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A Bluetooth based Health Monitoring & Alerting System for Contactless Interchange through Android Application

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Abstract: ***Project is design with working prototype for low-power, wearable wireless physiological parameter monitoring system with Android Bluetooth wireless connectivity. This system has to monitor vital parameters of patients to determine and alert critical conditions at the patient's side. This system is connected to the patient's body and it uses wireless body sensors which feeds data to Smartphone using high speed Bluetooth technology. This embedded technology based system continuously measures multiple biomedical parameters such as Blood Pressure (systolic and diastolic pressure), Heart Rate, Abnormal Body Posture and Body Temperature values.***

For individuals with heart disease, the Blood Pressure (BP), Heart Rate (HR), Respiration Rate (RR) and Body Temperature (BT) values are considered vital biomedical parameters that must be measured at regular intervals. Smartphone based health monitoring allows caregivers a better way to monitor their patients and the cost is also less compared to existing monitoring systems. For critical case patients are supposed to be monitored continuously for their vital biomedical parameters like Blood Pressure, Heart Rate, Respiration Rate and Body Temperature values. In critical care units (CCU or ICU or NICU) of hospitals monitoring of a patient, with medical staff being continuously informed of the changes in general condition of a patient.

I. INTRODUCTION

Countries like India face a high burden of disease because of lack of environmental sanitation and safe drinking water, malnutrition, poor living conditions, and limited access to preventive and curative health services. A desirable healthcare system should provide better healthcare services to people in an affordable and patient friendly manner. Wireless health monitoring with ability of networking between various medical instruments, and medical staff is essential. There is a necessity to develop a compact wearable technology which consumes very low power so that the vital health parameters can be monitored in real time. Vital signs monitoring and Medical diagnostics demands more technological solutions to cope with new methods of treatment.

In intensive care units, there are provisions for continuously monitoring patients. The most familiar hospital sensors are those that measure vital signs. A patient's vital signs describe the status of their main body functions—typically Blood Pressure (BP), Heart Rate (HR), Respiration Rate (RR) and Body Temperature (BT). These variables are periodically monitored by nursing staff, who manually measure these variables using portable monitors. Body-worn pulse-rate monitors or smart clothing with integrated sensing capabilities, are also emerging to determine performance and fitness levels. Some of these systems use wireless technologies to transmit vital signs for medical evaluation.

This project work focuses on building a working prototype for wearable health condition monitoring system using a Bluetooth based wireless connectivity to an Android based Smartphone. It can monitor in real-time the health parameters of the patient from convenient distance. It can prevent many communicable diseases and reduces the risk of doctors and other paramedical staff from getting infected by their patents while monitoring their patients.

This system is developed based on Atmega328P microcontroller which will act as a small computer and controls the activities of the entire system. It consists of Blood Pressure Sensor, Body Temperature Sensor, Respiration Rate Sensor (potentiometer), Patient Position (MEMS Accelerometer) Sensor, Bluetooth Module HC-05, LCD Display Unit, Relays & Relay Driver Circuit, Buzzer and Drive Circuit, Power Supply Units.

It will continuously measure multiple biomedical parameters such as Blood Pressure (Systolic and Diastolic Pressure), Heart Rate, Respiration Rate, Body temperature from sensors and body posture by a MEMS Accelerometer in real time. Abnormal Body Posture which can also be used to detect the death/unconsciousness condition of the patient.

II. PROBLEM STATEMENT

In the prevailing conventional healthcare system, medical professionals need to visit the patient's precinct for necessary diagnosis and advice. That necessitates the healthcare professionals to be present near the patient at all the time and the patient should be hospitalized. Most developing countries have large number of patients to be attended by limited available doctors and other paramedical staff. In order to improve the above condition, we can make use of technology in a smarter way. Wearable sensors are in contact with the human body and monitor his or her physiological parameters.

1) The traditional medical test instruments in large sizes.
2) Patient couldn't be found in time & helped in time.
3) Time consuming patient monitoring
4) Human attention is required for each patient.
5) Limited availability of medical instruments.
6) Continuous monitoring was not possible.
7) Most of the patient died due to lack of experts & machines.

There is a need to design and build a wearable technology system, which isn't bulky and dissipates very little power in the bio-medical vital parameter monitoring so that the location of patient can be tracked in real time when he is unwell. Such system can monitor the sensor data and upload it to cloud over internet and also capable of taking some curial decision using the IoT. Problems are what kind of technology would be used so that the above mentioned problem will be overcome easily and accurately.

