

## IOT Based Pregnant Woman Health Monitoring System

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### ABSTRACT

The developing countries such as India has more population in the rural areas than urban areas. The people in those areas are not aware of new health issues, and they are not amalgamated for sharing their medical information. In some rural areas the pregnant women are unable to do their normal check-ups during their pregnancy time. This can cause risk in the life of both mother and the child. Due this inefficiency, the number death count of new are more compared to the urban areas. As a remedy for this a situation we are suggesting a system, that contain an accelerometer sensor is designed to measure the kike/force by the fetus and it is transfer to the ARDUINO UNO controller. Movement of the baby and some vital parameter such as Blood pressure, Heartbeat rate, temperature of the mother is measured using various types of sensors. The measured parameters are transmitted by IoT and is displayed. This system is a portable system and can be used in home by the women by their self. Another implementation way in the rural area is by giving the system to the nurse who work in the primary health centre in that particular area. Ultra sound scanning is used now a day, which is expensive which cannot be affordable for the poor in the rural areas. The parameter are recorded and can be used for future medical examination. We use IoT module to calculate the normal and abnormal rate and also enable the gynaecologist to access the date from the cloud

**Keywords - Temperature sensor, SpO<sup>2</sup> sensor, Accelerometer sensor, Blood pressure sensor, ARDUINO board, Internet of things**

### 1. Introduction

A special attention is required for woman during this pregnancy period. Their health and health of the developing fetus is important. Health has a great impact on during pregnancy period and also in their future. Some factors that are to be considered during the pregnancy period are their nutrition, prenatal care, stress management. The prenatal care is the most important factor among them. Because prenatal care deal with the health of both mother and fetus. Which include regular check up with a health care provider, prenatal vitamins, and any necessary scanning. Proper checking of the basic parameter is important to identify the health condition of the mother and child, because abnormalities in the parameter can cause health issues for both. To make the check up procedure easier we suggest a new system with is portable and used friendly. The system consists of different types of sensors to measure the parameters of the mother and the fetus.

The sensor that we use are temperature sensor, blood pressure, SpO<sup>2</sup> sensor, Accelerometer. Three sensors are used for measure the parameter of the mother. Accelerometer is the sensor that is used to measure the health of the baby by measuring the force of the kick of the baby in the second and third trimester of the pregnancy period. IoT is used to store the measured parameter. The details can be assessed by using the mobile phone or via web. Alert messages is also sent to the mobile if there is variation in the parameters. If variation is detected the person can visit the doctor for further treatment.

### 2. Experimental Method or Methodology

Various sensors such as heart beat (max 30100), temperature (DS 18B20), accelerometer, and blood pressure sensor (real time) are controlled by an ARDUINO controller in this proposed device. The collective data from the sensors are being analysed with the help of ARDUINO UNO and then it

shared through WIFI module. This output has been displayed in the mobile application with the help of IOT. IOT (Internet of things) describes that, the combination of both hardware and software controlled with the help of Internet. It also used to connect and exchange the data (input of sensors) and actuators. The ARDUINO UNO contains IC Atmega328 based microcontroller. The input from the sensors is It can be attached to an ARDUINO microcontroller in analog form, and then converted to digital form with the aid of an ADC. The signal is then processed by ARDUINO, and the output is digital and then it displayed on LCD. Then that data shared through WIFI module to smartphone. Blood pressure and heart rate sensor is used to detect the BP and heart beat level of the pregnant woman. Accelerometer is used to sense the kick of the baby which is placed on abdominal region of the mother this will be measured and controlled by the process in the windows (Micro controller) then this will be send to the Internet of things (IoT). The microcontroller is programmed with the threshold values for the parameters temperature, pulse rate, amount of force/kick, if the threshold values of these parameters exceed then an alert message will be sent through GSM. Heart rate and pulse rate is displayed over the LCD display. the data will be viewed on mobile application. Thus, the sensor gives the values and then it performed by the IOT device from already exists one. But in this proposed system if there is abnormality may occur alert message to mobile.

