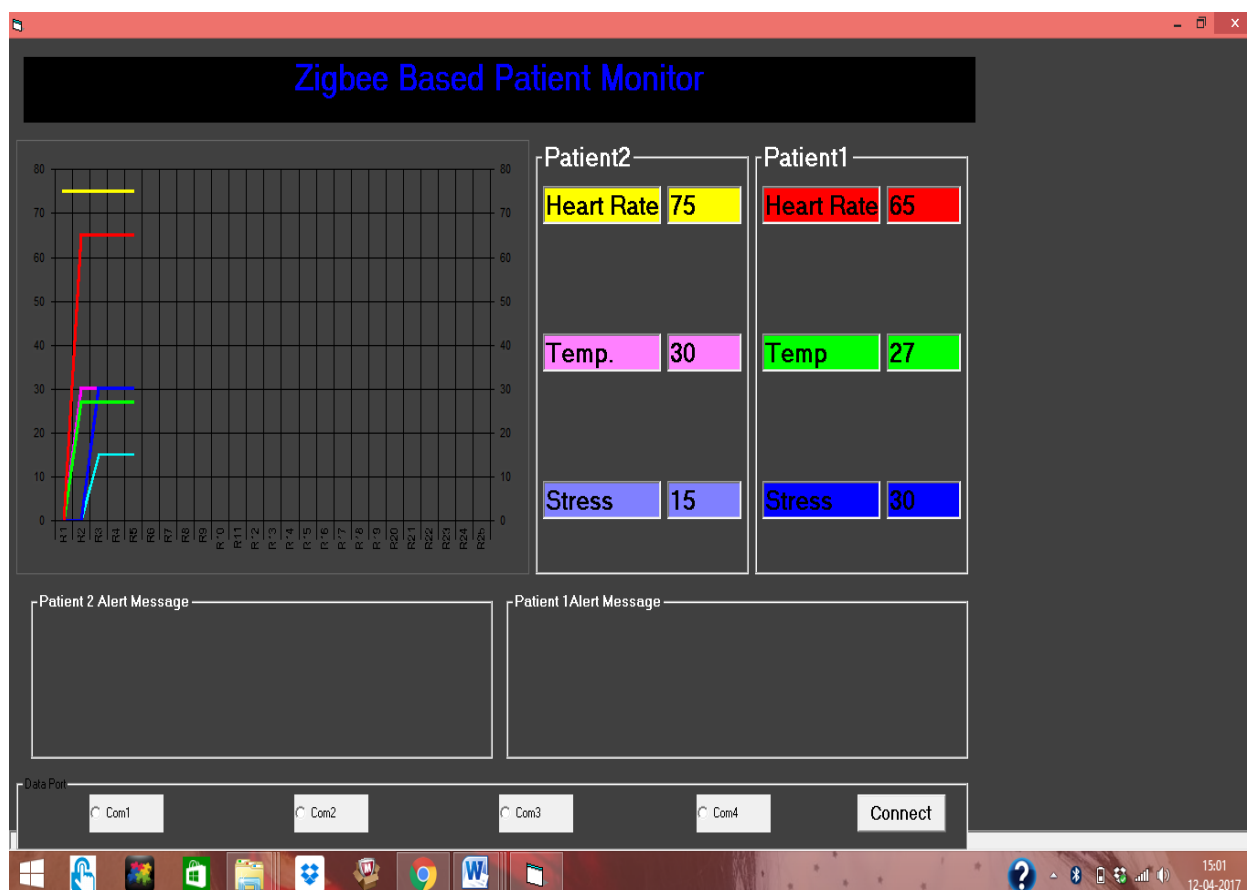


Figure6.1 Healthcare Result for normal patient.