A. Existing System

The existing healthcare systems in most of the developing countries are insufficient and are mostly catering to cities and towns. The rural healthcare is yet to get revolutionized. In most of the hospitals continuous monitoring of vital parameters of an admitted patient is done in ICU using multi-parameters monitor but those monitors are local to the room in which the patient is admitted. Physician/Doctor has to frequently visit the patient and asses his/her condition by analyzing the measured parameter such as temperature, blood pressure, heart rate, respiration rate etc. It was found from the literature survey that most of the existing systems require frequent direct physical interaction between patients and doctors. This increases the risk to both of contacting communicable diseases because of the close contact.

B. Proposed System

Here, we are designing and building a working prototype for low-power, wireless, wearable physiological monitoring system implemented using easily available components. The multiple sensors integrated into this wearable device can monitor multiple parameters for health and wellness of various patient populations. It enables health professionals to monitor critical health parameters from a considerable safe distance from a patient with the help of Bluetooth communications on their Smartphone. This non-invasive system supports physiological monitoring of multiple biomedical parameters & Abnormal Body Posture orientation to determine falls, continuously and displays them on a local LCD panel and compares them with the maximum and minimum threshold values and alerts when any abnormalities are found. It continues to monitor the parameters periodically, unless an abnormality is found in the parameters. When the doctor demands a fresh reading from this system, it operates and obtains a new set of readings. These collected parameter values are sent wirelessly to the Smartphone of health doctor/professionals for visualization.
The implemented system consists of an Atmega AVR microcontroller (ATmega328) as a main processing unit for the entire system and all the sensor and devices can be connected with the microcontroller. It connects to doctor's Android Smartphone through Bluetooth link. An Android Application (App) designed us; to be used with this system enables the doctors to access the readings and to visualize patient's vital health parameters on his/her Smartphone.

C. Objectives

Most important objective of this project is to design and fabricate a working prototype which enables to monitor critical health parameters, orientation of the patient from a considerable safe distance by the health professionals with the help of Bluetooth communications on their Smartphone. We aim to test its performance in real time and suggest any future modifications required. This non-invasive system continuously monitor vital signs and Abnormal Body Posture orientation to determine falls and displays them on a local LCD display. It also compares them with the maximum and minimum threshold values and alerts when any abnormalities are found. It continues to monitor the parameters unless an abnormality is found in the parameters. If any vital parameter goes out of range, it alerts the medical staff through buzzer and LCD display. When the doctor demands a fresh reading

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from this system, it operates and obtains a new set of readings and is sent wirelessly to the Smartphone of health doctor/professionals for visualization. The involvement of the doctors will help this system to be more accurate and acceptable for health monitoring. The main scope is to monitor people at risk in real time real-time data acquisition and alerting functions

D. Methodology

This system consists of an Atmega AVR microcontroller (ATmega328) as a main processing unit for the entire system and all the sensor and devices are connected with the microcontroller. The sensors can be operated by the microcontroller to obtain present values of all vital bio medical parameters and process them continuously and displays them on a local LCD module and then, compares these parameters with their preset minimum and maximum values stored in the system's memory. It continues to monitor the parameters periodically, unless an abnormality is found in the parameters. In the event of abnormality, it sounds a local alarm to alert the people around.

