

Portable Devices for Maternal Health Monitoring System

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Abstract: Healthy pregnancy and safe childbirth is a goal of all Indian health care systems. Despite significant improvements in recent decades, mothers and their babies are still in danger during the prenatal period, which covers pregnancy, delivery, and therefore the postpartum. Babies born too early are more likely to die than those born at term. To enhance prenatal health, we would like the proper tools to assess problems and their causes. We also got to monitor the health condition of the pregnant woman frequently. We have proposed the system using IOT which is predicated on maternal health care solution that promises to effectively monitor the health of the pregnant women in rural India. This technique allows sensing various attributes just like the temperature, pulse and therefore the vital sign of the mother frequently. The readings of the attributes are stored during a cloud. Just in case of any abnormal conditions there's a message which is shipped to the hospital, doctor responsible and therefore the guardian of the patient. We have also used Diffie Hellman Key Exchange algorithm to secure transmission of knowledge.

Keywords: Arduino, Blood pressure sensor, Health care, Heart rate sensor, Internet of Things, Temperature sensor.

I. INTRODUCTION

Internet of Things (IoT) is gaining prevalent popularity among the research community due to its impending to digitize world physical objects around us. IoT has emerged as a result of current wireless telecommunication services and ever-present presence of the Internet. Wireless sensor networks, RFID tags, actuators and various handheld intelligent devices like mobile phones, PDAs, Tabs etc. are foremost to the surfacing of IoT.

According to the present scenario, people like better to consume junk foods thanks to working pressure which is unhealthy and it results in obesity. Due to technological development and

environmental factors, people suffer due to stress which can mainly affect the pregnant ladies.

Time and distance are the main factors for pregnant women in emergency conditions. As we know that pregnant women they living in remote areas and that they probably cannot receive immediate treatment during the emergency; because, within the remote areas there's the shortage of medical care providers (e.g. Gynecologist, Physician, specialist and nurses etc.) and therefore the closing of small healthcare centers are problem identified in many remote areas. Hence it's our duty to resolve the health issue of pregnant women. This paper presents numerous devices which may be implemented to save lots of the lifetime of pregnant women and fetus.

II. DEVICES USED TO MONITOR THE HEALTH OF PREGNANT WOMEN

IoT makes use of real-world data to get the solution. Similarly to get accurate data and treat the pregnant women on time we can use IoT. The silly reasons for the mortality rate of pregnant women and fetus can be reduced by using the sensors to eliminate all this. Some of the much-needed attributes are:

- Temperature sensor
- Blood Pressure sensor
- Blood Glucose sensor
- Pulse sensor
- Accelerometer

These sensors measure the parameters and have to be embedded. To embed these sensors we are using many devices. In spite of embedding the measured parameters must be communicated for further precautions to be given. Some of the well-known devices which are used to embed are near field communication device, ESP8266, CC3200, and Arduino. Arduino is widely used in IoT. This paper analyzes the performance of all these devices.

A. Ultrasound Image

This is a traditional method which is used to see the fetal movements in the womb. This can only be done by experts and doctors. A sound is passed to the womb which is passed to the CPU and the displayed on the monitor. This is stored in a disk storage device for future reference. The ultrasound waves which are passed to the womb may affect the growth of the fetus. Refer Fig. 1.

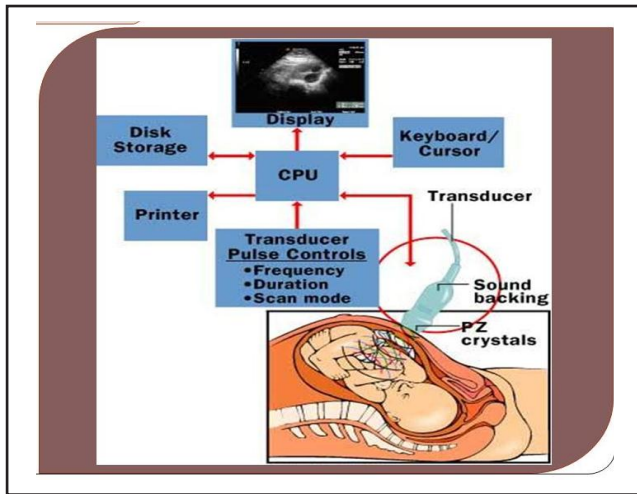


Fig. 1: Block Diagram of Ultrasound Scanning

B. Near Field Communication (NFC) Device

This is a device which has inbuilt sensors like the blood pressure sensor, blood glucose sensor, heart rate sensor collect the data and send it to a database. This can only be sent within a short-range range of distance as it uses Bluetooth to communicate. It is portable so that in rural areas there is no need to set up medical sectors which are not used every day. So the doctors, the nurse can use this device as it is portable.

C. Node MCU ESP8266 Wi-Fi Module

ESP8266 is a Wi-Fi enabled module. It is used for the development of IoT embedded applications. To this Wi-Fi module, the sensors are connected to collect the data. The sensors connected are a temperature sensor, heartbeat sensor and mems sensor. These sensors collect data and sends it to the cloud through the Wi-Fi module. This module helps to increase the communication range. Refer Fig. 2.

