



WIRELESS BODY AREA NETWORK

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ABSTRACT: Wireless Body Area Networks (WBANs) is one of the latest approaches in medical identification, management and also key building block for future intentional networks and Internet. Patient monitoring in a hospital environment is becoming more and more complex with multiple parameters (BP, SpO₂, temperature etc.) to be measured and the need of network that gathered data from many patients for observation at a central monitoring station. Wireless BAN has a capability to process and communicate data of heart beat, respiration, body temperature and blood pressure. Non-invasive sensors can be used to mechanically monitor physiological reading, which can be forward to nearest devices, as cell phone as a gateway. Among different multiplexing approaches like TDMA, FDMA, CDMA, SDMA best one is taken and the work will also involve selection and acquisition of biomedical sensors. The IEEE 802.15.4 (zigbee) is used to provide a low-power, low data rate protocol offering a high reliability. In this paper, we present an overview of wireless body area network (WBANs) & its applications.

1.INTRODUCTION:

Over the past few years, there is a rapid growth in the wireless body area network (WBAN) for patient monitoring system in information processing and wireless data transmission. WBAN provides low cost wireless sensor network technology that creates a system to monitor patient, remotely using an Internet, and it could be seen as a special-purpose wireless sensor node network that provide the health monitoring to anyone, anytime and anywhere. architecture of a WBAN system model for remote patient monitoring environment. In WBAN networks, wireless sensors are placed very close to the body for collection of specific physiological data from it. Those sensors forward data to Zigbee router and then it transfers to a Zigbee coordinator who allows the medical specialist to continuously monitor the patient situation by comparison with an original database of the patient . In patient monitoring system, data transmission is very important and that is why IEEE formed a specialist study group IEEE 802.15.4 (Zigbee), working on the development of body area network . The



main function of such devices is to collect patient physiological data and forward to medical center in the efficient way. Therefore, routing is a very important task in WBAN. Nowadays, lots of routing algorithms are available, but it is difficult to select the suitable algorithm for desired network.

1.1 RELATED WORK

Patient-Monitoring Systems, Reed M. Gardner & M. Michael Shabot, Year 2014

To meet the increasing demands for more acute and intensive care required by patients with complex disorders, new organizational units the ICUs were established in hospitals beginning in the 1950s. The earliest units were simply postoperative recovery rooms used for prolonged stays after open-heart surgery. Intensive-care units proliferated rapidly during the late 1960s and 1970s. The types of units include burn, coronary, general surgery, open-heart surgery, pediatric, neonatal, respiratory, and multipurpose medical-surgical units. Today there are an estimated 75,000 adult, pediatric, and neonatal intensive care beds in the United States.

IoT-Based Health Monitoring System for Active and Assisted Living, Ahmed Abdelgawad, School of Engineering and Technology, Central Michigan University, Mt. Pleasant, MI 48859, USA, Year 2017.

The Internet of Things (IoT) platform offers a promising technology to achieve the aforementioned healthcare services, and can further improve the medical service systems [1]. IoT wearable platforms can be used to collect the needed information of the user and its ambient environment and communicate such information wirelessly, where it is processed or stored for tracking the history of the user [2]. Such a connectivity with external devices and services will allow for taking preventive measure (e.g., upon foreseeing an upcoming heart stroke) or providing immediate care (e.g., when a user falls down and needs help). Recently, several IoT systems have been developed for IoT healthcare and assisted living applications.

IOT based health monitoring systems, Nayna Gupta & Sujata Pandey, Year 2012.

