Wireless observation of medical parameters in patients and alerting system

Patient monitoring: heart beat and saline level

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***Abstract*—The main aim of this project is the implementation of a compact model for patient monitoring in real time and for alerting. By using different physiological sensors or bio sensors, physical parameters like, heartbeat, body temperature, saline level, and oxygen level of a patient can be monitored in real time. Generally, there are number of wired communication techniques available for the ICU patient's health monitoring system. In this proposed system, continuous monitoring of patients health is done and the data thus received is transmitted to the wireless networks using GSM. Analyzing the input from patient and the storage of results of all parameters in data base is supported by Embedded Processor. If any abnormal variation occurs, alerting message is sent to their concerned medical authorities. The implementation of this system is achieved by the simple microcontroller programming and simulation results are obtained.**

Index Terms—physiological, GSM, health monitoring

I. INTRODUCTION

The present technology of wireless sensory networks is growing far and wide. In the researches regarding medical applications various high performance sensing networks are being developed. When it comes to health monitoring, two types of systems are available. Either directly attached to the body(invasive) or , indirectly in contact with the human body.

With the help of this method, self surveying of ones personal health is possible. Also we can observe the heart rate and recieve that data by a predefined format. The GSM modem enables us to receive the heath chart and GPS fetches the location and velocity of the one who wears it.

GPS receiver identifies the location in the form of Latitudes and Longitudes as it receives the data from the satellites.

This device functions on the basis of blood circulation. The number of contraction and expansion of blood vessels(blood pumps) can be sensed by the sensor. Depending upon the rate of circulation of blood , the heart beat is calculated per a particular time (30sec or 1min) this device consists of a micro controller which takes the input from the heartbeat sensor and calculates the heart rate of the patient.

II. IMPORTANCE OF ENGINEERING IN BIOMEDICAL APPLICATIONS

To improve the healthcare diagnosis , monitoring and therapy biomedical engineering plays a responsible role. periodic health monitoring for risk patients and long term applications this technology offers more freedom, comfort, and opportunities in clinical monitoring. With the existing system of ECG only heartbeat is monitored, by combining many other sensors it is possible to monitor the patient efficiently. By further improvement we can expect this to be used for multiple patients monitoring and their alerting.

chronic diseases are significantly more affective on health care and attack is common . Changes in population structure and lack of social and personal health care is the reason for new innovations. elderly people have to visit doctors frequently to get regular health check up on vital signs, which are essential for individual physical well being.

such vital signs include,

1. blood pressure
2. body temperature. etc.

Apart from these for the patients in hospitals, vital signs like

1. saline level
2. oxygen level.
3. patient movement. should be continuously observed.

The goal of this project is to provide a sophisticated , affordable, easy to use , reliable and compact monitoring system. remote patient monitoring (RPM) enables doctors to keep an eye on their patient even outside the clinic and the access to their vital data helps to analyze them easily. the proposed circuit is as below.

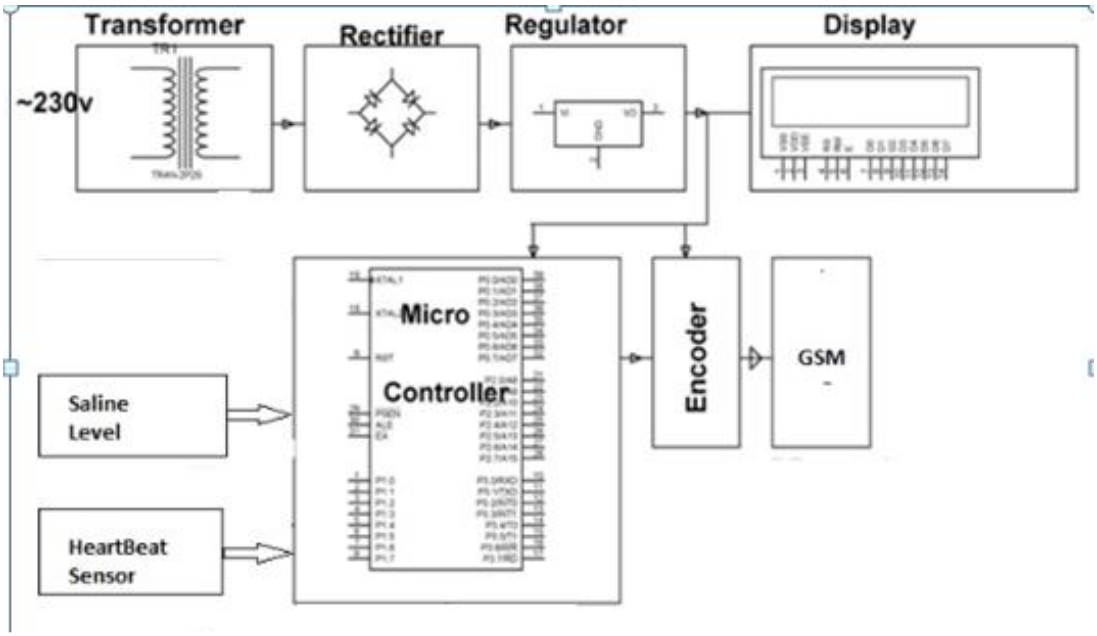


Figure 2.1 circuit diagram

III. HEART BEAT SENSOR

When considered individually the heart beat sensor is assembled with the help of LM358 op-amp, it works on the principle of photophisological signal, here the sensor shines a very bright small LED through the finger and measures the light that gets transmitted to LDR