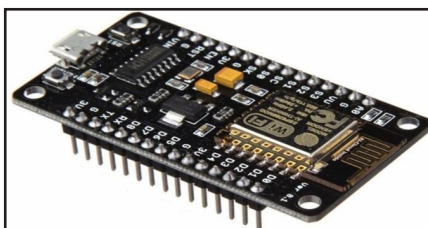


Fig. 2: Node MCU Board

D. CC3200

This CC3200 is the second generation series of the module in a microcontroller unit and Wi-Fi network. This module is connected to a pulse sensor, temperature sensor, pressure sensor. The measured parameters are sent as an analog signal to the microcontroller. As the controller consists of inbuilt ADC and Wi-Fi module the analog is converted to a digital signal which is transferred to the cloud. Refer Fig. 3.

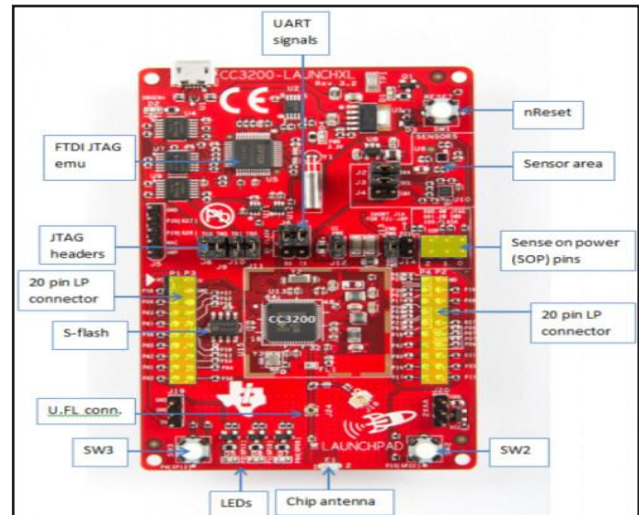


Fig. 3: CC3200 Board

E. Arduino UNO

In this the temperature sensor, heart rate sensor, accelerometer sensor and blood pressure sensor and controlled by the Arduino controller. The data from these sensors are being collected and then analyzed by the microcontroller and the results are being displayed. It then transfers data over the network. The results are viewed on a mobile application which is a cloud base IoT platform. Refer Fig. 4.



Fig. 4: Arduino UNO

III. RESULT AND DISCUSSIONS

IoT in the health care sector is more emerging technologies these days. Many research fields are based on this type of health

monitoring system. These devices can handle more sensors and can collect the data frequently. This can help to save many lives of the people for other purposes also like the old age people who cannot walk. Thus, this paper introduces a few of the IoT based devices that can be applied to a frequent health monitoring system which is portable. The comparison of the above-given devices is given below.

TABLE I: THROUGHPUT REPRESENTATION OF DIFFERENT ALGORITHMS

Name of the Device	Throughput (%)
Ultrasound scan	58
NFC Device	70
Node MCU ESP8266	75
CC3200	86
Arduino UNO	94

From the above Table I, it is evident that the lightweight algorithms show a good throughput percentage as well as it utilizes the battery more efficiently. Let us view its graphical illustration from the below graph.

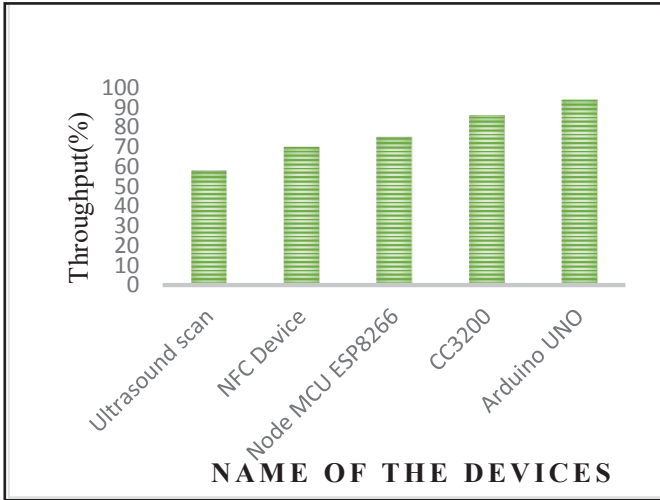


Fig. 5: Comparison Graph of Devices Used for Health Monitoring of Pregnant Women

IV. CONCLUSION

Technology and digitizing have been increasing day by day in various sectors like communication, health care, emergency, factory, supply chain, lifestyle, tourism and a lot more. Health care is the rapidly growing sector of IoT. In the under developing countries there is more mortality rate though the mortality rate of the world has decreased. Among these, most are the infant mortality rate. In this paper, we have seen many devices which can help the mother and the fetus to be healthy and have regular check-ups when they are not able to go to the hospital frequently. We have also studied various methods to monitor the health of pregnant women. This can reduce the mortality rate in the country.

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