III. COMPLETE SYSTEM

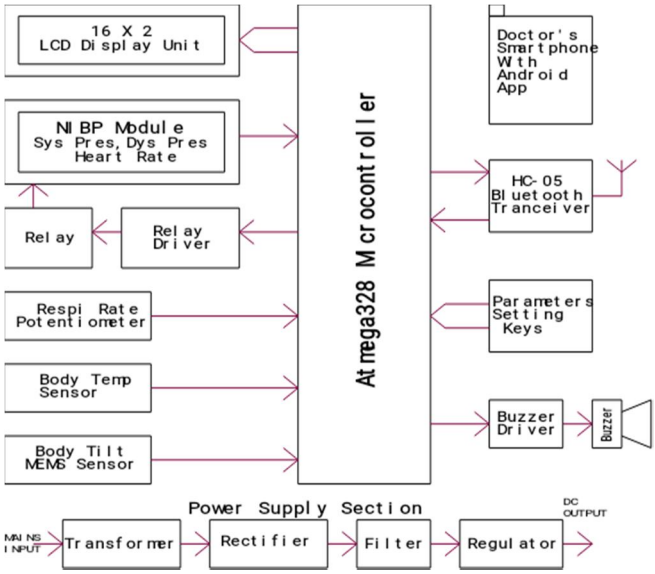

Fig. 1. Block Diagram Of Proposed System

IV. WORKING PRINCIPLE

This non-invasive Bluetooth Wireless Health Monitoring Alerting System for Contactless Interaction with Android App on Smartphone supports physiological monitoring of multiple biomedical parameters such as Blood Pressure (Systolic and Diastolic Pressure), Heart Rate, Respiration Rate, Body Temperature and Abnormal Body Posture orientation to determine falls. It continuously monitors the parameters and displays them on a local LCD display and compares them with the maximum and minimum threshold values. Unless an abnormality is found in the parameters, it simply keeps on monitoring those parameters periodically and alerts the medical staff when any abnormalities are found. When the doctor demands a fresh reading from this system, it operates and obtains a new set of readings. These collected parameter values are sent wirelessly to the Smartphone of health doctor/professionals for visualization.

This system consists of two units. A Patient Side Unit and the Smartphone with the Android App installed on it. An Atmega AVR microcontroller (ATmega328) as a main processing unit for the entire system and all the sensor and sub systems are connected with the microcontroller. An Android Smartphone is used as a long range Bluetooth wireless remote controller and display unit. It is used for sending commands to the patient side unit to take fresh set of readings and once these bio-parameters are received, display them on the screen for visualization. The sensors are integrated into a wearable device that can be used to monitor the health and wellness of various patient populations. The Bluetooth device (HC-05) attached to the Patient Side Unit, receives the data from the Smartphone and also can transmit the data back to the Smartphone. An Android Application (App) designed us to be used with this system, enables the doctors to access the readings and to visualize patient's vital health parameters on his/her Smartphone.

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V. WIRELESS COMMUNICATIONS

A. HC-05 Bluetooth Serial Communication Module

Bluetooth is a wireless technology standard for exchanging data over short distances using short-wavelength UHF radio waves in the ISM from 2.4 to 2.485 GHz from fixed and mobile devices, and building Personal Area Network (PANs). Invented by telecom vendor Ericsson in 1994, it was originally conceived as a wireless alternative to RS-232 data cables. It can connect several devices, overcoming problems of synchronization. Bluetooth has been designed to operate in noisy radio frequency environments, and uses a fast acknowledgement and a frequency-hopping scheme to make the communications link robust, communication-wise. Bluetooth is a Packet -Based Protocol with a Master-Slave structure. Bluetooth radio modules avoid interference from other signals by hopping to a new frequency after transmitting or receiving a packet.HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup. Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband.

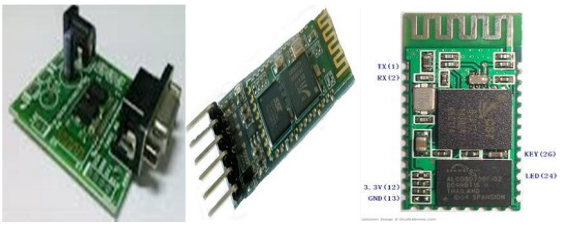
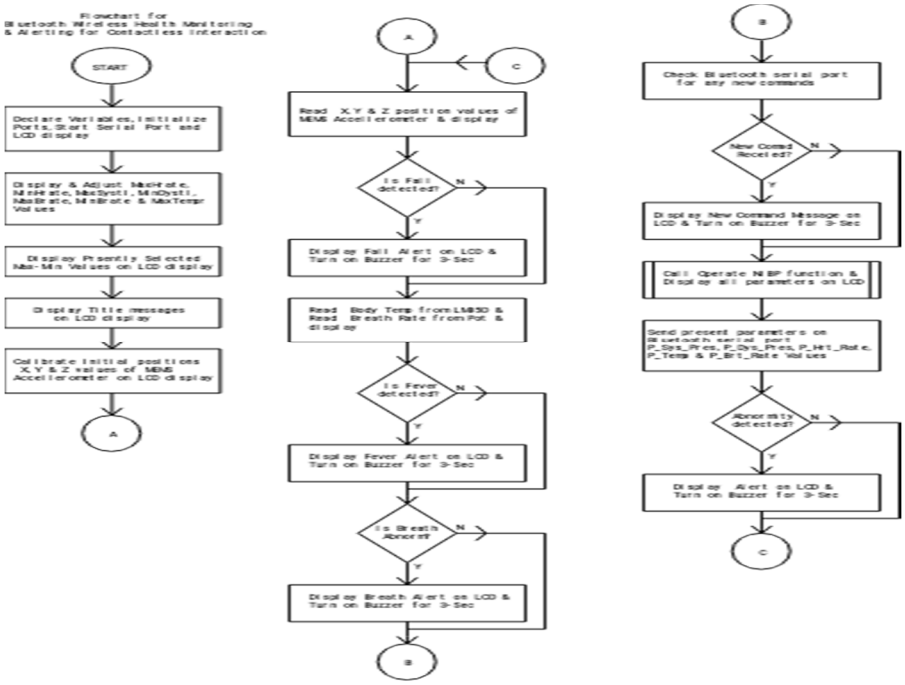