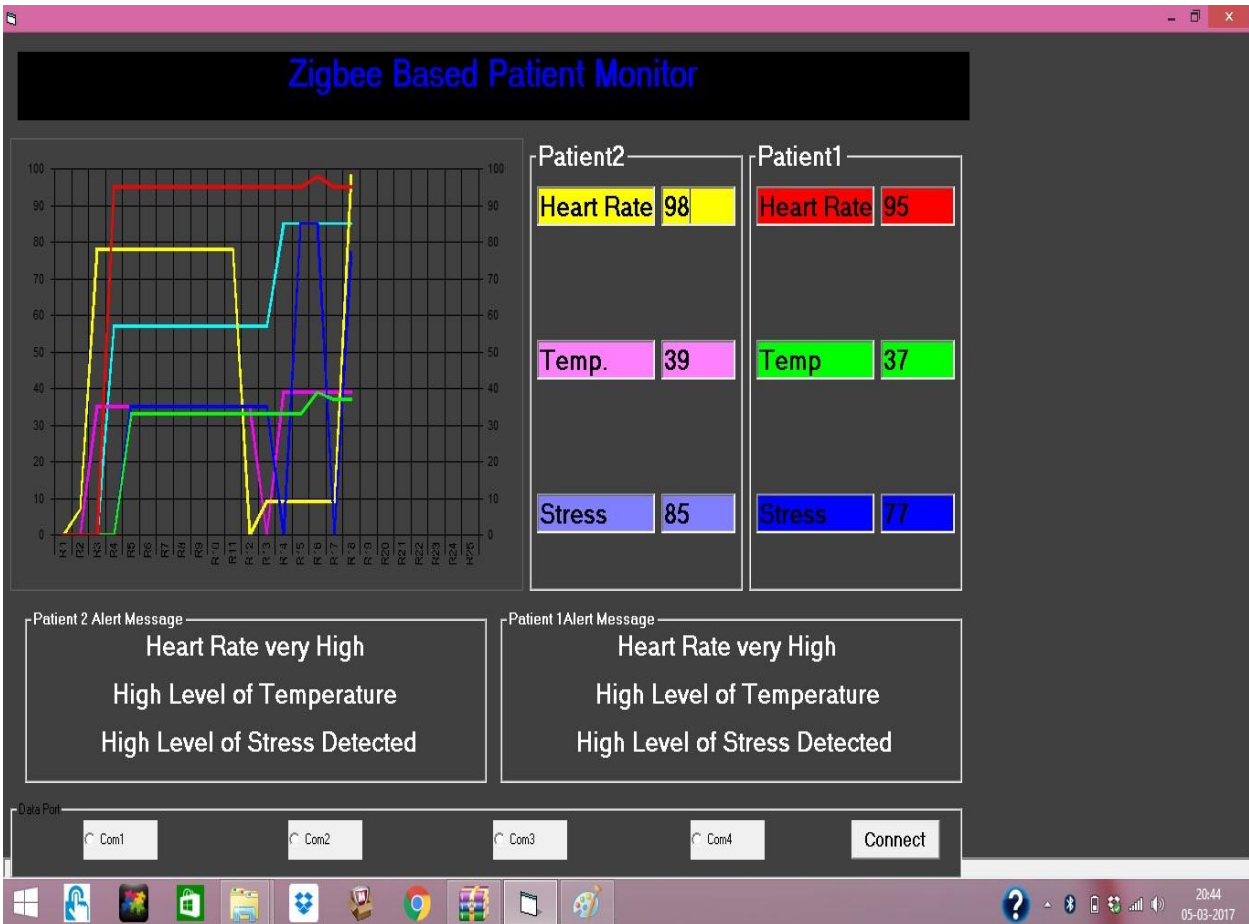


Figure 6.2 Healthcare results for abnormality patient

The tests run on a two-patient system shows graph generated for stress levels, temperature levels and heartbeat graphs. Corresponding messages are displayed at the bottom of the window; separate window for each target patient.

The analysis of the proposed network infers that it will provide:

- Monitoring and remote supervision of patients will be trouble free.
- It is a compact wireless sensor network which is also energy efficient.
- The vital body signs like heart rate, temperature and stress of the patient will be monitored continuously.
- If any abnormal reading will be found below or above threshold set in the system, an alert will be generate.
- Monitoring system is developed in such a way that it is flexible, portable and movable.

VII. CONCLUSION AND FUTURE SCOPE

Continuous monitoring with early detection can helps in increasing level of confidence in patient, which may result in improved quality of life. In addition to this, ambulatory monitoring will help the patient to engage in normal activities of daily life, rather than staying at home or close to any specialized medical service. We are successfully monitoring patient's vital body parameters like heart rate, temperature and stress.

They will be applied on the body as the skin patches and will be seamlessly integrated into a personal monitoring system. It would be worn for extended time period. As a further scope, an alert message will be sent to the doctor and patient's relatives.

VIII. REFERENCES

AfsanehMinaie, Ali Sanati-Mehrizy, PaymonSanati-Mehrizy, Reza Sanati-Mehrizy, 'Application of Wireless Sensor Networks in Health Care System', 120th ASEE Annual Conference and Exposition, Paper ID #6904, American Society for Engineering Education, 2013[1]

AlexandrosPantelopoulos, Nikolaos G. Bourbakis, 'A Survey on Wearable Sensor-Based Systems for Health Monitoring and Prognosis', Article in IEEE Transactions on Systems Man and Cybernetics Part C (Applications and Reviews), February 2010.[2]

K. Roemer, F. Mattern, 'The design space of wireless sensor networks', IEEE Wireless Communications, 2004.[3]

K.P.Safeer, Pragati Gupta, D.T.Shakunthala 'Wireless Sensor Network for Wearable Physiological System' Journal of Networks, Vol 3, No.5, May 2008.[4]

Lopez-Nores M., Pazos-arias J., Garcia-Duque J., Blanco-Fernandez Y. 'Monitoring medicine intake in the networked home: The icabinet solution.', Proceedings of the Second International Conference on Pervasive Computing Technologies for Healthcare (PervasiveHealth 2008); Tampere, Finland, 30 January–1 February 2008.[5]

Min Chen, Sergio Gonzalez, AthanasiosVasilakos, Huasong Cao, Victor C., M. Leung, "Body Area Networks: A Survey", Published online: © Springer Science+Business Media, LLC 2010, 18 August 2010.[6]

M. Hanson, H. Powell, A. Barth, K. Ringgenberg, B. Calhoun, J. Aylor, J. Lach, 'Body Area Sensor Networks: Challenges and Opportunities',IEEE Computer 42, 2009.[7]

Nitya, Pushpam, ManindarKaur.' An Advanced Wireless Sensor Network For Health Monitoring' International Journal of Advanced Reasearch in Electrical, Electronics and Instrumentation Engineering, Vol 2, Issue 2, February 2013.[8]

Oliver, N., and Flores Msngas F, 'HealthGear: A real-time wearable system for monitoring and analyzing physiological signals'. International Workshop on wearable and Implantable Body sensor Networks, BSN 2006, pp.61-64, Cambridge, MA, 3-5 April 2006.[9]

Rajiv C, "Mobicare: A Programmable Service Architecture for Mobile Medical Care", in Proc. of 4th Annual IEEE International Conference on Pervasive Computing and Communications Workshops, PerCom Workshops 2006, pp. 532-536, March 2006.[10]

Yujin Lim and Jaesung Park, 'Networking Strategies for Structural Health Monitoring in Wireless Sensor Networks', International Journal of Energy, Information and Communications, Vol.6, Issue 3 (2015), pp.11-18, 2015.[11]

UttaraGogate, JagdishBakal,"Smart Healthcare Monitoring System", CAST, IEEE conference. Dec 2016.[12]