

Patient Health Monitoring (o2 Level, Pulse Rate and Temperature Level) with Doctor’s PC Alert using Zigbee Communication

Ashish Malgave¹, Abhinandan Dige², Prashant Solankure³, Vishal Solankure⁴,
Suhas Chougule⁵, Snehal Kamble⁶

Assistant Professor, Electrical Engineering Dept, AMGOI, Maharashtra, India¹

Student, Electrical Engineering Dept, AMGOI, Maharashtra, India^{2,3,4,5,6}

Abstract: This paper present the wireless sensor circuit which is used for continuous monitoring the patient health parameters using simple, low-cost controller based Zigbee communication system. In this system using wireless technology to transfer or collect the information of the patient. Pulse rate of the subject is measured from the thumb finger using IRD (Infra Red sensor) and pulse rate is then averaged and displayed on a PC monitor. It is important for continuous monitoring in hospitals. This system uses regulated 5V, 750mA power supply. 7805 three terminal voltage regulator is used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac output of secondary of 230/12V step down transformer. Temperature, pulse rate, O2 level will be displayed on the LCD display which is connected to the ARM controller. And also the doctor PC monitor will have continuous information. This wireless technology works as master and slave communication. In this system pc is master terminal has visual basic software unit.

Keywords: Zigbee, ARM Controller, Visual Basic, sensor.

I. INTRODUCTION

Patient monitoring systems are gaining their importance because of rapidly increasing demands in hospital. This system uses wireless real time data transmission to the pc monitor. This paper describes wireless sensor circuit with zigbee system using transmitter and receiver circuit. This system collects the data from sensors and by analysing sends to receiver at doctor. This system consists of zigbee network, sensors and ARM controller. So the multipoint connection can be used using master and slave circuit. Cooperative system is used to check master circuit is in range of salve circuit. Visual basic software is used on the main PC terminal. The status of all the slaves is checked by the master circuit. Hence the wireless transmission ensures the successful transmission of all the health parameters.

II. SYSTEM REPRESENTATION

The below figure shows the various Component of the system. The system of Zigbee based network is four types of sensor, master and slave combination.

For this purpose a master and slave combination is used. The pulse rate, oxygen and temperature sensors are connected to transmitter as a slave circuit. Slave consists of three sensors, zigbee transceiver, ARM controller and LCD. Data is analysed with an ARM controller and send to a PC monitor by using zigbee wireless transmission

The range of zigbee is about 100mtrs. Visual basic software is used on the main PC master terminal. The status of all the slaves is checked by the master circuit. System gives alert to doctor when patients pulse rate, oxygen and body temperature falls outside of normal condition.

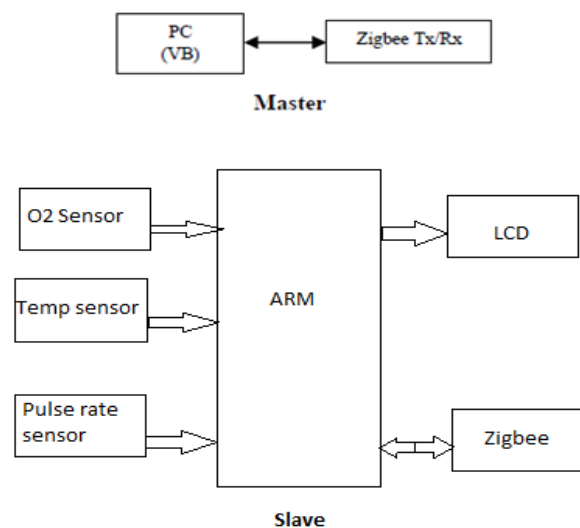


Fig- wireless patient monitoring

The transmission signal is shown on both master and slave circuit. In the request frame the master shows the slave ID. The request frame is received by all the slaves which are in range .The incoming request frame is received by slaves which are in range and stored to the RAM memory. If the incoming slave ID matches with their own slave ID then they accept the frame and send the parameter back to the master. When slave goes out of range then the communication fails. The slave should be placed in such way that they will be always in range of the PC master. The slave is under the PC based masters supervision .Therefore the PC master will communicate to the slave via Wireless Zigbee module.

