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IOT Based IV Bag Monitoring along with Heart Rate and Temperature Measurement

Hridhya AP [1], Rajesh U[2]

[1]*Department of Biomedical Engineering, EKNM Government Polytechnic College, Thrikaripur*
[2]*Department of Electronics Engineering, EKNM Government Polytechnic College, Thrikaripur*

Abstract - During the peak hours of medical treatment especially during pandemic like Covid 19, healthcare professionals found themselves difficult to manage every patients. In such times, it is not possible for frontline workers to monitor every patient personally. IV bag is a medical technique used to deliver fluids, medications, and nutrition directly into a person's vein. However, IV drips need to be regularly monitored and replaced and flow of the fluid also needs to be metered depending on the patient and their ailment. It uses a weight sensor to detect as the fluid level in the IV Infusion bottle goes down and transmits the data over IoT. The system measure heart rate, body temperature and weight of the IV bag. When the bottle has gone low level, it sends an alert over IoT. It makes it easier for a single individual to manage multiple patients. The weight sensor is used to measure the weight of the IV bag. The temperature sensor is used to sense the temperature and heart rate sensor is used to sense the heart rate. The current level of IV bag will be displayed on an Android app and this data is transmitted on IOT server via Wifi Module. This level is displayed on IOT server online.

***Key Words*:** Heart rate, temperature, heartbeat sensor, load cell, IV bag, Arduino-UNO

1.INTRODUCTION

With the development of social economy and the improvement of medical level, there is a sharp increase in the number of inpatients, In such times, it is not possible for medical workers to monitor and treat every patient personally. This paper discusses the basic knowledge related to weight measuring instruments and weight realization systems along with temperature sensors and heart rate sensors. The collection of real time data is controlled by Arduino-UNO controller. The transferring of sensed data from implemented LM-35 and heartbeat sensors at the online portal is performed through ESP-wifi shield. This platform is wirelessly connected to monitor and display the real time at indoor and outdoor environment. The monitoring of heart rates of the patients is done using LED, LDR and operational amplifier. The sensor uses PPG concept. It emits light using LED to the finger and a photodetector receives the reflected light. The data are available in an android app for viewing.

2. BLOCK DIAGRAM

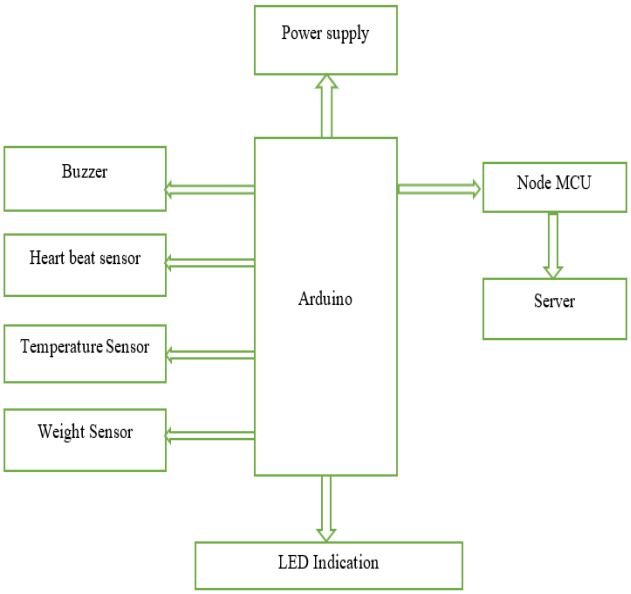

Fig-1: Block diagram of the system

2.1 BLOCK DIAGRAM DESCRIPTION

- Power supply
- Arduino UNO
- Heartbeat sensor
- Temperature sensor
- Load cell
- Buzzer
- LED indications
- Node MCU wifi module (ESP8266)
- Android device

2.2.1 Power supply

The microcontroller requires 5v. It is obtained through 7805 regulators. Two capacitors are used for filtering. The microcontroller and other components get power supply from Ac to Dc adapter through 7805,5v regulator. The adapter output is non regulated 12v DC. 12V output of the

adapter is converted to 5V DC by using 7805 voltage regulator IC.

