Implementation of ZIGBEE Protocol for Patient's Health Monitoring- A Review

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Abstract— A majority of older adults are challenged by chronic and acute illnesses and/or injuries. Seven out of ten older Indians are living with the health challenges of one or more chronic diseases. Remote patient monitoring (RPM) technologies have been shown to be effective in helping to manage chronic disease, post- acute care, and monitoring the safety of the older adult population. Heart failure needs close and continual monitoring procedure after diagnosis, in order to prevent mortality or further damage as secondary to the mentioned diseases or disorders. In today's world, it is sometimes difficult to monitoring these types of patients, usually; occur at hospitals or healthcare centers or at home. Heart arrhythmias for instance, in many cases, need continual long-term monitoring. However, the patients are often too early released, owing to need of hospital bed for another patient on the waiting list, who needs to be hospitalized immediately. Hence a remote monitoring system should be implemented so that the health of patient can be remotely monitored easily with less error.

Keywords— Zigbee, Temperature Sensing, Heart rate monitoring, Patient Health etc.

I. INTRODUCTION

The main objective of this paper is to demonstrate the importance of monitoring the healthcare and add new health monitoring system to one of the existing systems. In the field of health monitoring, the major patients are of age group 40 and above. The group of 40+ users shows more diversity in their health conditions than younger people. Earlier monitoring system for body temperature, pulse rate etc are based on sensors which shows the results instantly on the LCD available with it. This monitoring system is neither continuous nor available with long distance monitoring. Hence, it is not possible to continuously monitor the vital parameters such as temperature, pressure and pulse from a distant location. In a hospital either the nurse or the doctor has to move physically from one person to another for health check, which may not be possible to monitor their conditions continuously. Thus any critical situations cannot be found easily unless the nurse or doctor checks the person's health at that moment. This may be a strain for the doctors who have to take care of a lot number of people in the hospital. [2].

Various earlier studies has shown that Zigbee, GSM and SMS techniques if used properly can be the best monitoring system in present scenario.

A. ZIGBEE Protocol

The name "ZigBee" is derived from the erratic zigging patterns many bees make between flowers when collecting pollen. Bluetooth focuses on connectivity between large packet user devices, such as laptops, phones, and major peripherals; ZigBee is designed to provide highly efficient connectivity between small packet devices. ZigBee devices are actively limited to a through-rate of 250Kbps, operating on the 2.4 GHz ISM band, which is available throughout most of the world.

ZigBee has been developed to meet the growing demand for capable wireless networking between numerous low-power devices. Zigbee with its long battery life, low-cost , wireless range up to 70m indoors and 400m outdoors with full control of transmitted output power have networking flexibility to cover entire campuses and supports multiple network topologies encountered in home and professional settings.
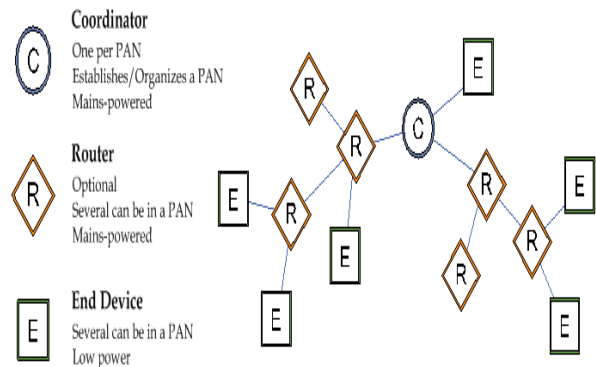

Figure 1.1 ZigBee Network Topology

II. EMBEDDED SYSTEM APPROACH

Mohamed Fezari, et al. [1], describes the development of a heart rate monitor system based on a microcontroller. The implementation of an embedded system based on a microcontroller for real-time analysis of ECG signals has been investigated. The system has been tested successfully on simulated ECG signals for different heart diseases. The system is having ECG signal diagnosis capability, the real-time ECG processing, the remote control of a patient and the transportability. They have used PIC16F876 microcontroller as shown
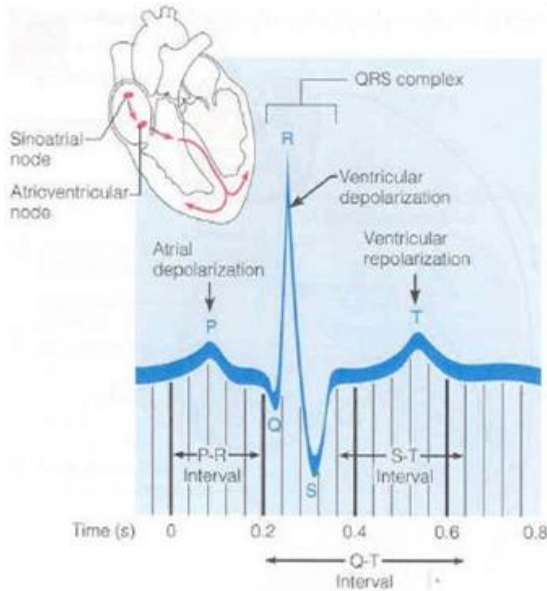
Figure 2.1 An electrocardiogram tracing with deflection waves and the important intervals.