Fig. 2. HC-05 Bluetooth Serial Communication Module

It uses CSR Blue core 04-External single chip Bluetooth system with CMOS technology and with AFH (Adaptive Frequency Hopping Feature). It has the footprint as small as 12.7mmx27mm. Hope it will simplify your overall design/development cycle.

HC-05 embedded Bluetooth Serial Communication Module has two work modes: order-response work mode and automatic connection work mode. And there are three work roles (Master, Slave and Loop-back) at the automatic connection work mode. When the module is at the automatic connection work mode, it will follow the default way set lastly to transmit the data automatically. When the module is at the order-response work mode, user can send the AT command to the module to set the control parameters and sent control order. This module enables us to wirelessly transmit & receive serial data. It is a drop in replacement for wired serial connections allowing transparent two way data communication. You can simply use it for serial port replacement to establish connection between MCU or embedded project and PC for data transfer.

VI. FLOWCHART



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VII. RESULTS

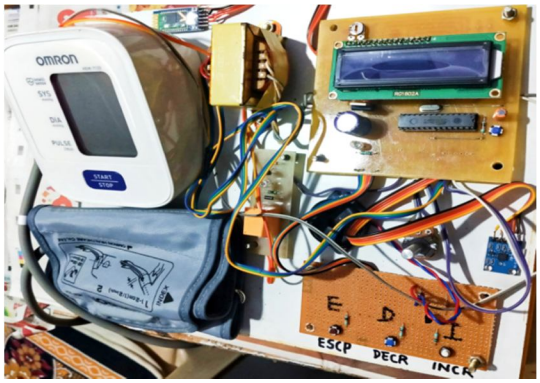

Fig. 3. Showing Complete Prototype after fabrication

A. Experimental Results

The primary aim of this project work was to develop and build a working prototype of a Bluetooth Wireless Health Monitoring Alerting System for Contactless Interaction with Android App on Smartphone for multiple bio-parameters monitoring and emergency alerting. It used the most modern techniques and tools to achieve the objectives. It used temperature sensor(LM35D) for measuring the body temperature, A potentiometer to simulate values for Respiration Rate, MEMS accelerometer for determining fall of the patient and OMRON NIBP module to measure Systole(SYS), Diastole(DYS) pressures and Heart rates (HR). This system was implemented and deployed successfully.

This system detected bio-parameter abnormalities quickly and accurately. This system collected those parameter values and compared with their standard set point values and displayed them on LCD display and accurately alerted when abnormalities occurred. During the test, all sensors were connected to the human body and the system was paired using Bluetooth protocol with the doctor's Smartphone to establish a Bluetooth connection. The Android App also performed perfectly.

Fig. 4. Display of Title #1

Fig. 5. Display of Title #2

Fig. 6. Set Max/Min Heart Rate display

Fig. 7. Set Max/Min Syst/Dyst Rate display

Fig. 8. Set Max/Min Breath Rate display

Fig. 9. Set Max Body Temper display

Fig. 10. Calibration of initial body posture

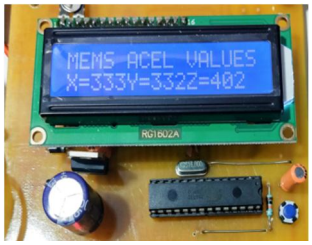

Fig. 11. MEMS Raw Values of Calibration

Fig. 12. Present Temp & Respiration Values

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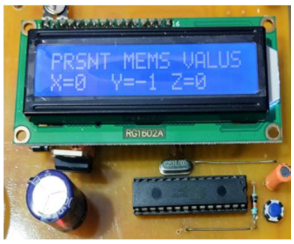