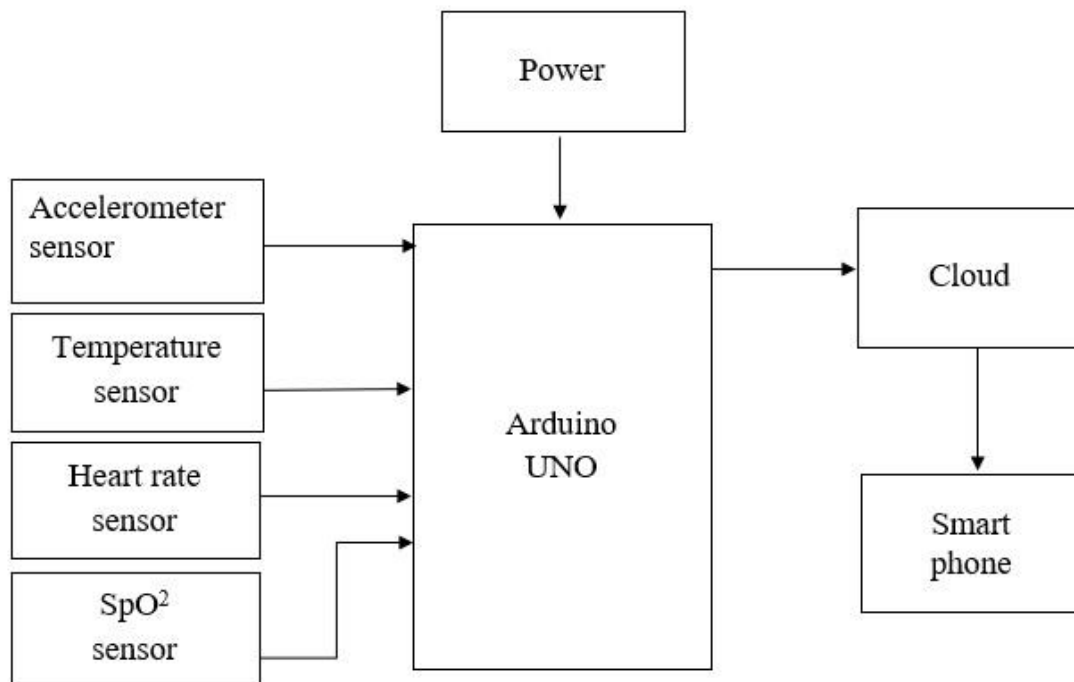


Fig 2.1 Block Diagram

### 2.1 Hardware Used:

#### ACCELEROMETER SENSOR

The accelerometer (adxl335) sensor can accelerate from one, two or three can be measured on orthogonal axis. This sensor is placed on the abdominal region of the mother. Pressure by kick of baby can be detected by this sensor is taken as an input of three axis X, Y, and Z in analog form. Then it converts digital by using ADC in Arduino UNO.

#### SpO<sup>2</sup> SENSOR

SpO<sub>2</sub> sensors measure your blood oxygen saturation put more simply, the amount of oxygen you have in your blood. In fact, these sensors and metrics are included in most modern smartwatches and fitness trackers.

### TEMPERATURE SENSOR

This temperature sensor can be communicated with the help of one wire for two-way communication to the microcontroller. The accuracy rate is about the range from  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ . Normally in human body temperature varies. By this we use this sensor to monitor the temperature of the mother.

### ARDUINO UNO

We used Atmega328 microcontroller take sensors input as in the form of analog signal and convert into digital form of signal. This microcontroller attached to the WIFI module which helps to transfer the output of collective data from the sensors.

### WIFIMODULE

The WIFI module contained soc Ip protocol which give access to connect through internet. it will connect to mobile network then it sends the data to smart application

### HEART BEATSENSOR

During pregnancy, the amount of blood pressure becomes high by the increase in heart beat by 30-50%. Heart rate increase at high speed from normal rate of 70bpm to 80 bpm to 90 bpm. So we monitor the heart rate by using heart beat sensor. It is an electronic device which helps to measure the heartbeat of the mother. The heart beat is in analog form then it converts into digital form with the help of ADC in microcontroller

### 3.Result and Discussion

Here we take the measurement of the basic parameter of the both mother and fetus. The measurement is taken in all the three trimesters. In first trimester the parameters of the mother is only measured. At the end of the second trimester the kick of the fetus is started to measured.

#### RESULT OF FIRST TRIMESTER

S.NO	PARAMETERS	NORMAL RATE	FIRST TRIMESTER	OUTPUT
1	HEART RATE	60 to 100 bpm	63 to 105.2	76 bpm
2	SpO2	95 to 100%	94.3 to 99.4 %	96%
3	TEMP(F)	97.8 to 99.1	95.99 to 99.52	97.52 F

