

## A REVIEW: ZIGBEE BASED PATIENT HEALTH MONITORING SYSTEM

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### Abstract:

*This paper, presents a Wireless Sensor Network (WSN) for monitoring patient's physiological conditions continuously using Zigbee. Here the physiological conditions of the patient's are monitored by sensors and the output of these sensors is transmitted via Zigbee and the same has to be sent to the remote wireless monitor for acquiring the observed patient's physiological signal. The remote wireless monitor is constructed of Zigbee and Personal Computer (PC). The measured signal has to be sent to the PC, which can be data collection. Although Bluetooth is better than Zigbee for transmission rate, Zigbee has lower power consumption. The first procedure of the system is that the wireless sensors are used to measure Heart rate, temperature using Zigbee. Next procedure of the system is to measure saline level in bottle using zigbee. The measured signal is sent to the PC via the serial port communication interface.*

### I. INTRODUCTION

The present patient monitor systems in hospitals allow continuous monitoring of patient vital signs, which require the sensors to be hardwired to nearby, bedside monitors or PCs, and essentially confine the patient to his hospital bed. Even after connecting these systems to a particular patient, a paramedical assistant need to continuously monitor and note down all the vital parameters of a given patient by keeping track of all of his/her records manually. Adopting such a method is error prone and may lead to disaster in the case of a human error. In the current proposed system the patient health is continuously monitored by the Mobile multi patient monitoring system and the acquired data is transmitted to a centralized ARM server using Wireless Sensor Networks. A ZigBee node is connected to every patient monitor system that consumes very low power and is extremely small in size. These are specifically designed for low power consumption, with minimal circuit components intended for small packet, long distance range applications and typically consist of a low power processor with minimal resources and interface capabilities. They also have a conservative transceiver that is capable of transmitting 8 bytes of data at a time and has a moderate transmitting range of about 130 m. Therefore, WPANs seem to be a perfect fit for remote patient monitoring. To improve the accuracy and to increase

the efficiency of the above processes a real time patient monitoring system based on Wireless Sensor Networks (using IEEE 802.15)

## **SYSTEM HARDWARE DESCRIPTION**

The system is based upon Zigbee WSN Technology in order to compensate for the existing health system, reduce the workload of the staff taking care of the patient, and improve the patient's mobility is specifically designed to provide better services and a better cure. Figure 1 depicts the block diagram of the system. The Hardware of the system consists of the two sections: Transmitter and Receiver. The Description of both the section is as follows: Description of Transmitter Section Transmitter section of the monitoring health care system consists of a Zigbee network which is made up of sensor nodes as shown in figure . To keep the moment of the patient intact with the sensors on the body, the wireless sensors are required to be minimized and portable. These sensors are heart beat sensor, saline sensor are the basic requirements of a general ward patient. Temperature sensor used here is LM35 which is a precision integrated device. LM35 is used to measure temperature of the patient's room. LM35 provides 3 pins as Vs, GND and VOUT. is the humidity sensor module used to measure humidity for the patients suffering from asthma. This humidity sensor is of capacitive type which is highly precise and reliable. It is of low cost and converts change of conductivity to correspond output signal of gas concentration. Now the sensed or collected data from the sensors as shown in the Figure 2 is to be transmitted to the control unit for matching process. Two Zigbee modules are used in this system: One at transmitter end and other at the receiver end. For this purpose, Zigbee Module is used as a communication device. Zigbee is created by Zigbee Alliance and its operating range is 2.4 GHz frequency band. It provides low-cost, low-power wireless sensor networks. Zigbee is based upon CSMA method of carrier sensing and hence the chances of collision is very less. It can support up to 16 channels at a time and it is most likely that channel overlap occurs if there are more than 16 Zigbee networks present. It has a wide variety of indoor and outdoor range.