Fig. 13. Present MEMS Tilt Values

Fig. 14. Screenshot of App soon after launch

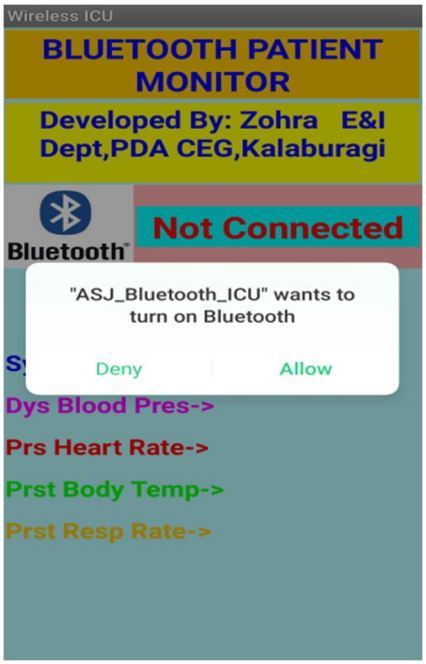

Fig. 15. Screenshot of App seeking permissionto turn on Bluetooth

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Fig. 16. Screenshot of App after connection to patient side unit

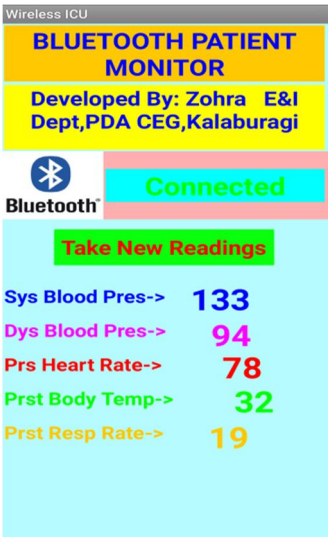

Fig. 17. Screenshot of App after getting parameter values from patient side unit

VIII. CONCLUSION

In recent years the rise of communicable & chronic diseases has increased due to the improved life expectancy and changes in lifestyle. This has made it necessary to given rise need for continuous monitoring of vital signs of people suffering from these pathologies. Hence, we built a working prototype to monitor such bio-parameters from a safe distance whenever required. We carried out rigorous tests for its proper operation and reliability and to prove its usefulness. This system was implemented and was rigorously tested.With the help of this project we are able monitor various health parameter of any patient. These parameters are Blood Pressure (Systolic and Diastolic Pressure), Heart Rate, Respiration Rate, Body Temperature and Abnormal Body Posture orientation to determine falls and displays them on a local LCD display. This system can provide new access opportunities for treatment and medical services, constituting a valuable support instrument for both patients and doctors. The system does not only monitor these parameters but also analyzes them, allowing the medical specialist to make a more accurate analysis.

IX. ACKNOWLEDGMENT

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REFERENCES

[1] M.V.N.R. Pavan Kumar1,Ghadge Rasika Vijay, Patil Vidya Adhikrao, Bobade Sonali Vijaykumar, Health Monitoring and Tracking of Soldier Using GPS, International Journal of Research in Advent Technology, Vol.2, No.4, April 2014E-ISSN: 2321-9637.

[2] Palve Pramod, "GPS Based Advanced Soldier Tracking With Emergency Messages & Communication System", International Journal of Advance Research in Computer Science and Management Studies, ISSN:2321-7782, Volume 2, Issue 6, June 2014, pp: (25-32).

