IOT based Patient Monitoring System

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Abstract : Heart diseases are dangerous. World Health Organization (WHO) research also shows that the most deaths are due to heart diseases. Therefore, these diseases can not be taken lightly. Hence, most health care equipment and monitoring system are designed to keep track the disease. This system consists of a number of the part. Controlling and data processing is done through the Arduino MEGA board, all the sensors are connected to Arduino MEGA. Through this system, we can measure ECG, heartbeat, BP.

Keywords:- Patient Monitoring System(PMS), Arduino, ECG,Blood pressure, Wifi module, MQTT protocol.

I. INTRODUCTION

This research paper engages sensors to measure parameters like heart beat rate, ECG (Electrocardiograph) and blood pressure. An Arduino board is used for analyzing the inputs from the patient and any abnormality felt by the patient causes the monitoring system to give an alarm. In patient monitoring system, the multiple sensors and electrodes is used for receiving physiological signals such as ECG electrode and blood pressure cuff to measure the physiological signals. During treatment, it is highly important to continuously monitor the vital physiological signs of the patient. Therefore, patient monitoring system is very important in the field of medical devices. The continuous improvement of the technologies not only helps us transmit the vital physiological signs to the medical personnel but also simplifies the measurements and as a result raises the monitoring efficiency of the patient.

A. Important Measures for Intense care

- Heartbeat rate
- ECG Monitoring
- Blood pressure monitoring

B. Definition of PMS

Continuous or repetition of observations or measurements of the patients' physiological parameter for the purpose of medical staff to make needed decision.

C. Components

1. Hardware:
   - Blood pressure sensor
   - ECG sensor(AD8232)
   - ECG electrodes
   - IOT module(NodeMCU-ESP8266)
   - Arduino Mega 2560
   - Connecting wires
2. Software:
   - Arduino IDE
   - Processing IDE

D. Block Diagram:

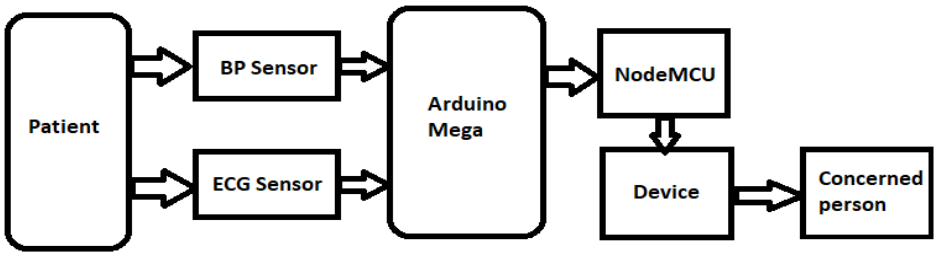

fig. 1. block diagram

E. Explanation:

The flow of the system is such as, the physical parameters of a patient are measured with use of sensors like blood pressure sensor and ECG sensor. It than transmits the signals to arduino board which converts the analog signals to digital signals. These digital signals are than transferred from one UART of the arduino MEGA to the other UART of the arduino MEGA where a wifi module NodeMCU is connected. The NodeMCU transmits the data with help of MQTT protocol via internet to concerned personnel.

II. COMPONENTS

A. Arduino MEGA

The Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input-output pins, 16 analog inputs, 4 UARTs , a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.

fig. 2. arduino mega 2560

B. ECG Module(AD8232)

The AD8232 is a neat little chip used to measure the electrical activity of the heart. This electrical activity can be charted as an ECG or Electrocardiogram. Electrocardiography is used to help diagnose various heart conditions.

fig. 3. ecg module(ad8232)

The AD8232 module has nine pins. SDN, LO+, LO-, OUTPUT, 3.3V, GND are pins for operating this monitor with an Arduino. 3.5 mm jack with ECG electrodes can be connected to the board. Additionally, there is an LED indicator light that will blink to the rhythm of a heartbeat.

C. Blood Pressure Sensor

Blood Pressure and Pulse reading are shown on display with serial out for external projects of embedded circuit processing and display. Shows Systolic, Diastolic and Pulse Readings. Compact design fits over your wrist like a watch. Easy to use wrist style eliminates pumping.

fig. 4. blood pressure sensor

Sensor Pinouts:-

- TX-OUT = Transmit output
- +5V = Regulated 5V supply input
- GND = Board Common Ground

D. ESP8266 NodeMCU

The NodeMCU is an open-source firmware and development kit that helps you to Prototype your IOT product with a quick programming code.