III. COMPONENT DESCRIPTION

1. ARM Controller:

The full form of ARM is Advanced RISC (Reduced instruction set computer) Machine. A 16/32 bit ARM controller has flash memory up to 512 kb. It has 64 pins from which 45 are GPIO pins. It has 2 ports and 14 ADC pins. Supply voltage of 3.3v dc is given to the ARM controller by using voltage regulator. The data collected from sensors is analysed, converted by ARM and given to the LCD and zigbee circuit. Various 32-bit timers, single or dual 10-bit 8-channel ADC(s), 10-bit DAC, PWM channels and 45 GPIO lines with up to nine edge or level sensitive external interrupt pins make these microcontrollers particularly suitable industrial control and medical systems.

2. Sensor:

A) IR Sensor:

The pulse rate sensor is basically used to keep track on the pulse rate of the person. In programming the maximum and the minimum set point are provided for the pulse rate. If the pulse rate goes below or above the set point then the alert will be immediately issued by the m Sensor is the essential part of any instrumentation system. Sensing is the first stage of any process in the instrumentation system. Sensors are required to sense the variations in the physical quantities. According to the variations in the physical quantities sensors give the output, which is electrical in nature. Without the sensors it is not possible to convert the physical quantities into the electrical form. The unique capability of conversion of the physical quantity into the electrical form makes the sensors most essential part of the presented work.

B) Temperature Sensor:

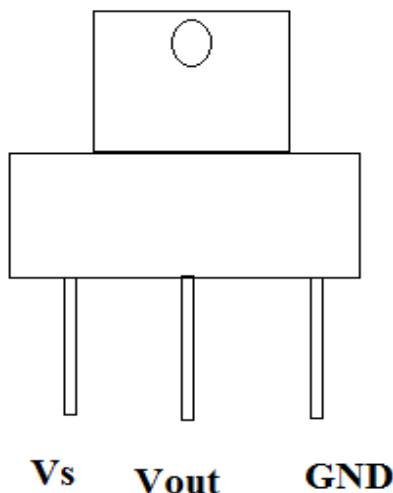


Fig- Temperature Diagram

Temperature is sensed by the temperature sensor. It can sense the temperature of human body. It is an analog sensor and gives the output into form of analog signal. This signal is feed to ARM controller and ADC will convert it into digital form. Once converted into analog form the controller can process the digital temperature signal as per the application.

C) Oxygen Sensor:

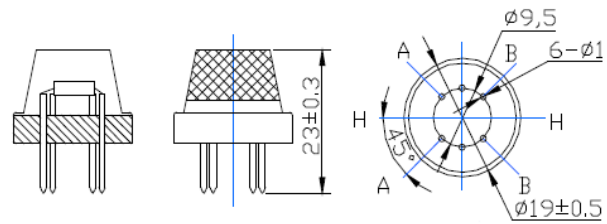


Fig- Oxygen Sensor

Sensor composed by micro AL2O3 ceramic tube, Tin Dioxide (SnO2) sensitive layer, measuring electrode and heater are fixed into a crust made by plastic and stainless steel net. The heater provides necessary work conditions for work of sensitive components. The enveloped MQ-4 has 6 pin, 4 of them are used to fetch signals, and other 2 are used for providing heating current.