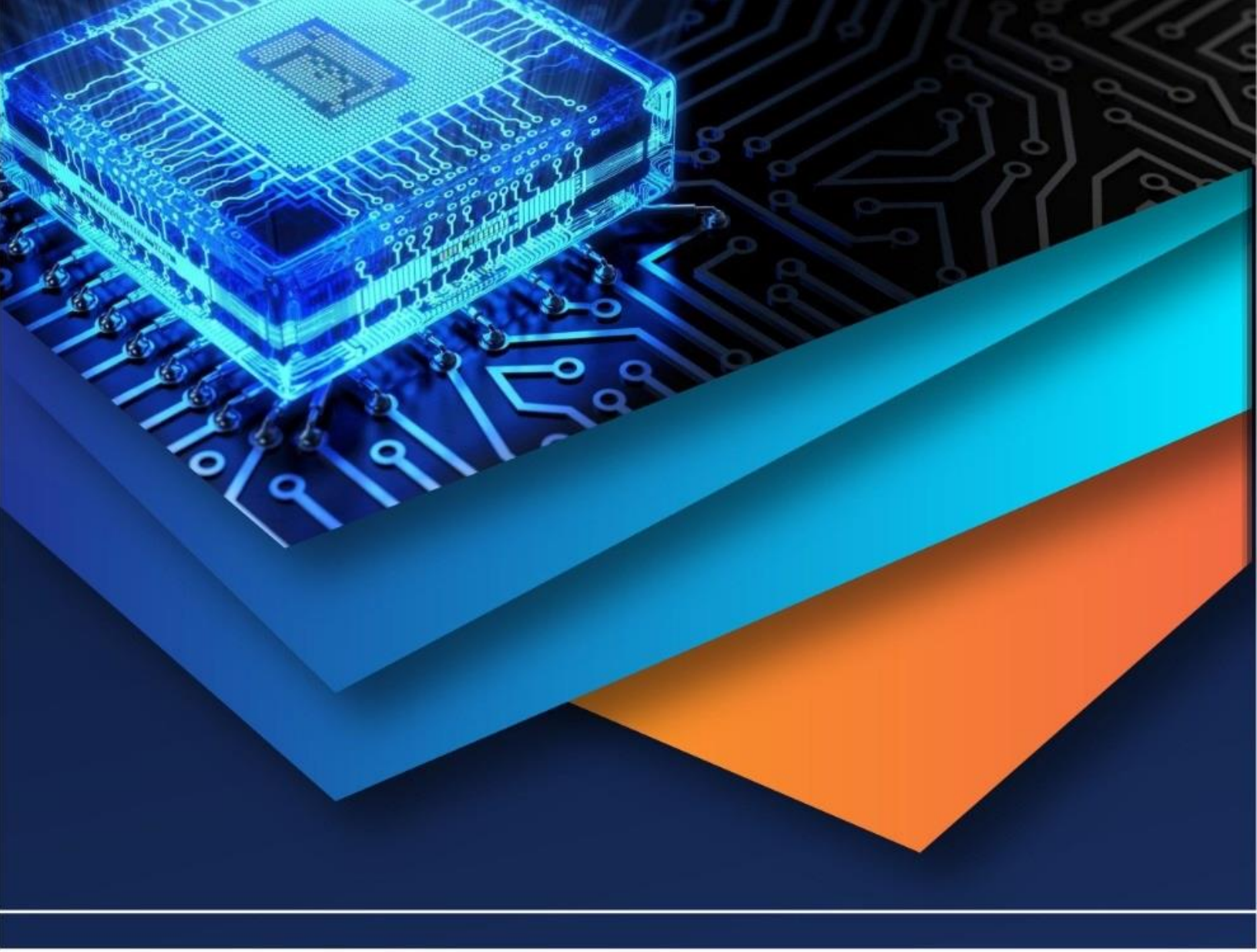
[3] Ekta Madhyan, Mahesh Kadam, "A Unique Health Care Monitoring System Using Sensors and ZigBee Technology", International Journal of Advanced Research in Computer Science and Software Engineering, ISSN: 2277-128X, Volume 4, Issue 6, June 2014, pp: (501-509).

[4] Shruti Nikam, and V.S.Bendre (July, 2014) "GPS Based Soldier Tracking and Health Indication System". International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering, Pune, Maharashtra, India. Vol 2, Issue 3.

[5] Srijani M., Koustabh D. Soumya K. Patient Health Management System using Health Monitoring Architecture. Advance Computing Conference (IACC), 2014 IEEE International. 21-22 Feb. 2014. Gurgaon, India.

[6] Mr. Rajdeep Limbu, Prof. V. V. Kale (2014) "GPS Based Soldier Tracking and Health Monitoring System" International Journal for Technological Research in Engineering, 1(12), pp: (1485-1488).

[7] R. Archana, S. Indira, (2014) Soldier Monitoring and Health Indication System, International Journal of Science and Research (IJSR) ISSN (Online): 2319-7064.



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