Specifications:-

- USB-TTL included, plug and play
- 10 GPIO, every GPIO can be PWM, I2C, 1-wire
- WI-FI module
- PCB antenna

fig. 5. Nodemcu

III. MQTT PROTOCOL

MQTT stands for Message Queuing Telemetry Transport. It is a basic Publish-Subscribe based messaging protocol. It is a M2M(machine to machine) protocol for IOT applications. Machine can publish a message to a particular topic and every other machines subscribed to that particular topic can receive the message. For messages to establish a connection we need a broker. There are many online brokers available.

IV. FLOWCHARTS

A. BP monitoring:

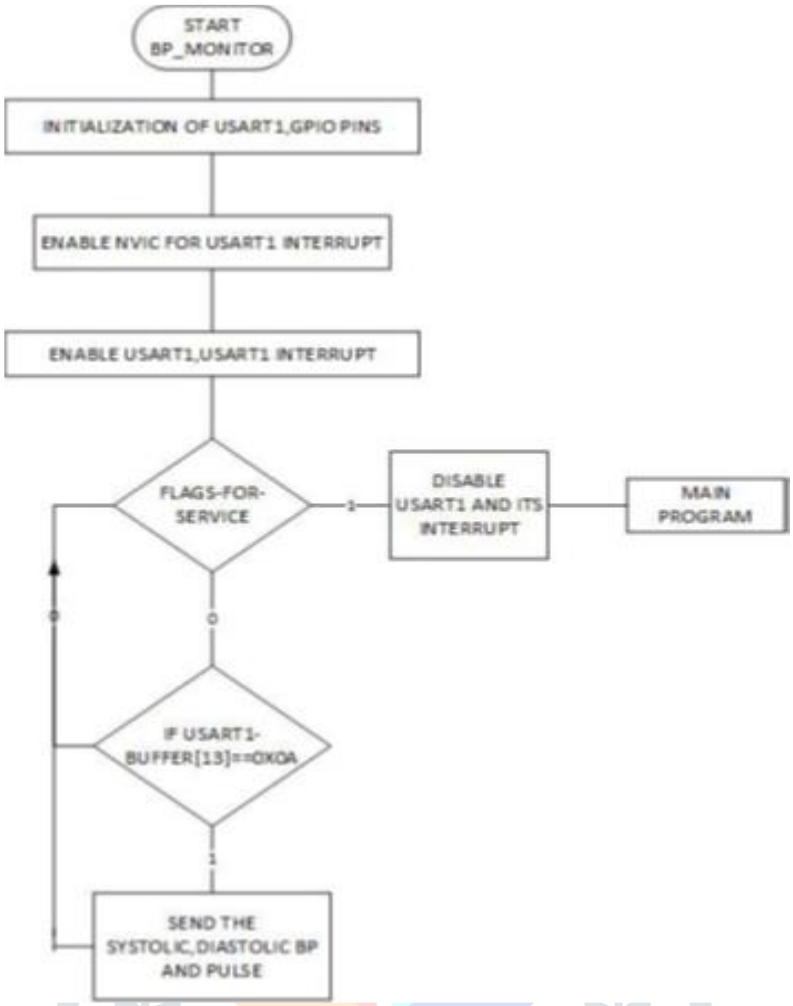

fig. 6. flowchart of blood pressure monitoring

B. ECG monitoring

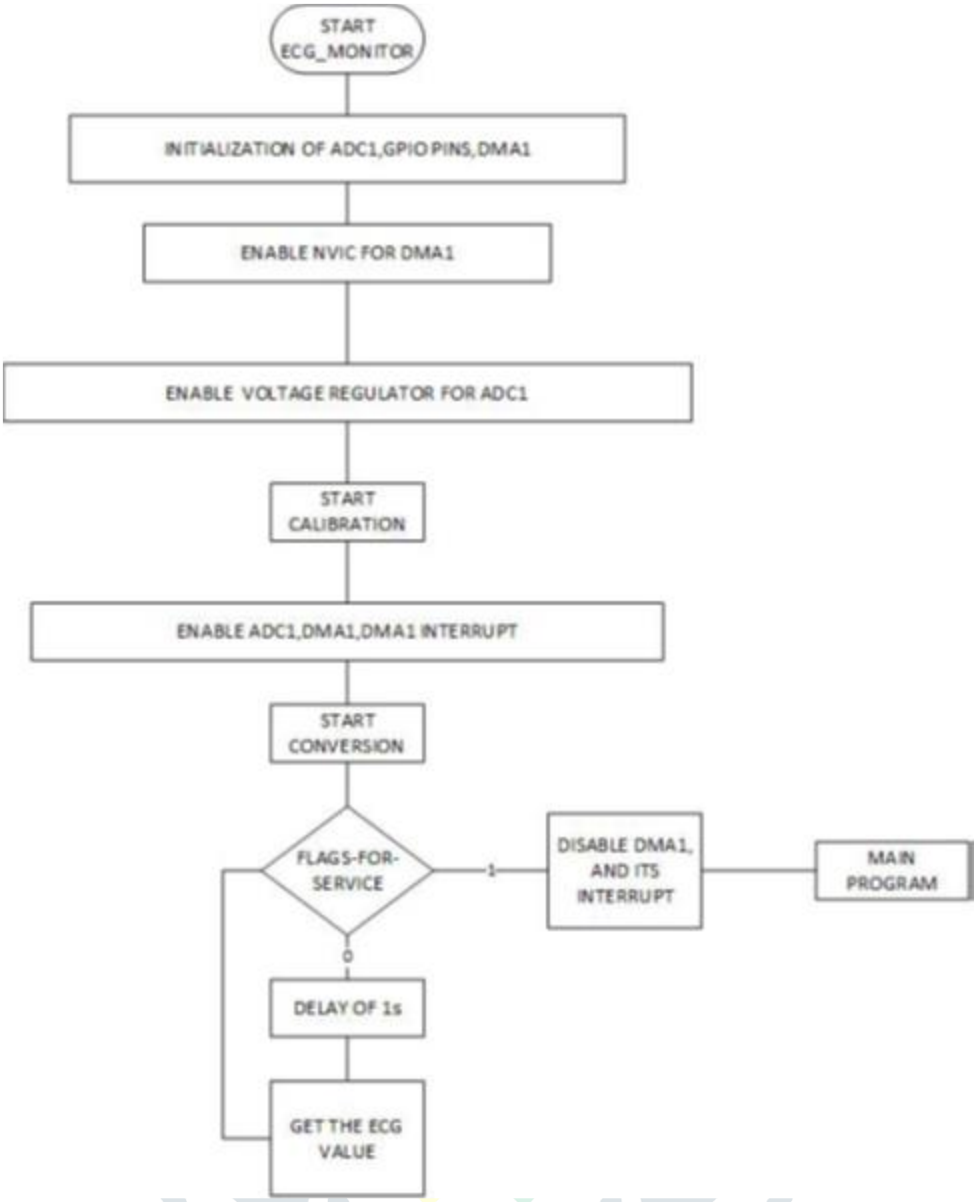

fig. 7. flowchart of ecg monitoring

V. APPLICATION

PMS is used in:-

- Patients with unstable physiologic regulatory systems.
- a patient who has findings indicating an acute heart attack can be alarmed.