D) LCD:

The 16/2 LCD display is used to visualize the output of the application. It issued to check the output of different modules interfaced with the microcontroller. Thus LCD plays a vital role to see the output and to debug the system module wise in case of system failure in order to rectify the problem display device is required only at the coordinator end. To know what is going on the sensing node. The data must be shown on the display. This data can also be recorded and kept safe for the analysis. Health status of the human can only be known by observing the data. That's why the display is must for the presented application. For the presented work, LCD is used as a display device. LCD is the short form of the liquid crystal display. LCD displays utilize two sheets of polarizing material with a liquid crystal

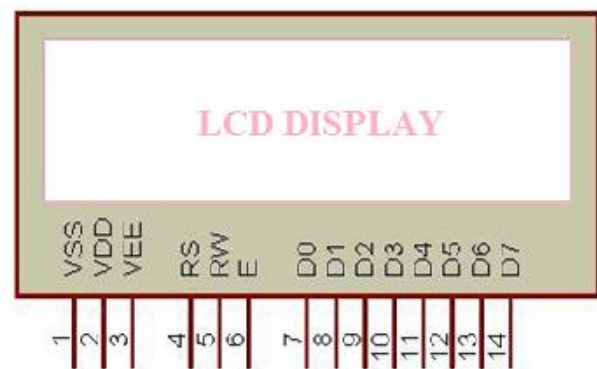


Fig- 16/2 LCD Display

E) Power Supply:

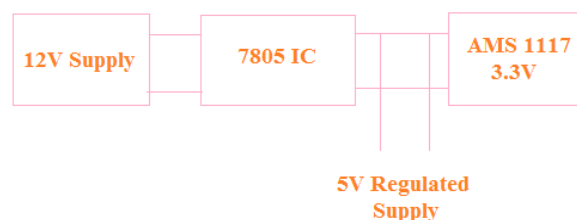
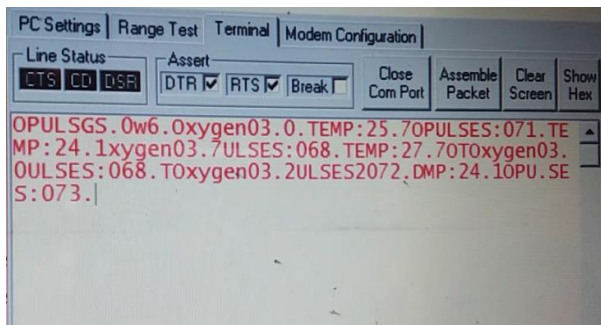


Fig- power supply

There are several components used at the sensing node and coordinator end. These components have different operating voltage such as ARM controller operates at 3.3 V. ZigBee transceiver operates at 1.8 V to 3.8 V, LM 35 and LCD display operates at 5 V. To meet these requirements of different operating voltage ranges a proper arrangement of power supply is required. The 7805 voltage regular is used to provide 5 V regulated power supply and AMS 1117 is used to provide 3.3 V regulated power supply.

IV. RESULT

➤ Doctor's PC Monitor Output:



Mr. Vishal Solankure working as an assistant professor in the Department of Electrical Engineering of Ashokrao Mane Group of Institution, Vathar Tarf Vadgaon, Kolhapur, Maharashtra.



Mr. Suhas Chaugule working as a student in the Department of Electrical Engineering of Ashokrao Mane Group of Institution, Vathar Tarf Vadgaon, Kolhapur, Maharashtra.



Miss. Snehal Kamble working as a student in the Department of Electrical Engineering of Ashokrao Mane Group of Institution, Vathar tarf Vadgaon, Kolhapur, Maharashtra.

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BIOGRAPHIES:



Prof. Ashish Malgave working as an assistant professor in the Department of Electrical Engineering of Ashokrao Mane Group of Institution, Vathar Tarf Vadgaon, Kolhapur, Maharashtra.



Mr. Abhinandan Dige working as a student in the Department of Electrical Engineering of Ashokrao Mane Group of Institution, Vathar Tarf Vadgaon, Kolhapur, Maharashtra.



Mr. Prashant Solankure working as a student in the Department of Electrical Engineering of Ashokrao Mane Group of Institution, Vathar Tarf Vadgaon, Kolhapur, Maharashtra.