Basically when the heart pumps the blood, the blood vessel widen and become more opaque therefore the light transmitted to the detector is less, on every heart beat the signal received by LDR varies, that varied signal is converted into electrical pulse, this signal gets amplified and an output of +5V is obtained, this variation is measured for a particular/ predetermined time and any abnormal variation if detected the microcontroller receives the +5v into, thus causing the buzzer, LCD and GPS both gives their respective output as programmed.

The sensor shines a small very bright LED through the finger and measures the light that gets transmitted to the LDR. the amplified signal gets inverted and filtered . the heart rate calculation is based on the blood flow to the finger tip. it is assembled with the help of another opamp .

figure 3.1 TCRT1000 reflective optical sensor

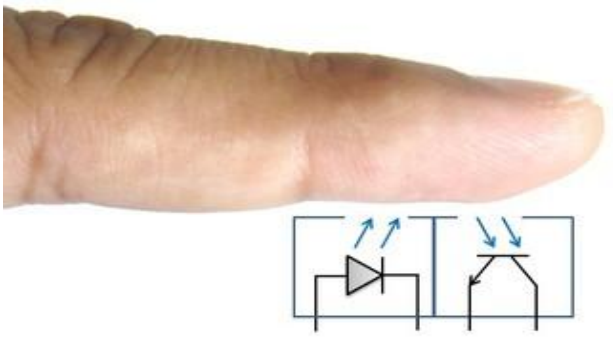


figure 3.2 principle of working of heart beat sensor

IV. SALINE LEVEL DETECTOR (FLOAT)

In place of ultrasonic sensors float switch can be used. it is a analog switch to detect the fluid level. **Description** Float Sensor is an electrical ON/OFF Switch, which operates automatically when liquid level goes up or down with respect to specified level. The Signal thus available from the Float Sensor can be utilized for control of a Motor Pump or an allied electrical element like Solenoid, Lamps, and Relays etc.

Float Sensors contain hermetical sealed Reed Switch in the stem and a permanent Magnet in the Float. As the Float rises or falls with the level of liquid the Reed Switch is activated by Magnet in the Float.

The affordable saline level monitoring system consists of patient, nurse , saline level monitoring unit and control system. The transmitter contains ATMEGA328, GSM module, buzzer, float sensor, and battery. The receiver part contains mobile (smart phone). Transmitter is placed at patient's bed inside the saline bottle. float sensors are used to detect saline level in the bottle.

Application:

House hold Equipments such as overhead water tanks,Water purifiers presently use the floats for detection of available water level.

figure 4.1 analog float

figure 4.2ultrasonic float

Interfacing of sensors with microcontroller

The supply obtained from mains varies from the voltage required for the microcontroller and also sensors. so there is a need of modification in connection. the transformers, rectifiers and necessary switches are used in order to make the proper working of the circuit possible. below are the diagrams of 1) heart beat sensor connection and 2) saline level monitoring connection.

