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IOT BASED PREGNANCY WOMEN HEALTH MONITORING SYSTEM FOR PRENATAL CARE

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Abstract- **The IoT-based pregnancy women health monitoring system for prenatal care represents a technological solution aimed at enhancing the quality of maternal healthcare during pregnancy. Leveraging internet of things (IoT) devices, this system continuously monitors crucial health parameters for both the expectant mother and the developing fetus. Wearable devices worn by the pregnant woman collect real-time data on metrics such as heart rate, blood pressure, temperature, fetal heartbeat, and maternal activity levels. The collected data is transmitted securely to a centralized cloud-based platform, providing healthcare professionals and expectant parents with remote access through a user-friendly mobile application.**

Keywords: IoT, could computing, real-time monitoring, ESP32, DHT11, MAX30100, Vibration sensor, Pulse Oximeter Module, Maternal health, Mobile Application (Blynk app).

I. INTRODUCTION

Pregnancy is a transformative and critical period in a woman's life, requiring careful monitoring and personalized care to ensure the well-being of both the expectant mother and the developing fetus. The advent of Internet of Things (IoT) technology provides an unprecedented opportunity to revolutionize prenatal care by creating a dynamic and comprehensive monitoring system. This system aims to leverage wearable devices, cloud computing, and advanced analytics to enable real-time tracking of vital health parameters throughout the pregnancy journey. The IoT-Based Pregnancy Women Health Monitoring System seeks to overcome these limitations by providing continuous, remote monitoring capabilities. Wearable devices equipped with sensors are employed to capture essential maternal and fetal health metrics, offering a more nuanced understanding of the pregnancy progression. In this technological

ecosystem, data collected from wearable is seamlessly transmitted to a centralized cloud-based platform, ensuring secure storage and accessibility for healthcare professionals and expectant parents alike. The system incorporates advanced data analytics and machine learning algorithms to derive meaningful insights, aiding in the early detection of potential complications and the provision of personalized health recommendations. The integration of this IoT system with existing Electronic Health Records (EHR) facilitates a cohesive and streamlined approach to maternal healthcare. Security measures are paramount, with robust encryption and authentication protocols implemented to safeguard sensitive health information.

Integration with Electronic Health Records (EHR) ensures seamless communication with existing healthcare systems, while robust security measures protect the confidentiality of sensitive health information. This comprehensive system promotes proactive and continuous maternal health monitoring, empowering healthcare professionals and expectant parents with valuable insights. The goal is to redefine prenatal care, fostering healthier pregnancy outcomes through remote, data driven interventions and a collaborative approach to maternal healthcare.

II. LITERATURE SURVEY

1) Growth Monitoring of Children and Pregnant Women using IOT Devices(ICACRS-2023)
   By the study of this paper the improve accuracy and reliability of data enhance monitoring capabilities of a system
2) A Survey of Healthcare Monitoring System for Maternity Women Using Internet-of-things(ICISS 2020)
   This paper doesn't address how these security concerns will be mitigated in the monitoring system.
3) An IoT based Multi- parameter data Acquisition System for Efficient Bio -Telemonitoring of Pregnant women at home (2018)

To refer this paper while ethical analysis is mentioned, there is no details on how the potential ethical dilemmas will be addressed in practical.

III. ARCHITECTURE DIAGRAM

The shows the overview of the proposed work. The sensor will sense the information from the pregnant women, Children below 6 years. The information is stored in the cloud server using Wi-Fi module. If the anganwadi workers likes to know the details about the registered person. They will access the information through the mobile app or web

app. By giving the id the information will be retrieved from the cloud and displayed in the web page. Fig.1 Overview of the proposed Work the sensors used to monitor the health of the pregnant women.

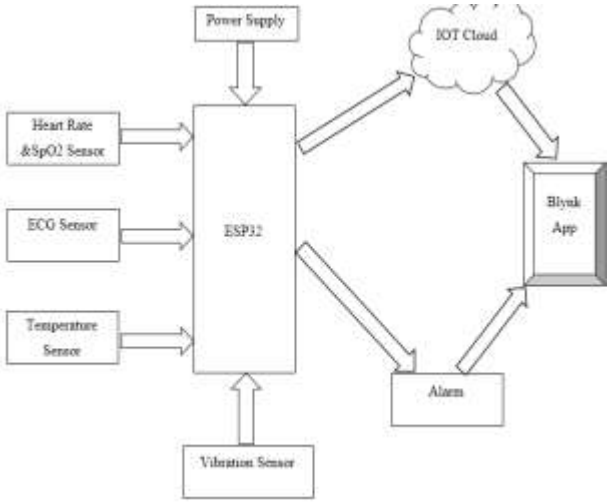

Fig.III a) Overview of the proposed work

HEART RATE SENSOR: Heart rate sensors are designed to give digital output of heart rate

When the heart rate detector starts working, the light emitting detector (LED) blinks simultaneously for every heart rate. An optical heart rate sensor measures pulse waves, which are changes in the volume of a blood vessel that occur when the heart pumps blood. Pulse waves are detected by measuring the change in volume using an optical sensor and green LED. It senses the heartbeat of a person and converts it in the form of electrical signals and pulses.