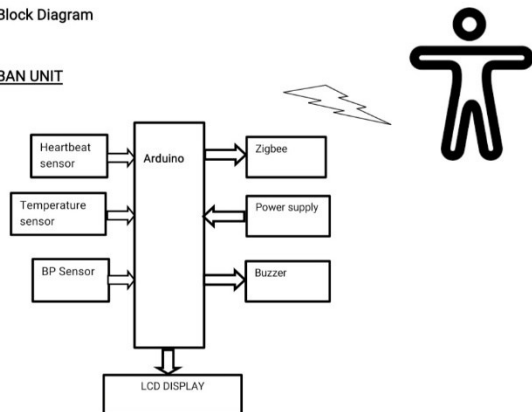
In this fast pace world, managing work and health simultaneously have become a matter of concern for most of the people. Long waiting hours at the hospitals or ambulatory patient monitoring are well known issues. The issues demands for a health monitoring system which can monitor the daily routine health parameters and heart rate monitoring seamlessly and can report the same to the concerned person with the help of GSM module. With progressing in technology various monitoring systems have come up and provided ease to the individuals. This paper portrays the current research and development in the field of health. Different implemented systems have been compared and evaluated to identify the concerned lacking areas and what can be done in order to provide better throughput than the current scenario systems.

2. PROPOSED SYSTEM DESIGN

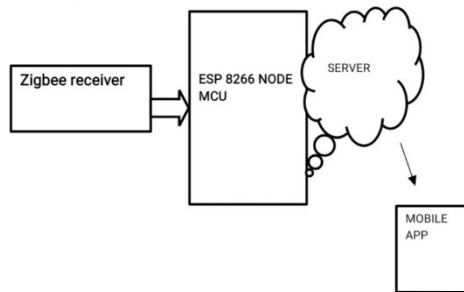
A. Block Diagram

Block Diagram

BAN UNIT



GATEWAY UNIT



In WBAN networks, wireless sensors are placed very close to the body for collection of specific physiological data from it. Those sensors forward data to Zigbee router and then it transfers to a Zigbee coordinator who allows the medical specialist to continuously monitor the patient situation by comparison with an original database of the patient. In patient monitoring system, data transmission is very important and that is why IEEE formed a specialist study

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3. HARDWARE DESCRIPTION

3.1 Arduino Uno:

Arduino UNO is a low-cost, flexible, and easy-to-use programmable open-source microcontroller board that can be integrated into a variety of electronic projects. This board can be interfaced with other Arduino boards, Arduino shields, Raspberry Pi boards and can control relays, LEDs, serves, and motors as an output. Arduino UNO features AVR microcontroller Atmega328, 6 analogue input pins, and 14 digital I/O pins.



Fig: Arduino UNO

3.2 Temperature and Humidity Sensor(DHT11)

DHTI 1 Temperature & Humidity Sensor features a temperature & humidity sensor complex with a calibrated digital signal output. By using the exclusive digital-signal-acquisition technique and temperature & humidity sensing technology, it ensures high reliability and excellent long-term stability. This sensor includes a resistive-type humidity measurement component and an NTC temperature measurement component, and connects to a high performance 8-bit microcontroller, offering excellent quality, fast response, anti-interference ability and cost-effectiveness.

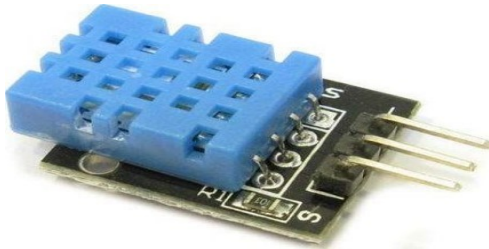


Fig.2: DHT11 Sensor

3.3 Heartbeat Sensor(MAX30100)

Heartbeat Sensor is an electronic device that is used to measure the heart rate i.e. speed of the heartbeat. Monitoring body temperature, heart rate and blood pressure are the basic things that we do in order to

keep us healthy. In order to measure the body temperature, we use thermometers and a sphygmomanometer to monitor the Arterial Pressure or Blood Pressure. Heart Rate can be monitored in two ways: one way is to manually check the pulse either at wrists or neck and the other way is to use a Heartbeat Senso Monitoring heart rate is very important for athletes, patients as it determines the condition of the heart (just heart rate). There are many ways to measure heart rate and the most precise one is using an Electrography.