S.Josephine Selvarani [2] has developed an on-line health monitoring of physiological signals of humans such as temperature and pulse using Zig-Bee by which the temperature and pulse of humans can be monitored from a distant location and some abnormalities can be easily indicated via SMS .The physiological measurements obtained from the Temperature Sensor and Heart Beat Sensor are transmitted to the programmed microcontroller to the PC through Zig-Bee. The PC collects the physiological measurements and also sends SMS, to the indicated mobile number through a GSM modem.
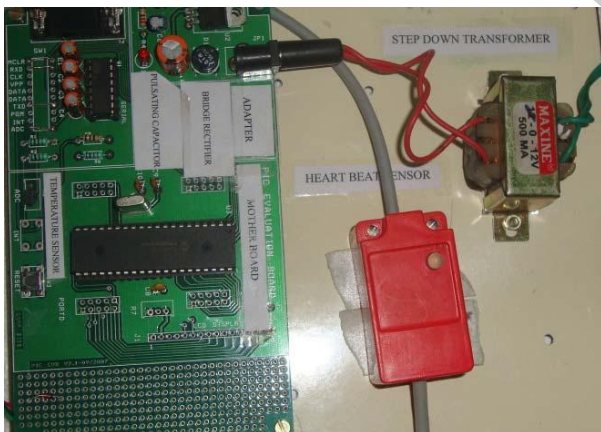

Figure 2.2 Hardware used

III. E-HEALTH CARE

Xiaoxin Xu Mingguang et al., proposed an outdoor patients' healthcare monitoring system composed by Reference Nodes, Mobile Devices, a Gateway and Host servers for tracking patients, helping doctors and nurses to keep tabs on their patients' healthy remotely [3].

Baik-Woo Lee and et al., explored the technology to embed discrete passive components into a multilayered flexible substrate, which can significantly contribute to achieving thin and flexible bandage-like Ehealthcare sensors that are worn on users' body to acquire bio-signals from their body during their everyday life [5].

Hsin-Lu Chang nad et al., In the information society, electronic healthcare service (ehealth), the new concept of medical treatment, has been introduced to improve health and healthcare, e-health has become a trend of new type of medical treatment and healthcare especially in remote area. Since it can reduce many kinds of resources and provide more convenient services for patients, it is important to make the entire service process more efficient and improve the performance of the entire service delivery system.

A. Wearable Health Monitoring Systems:

Ankush Nayyar and Hemant Lenka [10] have designed the wrist tilt mechanism for checking the movement of patient. Also they have introduced further the sensing techniques which can sense temperature of human.

A smart vest is essentially a wearable physiological monitoring system, incorporated in the vest. There are large amount of research carried out in the field of sensors integrated in fabrics, garments which can sense the bio-signals. The parameters which can be measured by vest include ECG, HR, BP, body temperature and galvanic skin response.

IV. PROPOSED SYSTEM

The system to which the messages from the modem present in base station of homecare embedded system is sent. This is the Zigbee monitoring system caretaker of the patient or a neighbor or a medical doctor or a relation to the patient as shown.
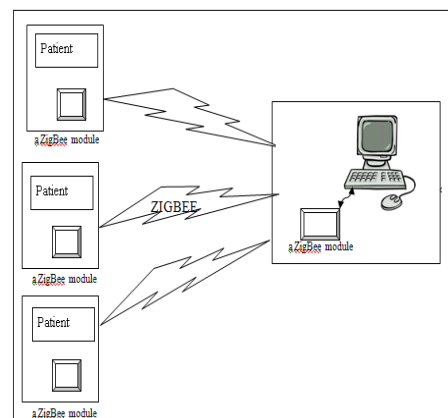

Figure 4.1 ZIGBEE monitoring system and Alarms to the External People
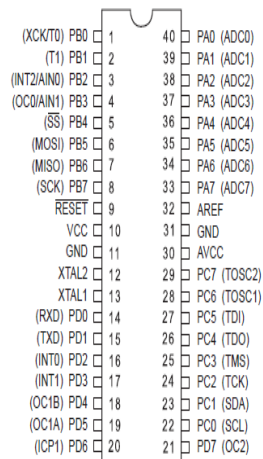
A. Atmega16a microcontroller

Figure 4.2 Pin diagram of ATMEGA 16a

V. CONCLUSION

An extensive research has been carried out in the field of health monitoring up till date. Various techniques are also suggested by some researcher's. Being most efficient and highly reliable protocol, ZIGBEE can now serve among the best solution for remote health patient monitoring. This system leads to number of benefits as mentioned below:

- People living in isolated areas, far from hospitals and healthcare centers can be monitored easily.
- Offers services when no of doctors, nurses, and hospitals are less in number than required.
- Providing advanced services in case of emergency.
- Facilitate cooperation between the hospitals in the provision of medical care.

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