

## INTELLIGENT ICU MONITORING SYSTEM

Nida Khan<sup>1</sup>, Nehar Mujawar<sup>2</sup>, Priyanka Panchal<sup>3</sup>, Prof. Neelum Dave<sup>4</sup>

<sup>1</sup>Student, Dept. Of Electronics and Telecommunication Engineering, D.I.T Pimpri, Maharashtra, India

<sup>2</sup>Student, Dept. Of Electronics and Telecommunication Engineering, D.I.T Pimpri, Maharashtra, India

<sup>3</sup>Student, Dept. Of Electronics and Telecommunication Engineering, D.I.T Pimpri, Maharashtra, India

<sup>4</sup>Professor, Dept. Of Electronics and Telecommunication Engineering, D.I.T Pimpri, Maharashtra, India

\*\*\*

**Abstract** - A network of sensor devices connected wirelessly for communication on, in and near the body to obtain data from sensor devices is known as wireless body area network. This paper implements the use of wireless network for monitoring body temperature, heart beat rate and oxygen supplied to the patient. The two vital factors that plays a very important role in determining the patient's health are the heart rate and the body temperature. This device helps to determine the heart rate of the patient using heart rate sensor and the patient's body temperature using the temperature sensor LM35. This device can also measure the oxygen supplied to the patient as well as the oxygen level present in the oxygen cylinder. When the patient is dead, the heart rate and the body temperature reduces this can be detected by the device. If the results are transferred wirelessly to the doctor via computer or cell phone, quick action can be taken to provide the proper treatments to the patients and any untoward incident can be averted.

**Key Words:** Heart Beat Sensor, PIC, Body Temperature Sensor, Flow Sensor, LCD, Wireless Module, bpm, psi, etc.

### 1.INTRODUCTION

ICU Monitoring System is such a system which is very vast it measures lots of parameters such as heart beat, blood pressure, diabetics, and much more. In this system we are going to measure the main parameters such as heart rate, body temperature, oxygen utilization and the measure of oxygen level in the cylinder.

Oxygen utilization is nothing but the use of oxygen by the patient. There is a flow sensor used at the knob of the oxygen cylinder which will control the flow rate of the oxygen provided to the patient. Oxygen cylinders are of various limits such as 2000psi, 1500 psi, 1000psi and also 500psi. 500psi oxygen cylinder can be used by a patient for a complete day. There will be a DC Motor used for the flow control of oxygen and the limit is decided by the doctor. The flow rate is suggested by the doctor that how much rate of oxygen is to be passed from the flow sensor.

The oxygen level is measured with the help of mechanical assembly. In this assembly the contact is developed below the oxygen cylinder. The desired level is set

in the device after which the red LED glows and also buzzer indication is provided. This ensures that there will be continuous flow of oxygen and when the oxygen is less it indicates the authorities to change the oxygen cylinder.

A heart rate monitor is a personal monitoring device that allows a subject to measure their heart rate in real time or record their heart rate for later study. Early models consisted of a monitoring box with a set of electrode leads that attached to the chest. The heart beat is measured in beats per minute or bpm, which indicates the number of times the heart is contracting or expanding in a minute. If the heart rate is greater than 100 then it is called as high heart rate, if the heart rate is between 60-100 then it is ideal heart rate and if the heart rate is less than 60 then it is low heart rate. The heart rate of a healthy adult at rest is around 72 beats per minute (bpm) & Babies at around 120 bpm, while older children have heart rate at around 90 bpm. The heart rate rises gradually during exercises and returns slowly to the rest value after exercise.

In hospitals, patient's body temperature must need to be monitored constantly, which is usually done by doctors or other paramedical staff. They observe the body temperature of the patient constantly and maintain a record of it. The ideal body temperature of an adult is 97F(36.1 degree) to 99F(37,2 degree).

Also the wireless module used within this system provides the time to time update of the patient's health to the family and the doctor under the guidance of. The parameters which will be recorded by the system will be displayed on the LCD placed in the patient's room continuously and will be also updated within few minutes. The system of messaging to the family and the doctor will be by the long period of gap.

In today's scenario we observe that the doctors and the hospitals are just keeping the person on the ventilator to increase the bill due to this the oxygen is also wasted. Our system overcomes this drawback by sending the message even to the relatives.

This remote monitoring system allows the doctors to monitor the health status of the patients whenever a change occurs in patient's health condition. It is impossible for doctors and other hospital staff to work on single patient.