Heartbeat sensor

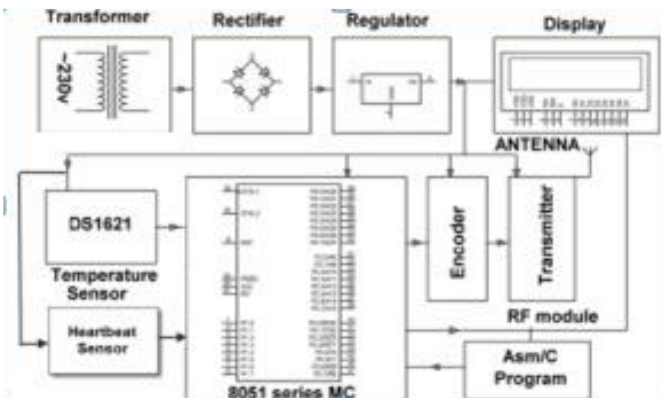


figure 4.3

Saline level detector

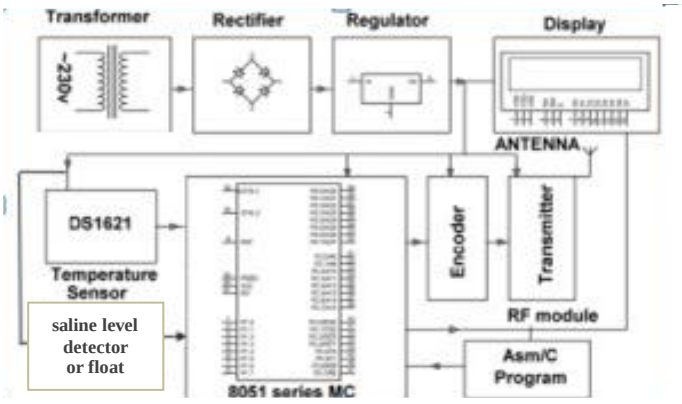
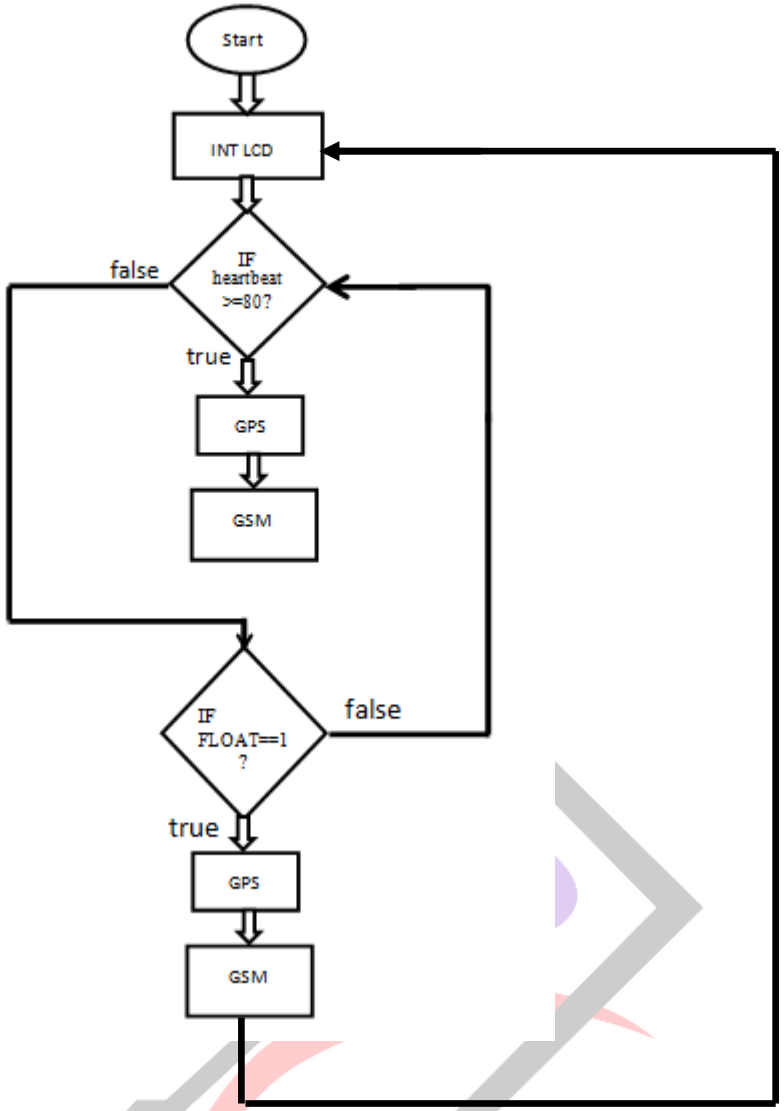


figure 4.4

V. FLOW CHART



The program runs as an unending loop. once the heart rate is counted, it is compared to the reference value(>=80/<=70) and if any of those comes true, the output is given from the alerting system as well as the message is sent, the loop goes back to the initial step and this continues. in a similar way, the saline level is also checked. if any output from the saline sensor(float) is given then the loop goes to the alerting system commands. and after this again the loop repeats for checking unless another input is obtained from one of the sensors.

VI. EXPERIMENTAL RESULTS

The sensors are attached to the patient in ICU, body inputs will be taken from those sensors . Sensor sends information to the microcontroller. the predefined program allows us to keep a count of heart beat either per minute or per 30 seconds. after one such time interval the obtained values are compare with that of standard values. if any abnormal variations are observed, the same is sent to the alerting system. that means, the buzzer statrs buzzing , to indicate a problem detected, simultaneously the LCD displays the origin of variation. and if in case the message of the same is sent to the alloted medical authorities. Microcontroller will compare with references values of float to the maximum extent of lift in the float, and when nearly the bag is full, the float reaces its maximum level and hence creating an input to the micro controller. even this is notified to the nearby nurses through buzzers and LCD.

this system is helpful in observation of a patient in case he is away from the hospital, or being transferred from the hospital, or if the patient is immotile. in case of absence of doctors

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