2.2.2 Arduino UNO

Arduino is an open-source hardware and software company. Its hardware products are licensed under a CC-BY-SA license and software is licensed under the GNU Lesser General Public License (LGPL) or the GNU General Public License (GPL).

2.2.3 Heartbeat sensor

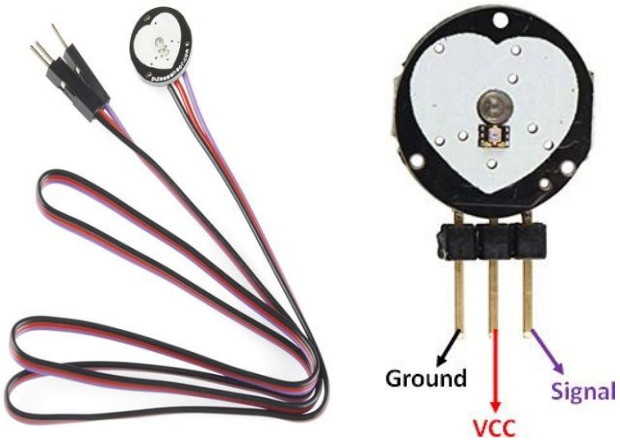

Fig-2: Heartbeat sensor

The basic heartbeat sensor consists of a light-emitting diode and a photodetector such as light detecting resistor or a photodiode. The heartbeat pulses produce a variation in the blood flow to different regions of the body.

2.2.4 Temperature sensor LM35 is a temperature measuring device which has an analog output voltage that is proportional to the temperature. The output voltage is in Centigrade (Celsius). No external calibration circuitry is required for its working.

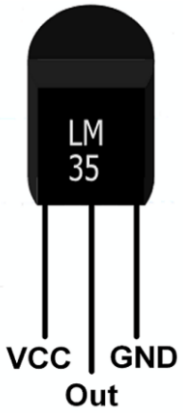

Fig-3: Temperature sensoe-LM35

2.2.5 Load cell

Load cells are used for force measurement. Load cell uses flexible load-bearing components or its component combinations. The force applied to the elastic element causes it to bend, which is sensed by the auxiliary sensor and converts it into a measurable output. The output is obtained in the form of electrical signals like voltage.

2.2.6 Buzzer

A buzzer or beeper is used to give an audio signal. It can be mechanical, electromechanical, or piezoelectric type.

2.2.7 LED indications

A light-emitting diode (LED) is a semiconductor device that can emit light when current flows through it. In the semiconductor the electrons recombine with holes, releasing energy in the form of photons. The color of the light emitted by the LED corresponds to the energy of the photons emitted which in turn depend on the energy required for electrons to cross the band gap of the semiconductor.

2.2.8 Node MCU wifi module (ESP8266)

NodeMCU module is an open-source development board and firmware. It is possible to program the ESP8266 WiFi module with the simple and powerful LUA programming language or Arduino IDE.

3. CIRCUIT DIAGRAM

The circuit diagram consists of Arduino UNO microcontroller, power supply buzzer, load cell, Heartbeat sensor, temperature sensor, NODE MCU (ESP8266), and LED indications. The core part of the circuit is Arduino UNO. It has 6 Analog and 14 Digital pins. So it has 20 controlling pins. The buzzer, load cell, and LED indications are connected digital pins. The heartbeat sensor and temperature sensor are connected to analog pins of Arduino. The wifi module is connected to the TXD and RXD pins of Arduino. The power supply section consists of a bridge rectifier, the output of which is pulsating DC. So, to obtain pure DC output filtering must be done using RC filter. The filtered output is pure DC. The 12v DC is divided using a voltage regulator in to 5v DC which is fed to the Arduino UNO microcontroller.