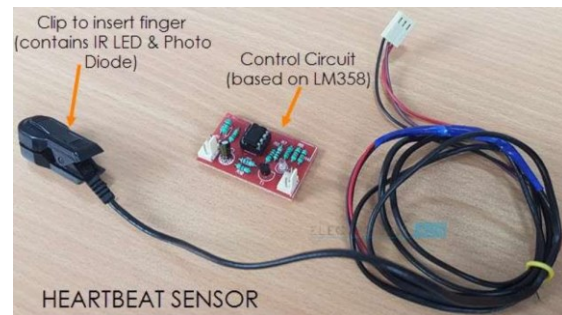


Fig.3: MAX30100 Sensor

3.4 Zigbee

Pin Description:

- 1, VDD 3.3 V or 5V power supply positive
- 2, GND Power negative
- 3, TXD: serial output module, connected microcontroller or USB to serial RXD
- 4, RXD• module serial input connected microcontroller or USB to serial TXD



5, CMD enter upgrade mode or AT mode pin, active low

3.5 ESP8266 Node MCU

These modules come in different form factors and pinouts. See the page at ESP8266 community wiki for more info: ESP8266 Module Family. Usually these modules have no bootstrapping resistors on board, insufficient decoupling capacitors, no voltage regulator, no reset circuit, and no USB-serial adapter.

4. SOFTWARE DESCRIPTION

4.1 Arduino IDE

Arduino Integrated Development Environment is a publicly accessible software where one can easily write codes and upload them to the board. It makes code compilation very easy. Being a cross-platform application, codes can be written in C and C++ language for Windows, macOS, and Linux.

5. CONCLUSION

WBAN is an emerging technology which is expecting to have a great impact on our society as well as in the field of medical and non-medical sector. In this paper an overview of WBAN has been outlined where we have highlighted the WBAN

architecture and deploy requirements of this technology. We have also discussed about development and the technology adoption with different fields of application here. The aim of this work was to offer a suitable and appropriate wireless technology in order to deploy network. For this reason we have described several short range wireless communication technology that can be adopted in WBAN. Through this paper it has been shown that many applications that are suitable to apply for WBAN. After all the narration we can summarize that for medical applications ZigBee and UWB are suitable where in the sector of lifestyle and entertainment Bluetooth and ZigBee can be appropriate. In the end we feel that several non-technical factors would also play crucial roles in the success of the WBAN technology development such as affordability, legal, regulatory and ethical issues, and user friendliness, comfort and acceptance. In this survey, we have reviewed the current research on Wireless Body Area Networks. In particular, this work presents an overview of the research on the propagation in and on the human body, MAC-protocols, routing protocols, Quality of Service and security. To conclude, a list of research projects is given and open research issues are discussed. A WBAN is expected to be a very useful technology with potential to offer a wide range of benefits to patients, medical personnel and society through continuous monitoring and early detection of possible problems. With the current technological evolution, sensors and radios will soon be



applied as skin patches. Doing so, the sensors will seamlessly be integrated in a WBAN. Step by step, these evolutions will bring us closer to a fully operational WBAN that acts as an enabler for improving the Quality of Life. We feel that this review can be considered as a source of inspiration for future research directions.

6.FUTURE SCOPE

Emerging Markets and Future Applications

Although WBANs have been developed for medical applications, they can be easily tailored for smart environments that combine sectors such as business, entertainment and education for a heightened seamless experience. The recent explosion of personal computing devices into the consumer market that combine social networking applications can be boosted with the introduction of WBANs without active involvement of the individual at the center of the networks. This kind of passive involvement in data transfer can ease the cognitive burden on the individual and result in more unobtrusive computing applications. It also has the potential for breakthroughs in the study of medicine, ecology and other civilian and military applications. A major concern underlining these advances will be that of privacy and security of data and the applications running on them, since this kind of passive involvement by the individual might result in the use of default

settings for data privacy and might be vulnerable to malice by unintended users of the data. WBANs will also need evolving standards for co-existence and data transfer with other ad hoc networks, mobile networks and the Internet. The success of WBANs and their eventual widespread acceptance will be accelerated by merging it with existing technologies and creating frameworks with ease of data transfer and data access.

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