### 1.1 Block Diagram

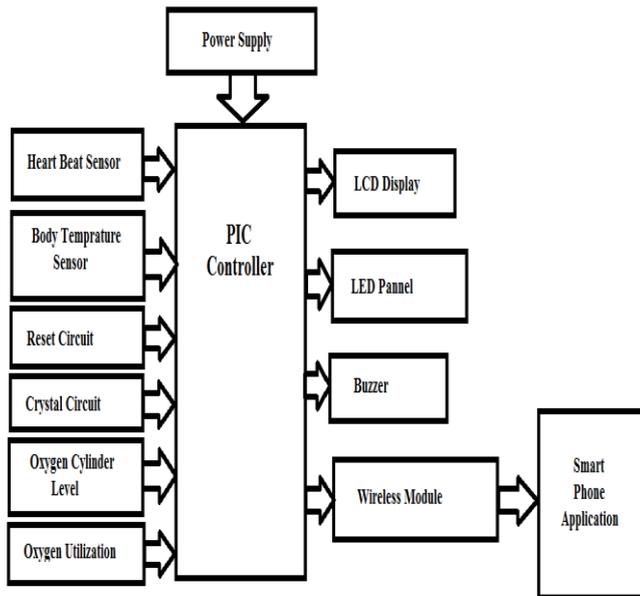


Fig: Block Diagram

### 1.2 Specification

◆ **Micro-controller: PIC16F877A**

Operating voltage: 5VDC

Current: 25mA

No. of pins: 40 pins

◆ **Heart rate sensor:**

Operating voltage: 5v DC

Current: 25mA

No. of pins: 3

◆ **Body temperature sensor (LM35)**

Operating voltage: 5v DC

Current: 25mA

No. of pins: 3

◆ **LED:**

Operating voltage: 2.2VDC

Current: 10mA

◆ **Flow sensor:**

Operating voltage: 5v DC

Current: 25mA

No. of pins: 3

◆ **LCD:**

5 x 8 dots with cursor

Built-in controller

+ 5V power supply

1/16 duty cycle

◆ **Bluetooth Module:**

Frequency: 2.4GHz

Operating voltage: 5VDC

Range: 10mtr-30mtr

Current: 40mA

## 2. HARDWARE DESIGN

### Microcontroller (PIC 16F877A)

•High-performance RISC CPU with only 35 single-word instructions to learn.

• Operating speed: DC- 20MHz clock input

DC- 200ns instruction cycle

• Flash program memory

– 8K X 14 words

• Data Memory: 368bytes

• EEPROM Data Memory: 256bytes

• Peripheral Feature: Timer0: 8-bit timer/counter with 8-bit prescaler.

Timer1: 16-bit timer/counter with prescaler.

Timer 2: 8-bit timer/counter with 8-bit period register, prescaler and postscaler.

•I/O Ports: A, B, C, D, E.

• Package: 40-pin PDIP

**Sensors:**

**[1]Body Temperature Sensor-**

For measuring body temperature this system consists of a temperature sensor LM35. This sensor is a three pin sensor with VCC, output and ground pins. To measure the temperature the left most pin is connected to the power (5V) and the right pin is connected directly to the ground. The middle pin will give us an analog output. The analog voltage produced, is directly proportional to power supply.

**[2]Heart Rate Sensor-**

For measuring the heart rate we have designed a heart rate sensor. This sensor provides the output of the heart rate when the finger is placed on it. This output can be connected to the microcontroller to measure the heart rate in bpm. This sensor uses the principle of light modulation by blood flow through the finger at every pulse. The sensor consists of a bright led and light detector. The amount of light detected gets reduced when the heart pumps blood and because of this there are variations in the signal. These variations are then converted into electrical signals.

**[3]Flow Sensor:**

The Flow sensor is used to measure the oxygen supplied to the patient. The flow sensor is controlled using a motor driver to switch on or off the knob. According to the unit of oxygen supplied the bill is calculated. If the patient is dead the oxygen is not further supplied to the patient. The motor driver used is IC L293D which is a 16 pin IC.

**Power supply design:**

Power supply is used to drive the various components of the electronic systems. In this system we require a 5v supply for digital IC's and a 12v supply to drive the motor. For this we require two separate voltage regulator ICs which are IC 7805 for 5v and IC7812 for 12v.

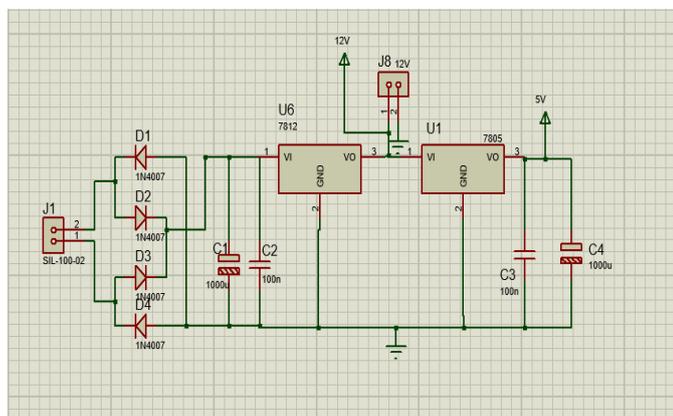


Fig: Schematic fig of power supply simulation.