- Patients at high risk of developing a life-threatening condition. Example: patients immediately post open heart surgery, or a premature infant whose heart and lungs are not fully developed.
- Patients in a critical physiological state. Example: patients with multiple trauma or septic shock.

VI. FUTURE TRENDS

- Blood gas analyzer
- Drug dosage calculator
- RFID in PMS
- Real time patient location system
- Wearable PMS

VII. CONCLUSION

Below are the images of the output obtained by the systems:

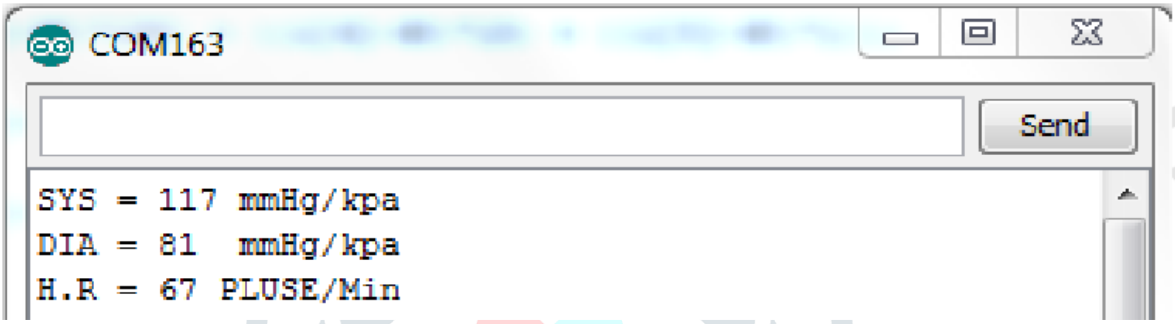

fig. 8. output of blood pressure sensor

fig. 9. output of ecg sensor

The results obtained in the above images are then send to the concerned person via help of the internet. If any irregularity occurs in any of the parameters than it alarms the patient. Hence this paper makes you understand about a device which not only acts as an alarm system but also can measure the parameters of the body.

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