#### RESULT OF SECOND TRIMESTER

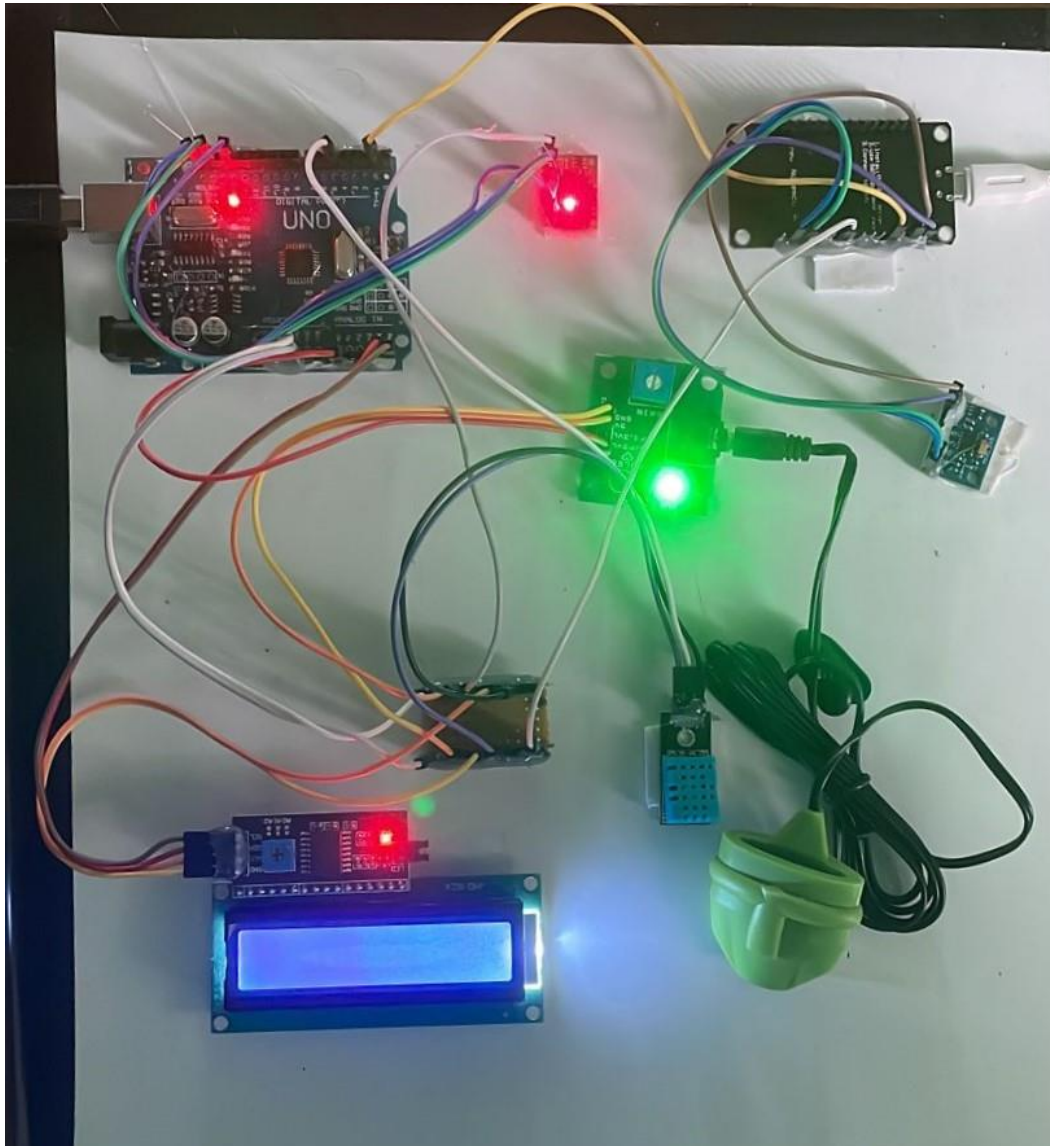
S.NO	PARAMETERS	NORMAL RATE	SECOND TRIMESTER	OUTPUT
1	HEART RATE	60 to 100 bpm	64.5 to 113.8 bpm	79 bpm
2	SpO2	95 to 100%	93.4 to 98.5 %	96 %
3	TEMP(F)	97.8 to 99.1	95.67 to 99.23	98.62
4	ACCELEROMETER		16 to 28 N	25N

#### RESULT OF THIRD TRIMESTER

S.NO	PARAMETERS	NORMAL RATE	THIRD TRIMESTER	OUTPUT
1	HEART RATE	60 to 100 bpm	64.5 to 113.8 bpm	84 bpm
2	SpO2	95 to 100%	94.3 to 99.4 %	97%
3	TEMP(F)	97.8 to 99.1	95.67 to 99.23	98.68F
4	ACCELEROMETER		30 to 46N	43N

The abnormalities can cause health effects. Heart will work harder to pump the extra blood throughout the mothers and fetus body' This extra work can result in heart palpitations. Although they can be alarming, most pregnancy heart palpitations aren't dangerous. They usually go away after delivery.

If the temperature is high, it is risk because it can be reason of many health issues. If the SpO<sup>2</sup> is less or low it means there is no proper supply of oxygen.



**3.1 working kit**

#### **4. Conclusion**

This system utilized various data collectors, including a cross-platform mobile application, to collect bio-signals and self-report data. The collected data were stored and analysed in the cloud server. The doctor can assess the data from any where in the world and can give proper suggestion if there is any necessary treatment or medication is need. The system is used friendly and a portable one. high or low readings of the parameter. Alert messaging system is also implemented in the so the user can get the message if there is

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