**SOFTWARE DESIGN**

**Flowchart:**

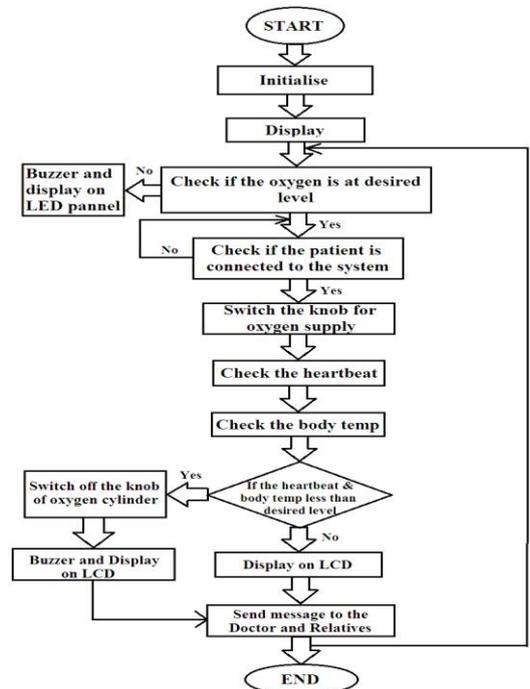


Fig: Flowchart

**RESULT AND ANALYSIS**

• **Heart rate**

[1] CONDITION	[2] HEART RATE
[3] HIGH	[4] GREATER THAN 100
[5] IDEAL	[6] BETWEEN 60-100
[7] LOW	[8] LESS THAN 60

• **Body Temperature**

[9] AGE	[10] BODY TEMPERATURE
[11] CHILDREN	[12] 97.9F (36.6 degree) to 99F (37.2 degree)
[13] ADULT	[14] 97F (36.1degree) to 99F (37.2 degree)
[15] SENIOR ADULT	[16] Lower than 98.6F (36.2degree).

- **OXYGEN SUPPLY**

If the heart rate and body temperature of the patient is more than prescribed by the doctor then the knob of flow sensor is kept on to supply the oxygen to the patient continuously.

If the heart rate and body temperature of the patient is less than the level prescribed by the doctor then the patient is dead and the knob is automatically switched off to reduce the wastage of the oxygen.

### 3. CONCLUSIONS

Now a days we see in many hospitals if the patient is dead then also the oxygen is supplied to the patient to increase the cost. Because of wastage of oxygen is introduced. So this system overcomes the drawback. This system measures the heart rate, body temperature and oxygen utilization. The main aim of this project is to measure the oxygen utilization with the help of flow sensor. For sending the data we use Bluetooth wireless module. The respective data of each parameter is displayed on LCD and send the message to the doctors and relatives with the help of wireless module. Because of which the daily updation will get to the doctors and relatives.

### REFERENCES

[1]Ato. Biniyam, Ato. Guta Tesema, Ato. Akrem Mohammed, Dr.Narayana Swamy Ranaiah and Ato. Eyassu Dilla Department of Electrical and Computer Engineering Arba Minch University SNNPR, Gamo Gofa, Arba Minch, Ethiopia "DESIGN AND IMPLEMENTATION OF HEART RATE MONITORING SYSTEM USING PIC MICROCONTROLLER" 2017 International Conference On Smart Technology for Smart Nation 978-1-5386-0569-1/\$31.00 c 2017 IEEE

[2]M. Udin Harun Al Rasyid<sup>1</sup> , Bih-Hwang Lee<sup>2</sup> , Amang Sudarsono<sup>1</sup> <sup>1</sup> Politeknik Elektronika Negeri Surabaya (PENS), Jl. Raya ITS Sukolilo Surababaya, Indonesia <sup>2</sup> Department of Electrical Engineering, National Taiwan University of Science and Technology (NTUST), Taiwan "Wireless Body Area Network For Monitoring Body Temperature, Heart Beat And Oxygen In Blood" 2015 International Seminar on Intelligent Technology and Its Applications, 978-1-4799-7711-6/15/\$31.00 © 2015 IEEE.

[3]Prajakta A. Pawar "HEART RATE MONITORING SYSTEM USING IR BASE SENSOR & ARDUINO UNO" International Journal of Engineering Trends and Technology-Volume4Issue2- 2013, 978-1-4799-3064-7/14/\$31.00©2014 IEEE.