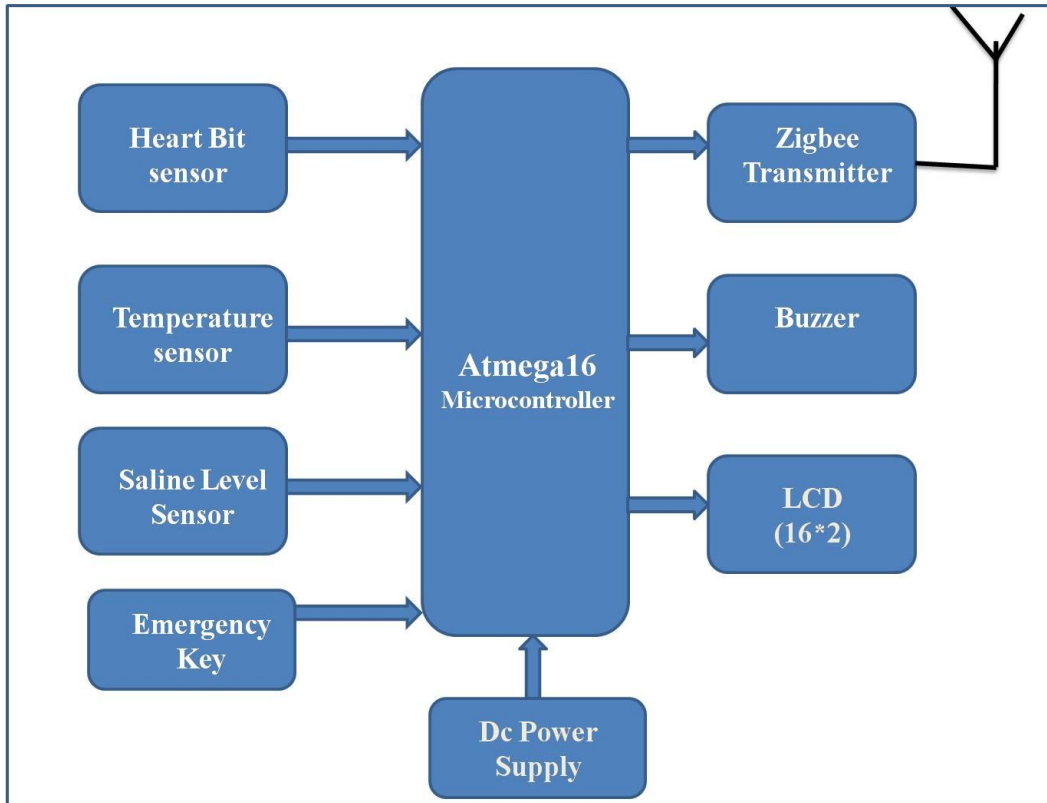
## **DESCRIPTION OF RECEIVER SECTION**

The information sent by the Zigbee Module is received wirelessly by the other Zigbee Module at the receiver section as shown in the Figure 3. Zigbee Module will transfer the data to the some control device. For controlling action, AVR Microcontroller is used It is an 8-bit microcontroller with inbuilt 128 bytes of internal random access memory, 4K read only memory, timers/counters, four general purpose input/output ports. Controller will match the limit predefined in the code of the microcontroller. If a mismatch occurs, that is if the collected data is more than the limit defined than alert signals are issued. Alert signals are issued to alert the staff taking care of the patient and to provide better cure. If the collected data is within the limits then the value of the sensed data will be displayed on LCD and PC Display. Besides, the buzzer alarms to alert the staff two other alert systems are also used here. All the components are connected according to the requirements and mounted on PCB. HD44780 LCD is made available for the nurses and the staff at the main receiver section. LCD is connected to the microcontroller for displaying the conditions. Also, the results will also be displayed on the personal computer through serial communication. For serial communication, USB TO TTL Converter is used. As it