4. CIRCUIT WORKING

The data obtained from heart beat sensor and LM35 and given to Arduino UNO. The processed data is sent from Arduino uno to the nearby health analyst or bystander mobile app using NODE MCU module. Similarly, the data obtained from the weight sensor is also transmitted from Arduino Uno to server digitally using NODE MCU. Whenever the weight of the IV bag goes below 20grams the system will enable an alarm and the beep sound makes the health provider aware of the situation. Android app will sent with data getting from Arduino device to server including patient ID, date and time.

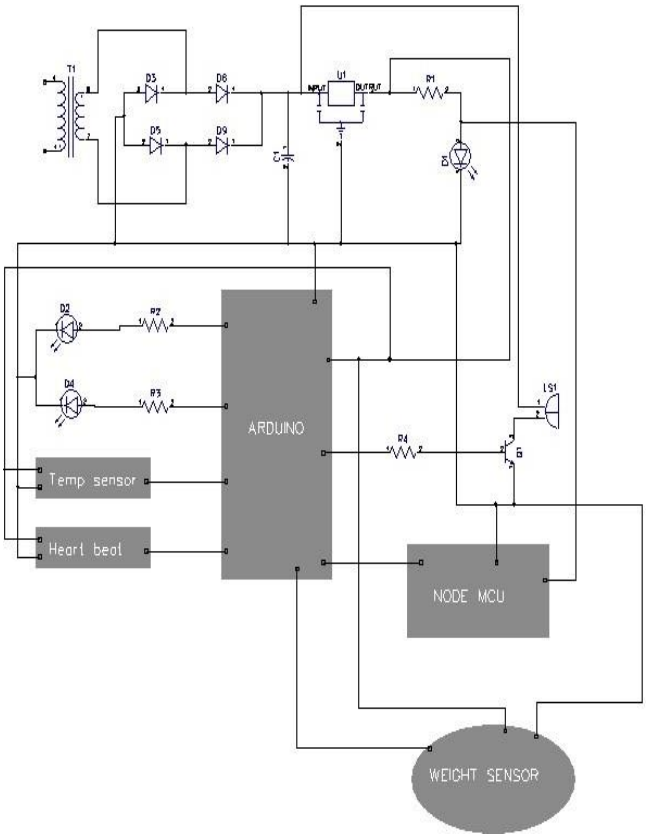

Fig-4: Circuit diagram

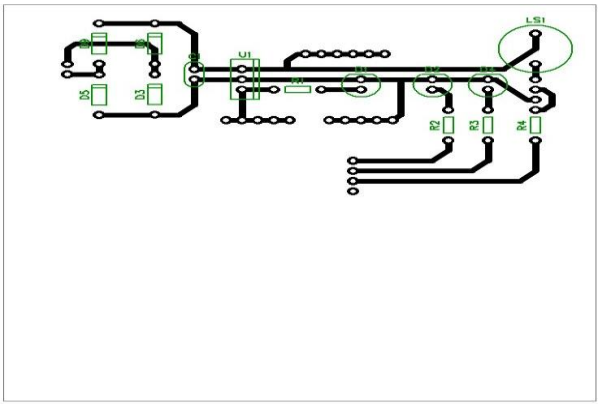

Fig-5: PCB layout

3. CONCLUSIONS

This paper provides a low-cost model for iv bag monitoring and bio parameter measurement. The system will be of great use for the healthcare providers to render a effective treatment. Mishaps occurring due to lack of attention can be avoided to a great extent by adopting this system. By making use of the android application the bystanders and the relatives are informed with the health condition of the patient. The project can be extended by including more bio parameters.

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BIOGRAPHIES

Hridhya AP, Lecturer in Biomedical Engineering, EKNM Government polytechnic College, Thrikaripur, Kerala, holds B-tech degree in Biomedical Engineering from Calicut University and M-Tech Degree in Ebedded system from APJ Abdul kalam Technological University.