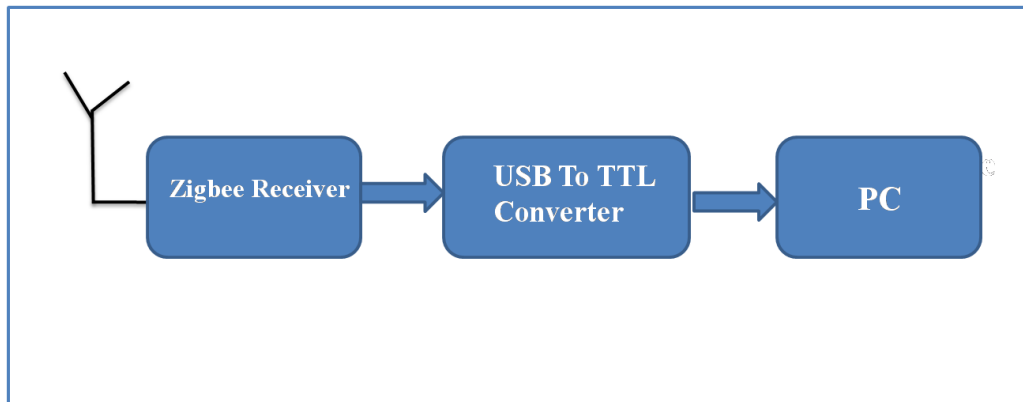
creates a virtual COM port on the PC, the results will also be displayed using Flash Magic Software as shown in the Figure .

**Block Diagram:**

**Transmitter:**

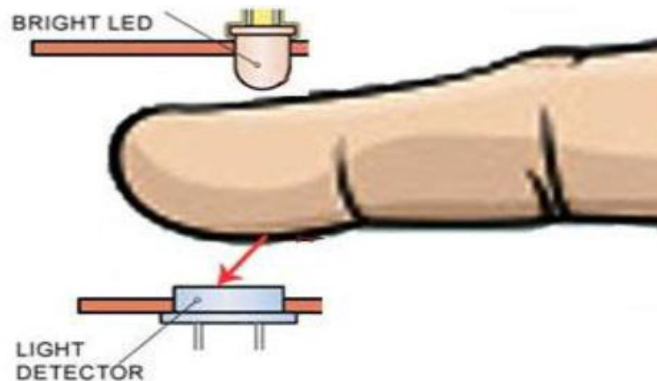


**Receiver:**



### Heart Beat Sensor:

The system consists of an infrared (IR) LED as transmitter and an IR photo-transistor as a receiver that acts as a fingertip sensor. The sensor consists of a super bright red LED and light detector. The LED needs to be super bright as the maximum light must pass spread in finger and detected by detector. Now, when the heart pumps a pulse of blood through the blood vessels, the finger becomes slightly more opaque and so less light reached the detector. With each heart pulse the detector signal varies. This variation is converted to electrical pulse. This signal is amplified through an amplifier which outputs analog voltage between 0 to 5V logic level signal. The illustration of fingertip sensor is shown in fig 2.



### Temperature Sensor:

The LM35 series are precision integrated-circuit temperature sensors, with an output voltage linearly proportional to the Centigrade temperature. Thus the LM35 has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling. The LM35 is rated to operate over a  $-55^{\circ}\text{C}$  to  $+150^{\circ}\text{C}$  temperature range.

### Saline level sensor:

Saline level sensor is used to measure the IV fluid levels. This sensor detects the saline level in the bottle and sends a message to the doctor and at the same time an alarm will indicate that the saline has completed. This sensor uses a 555 timer in the transmitting section and TSOP1738 IR

sensor in the receiver section. This sensor is placed at the neck of the bottle so that it detects the IV fluid level.

## **CONCLUSION:**

This paper presents a system to upgrade existing health monitoring systems in the hospitals by providing monitoring capability and a thus a better cure. This system is based upon wireless technology i.e. Zigbee IEEE 801.15.4 providing low cost effective solution. As it is wireless device, the cost of cables is reduced here. It provides continuous monitoring of the vital signs of the patient over long periods of time until an abnormal condition is captured and hence critical situations can be overcome. This intelligent monitoring system provides long term monitoring capability useful for the staff in the hospitals and reduces their workload. Future work may include more number of sensors in a single system to provide flexibility. Hence the main goal of this paper is to develop a patient health monitoring system to alert the staff in the hospitals so that immediate care is provided to patients.

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