ECG SENSOR: An ECG (Electrocardiogram) sensor is a device used to monitor the electrical activity of the heart. It typically consists of electrodes that are placed on the skin to detect the electrical impulses generated by the heart. ECG sensors are commonly used in medical settings to diagnose heart conditions such as arrhythmias, myocardial infarction, and atrial fibrillation.

TEMPERATURE SENSOR: The DHT11 is commonly used to determine the temperature and humidity, for this system is prefer to sense the temperature level of the pregnant women.

VIBRATION SENSOR: Vibration sensors for monitoring fetal activities, also known as fetal movement sensors, are devices designed to detect and record movements of the fetus in the womb. These sensors typically utilize accelerometers or piezoelectric sensors to detect vibrations caused by fetal movements. The data collected by these sensors can provide valuable information to healthcare professionals about the well-being and development of the fetus

ALARM MODULE: An alarm module is a component or feature in various systems designed to alert users to specific events or conditions. It can range from simple audible alarms to sophisticated systems integrated with sensors and monitoring devices. They can be programmed to trigger based on predefined thresholds, such as motion detection, temperature changes, or unauthorized access. Additionally, alarm modules may include features like remote monitoring, notification via mobile devices, and integration with other smart devices for enhanced functionality and convenience.

NODE MCU: NodeMCU is a low-cost open source IoT platform. Strictly speaking, the term "Node MCU" refers to the firmware rather than the associated development kits. Both the firmware and Prototyping board designs are open source. The firmware uses the Lau scripting Language. NodeMCU is an open source IoT platform. It includes both the firmware and Prototyping board designs are open source. The firmware uses the Lau scripting Language.

Blynk App: Blynk is an IoT platform with IOS and Android apps that enables users to control Photons, Arduino, Raspberry Pi, NodeMCU and similar devices over the Internet. The Blynk App contains an impressive range of pre-built widgets that you can use to represent data sent from your IoT device and/or control your IoT device. Blynk App - mobile applications that allow you to interface with your IoT devices. Blynk Server - an open source cloud-based server that brokers communication between the smartphone running the Blynk App and the IoT device(s).

IV. PROTOTYPE

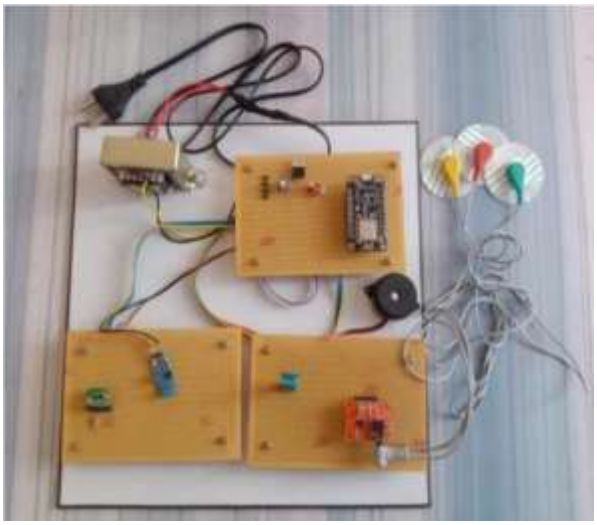

Fig IV.a) Hardware View

The ESP32 module continuously tries to establish a connection over internet to transfer data from heart rate sensor, SpO2 sensor, ECG sensor, vibration sensor and temperature sensor supports the data to be visible on phone screen via Blynk and the

data is upload on sever which can be monitored from any corner of the world.

V. OUTPUT

Fig V. a) Output view of a device

VI. RESULTS AND DISCUSSION

The user-friendly mobile application empowers expectant parents with information, fostering a better understanding of prenatal care guidelines and Promoting active participation in health management. Continuous monitoring generates a wealth of data, allowing for in depth analysis and insights into maternal health trends, contributing to ongoing research and the improvement of prenatal care practices. While initial Implementation costs are a consideration, the system's ability to detect complications early may lead to cost savings by reducing the need for more extensive medical Interventions or emergency care. The system promotes better communication and Collaboration between healthcare providers and expectant parents, fostering a Collaborative approach to maternal healthcare. This proposed system is Compact in nature, when the patient's data is received, doctor analyses it and Provides suitable treatment. The clinicians can view the patient's parameters reading via the phone and analyze the patient health condition. Also, if any abnormal Readings are found, it sends alert notification to respective clinicians indicating the emergency. It will be helpful to pregnant ladies to avoid miscarriage, blood loss, maternal death etc.

VII. CONCULSION

The IoT platform integrates facial recognition, monitoring, and height and weight measurement devices into a single application, with each event occurring in a predetermined order. None of the functionality will move forward for evaluations if one is not present. The proposed work will avoid all the manual operation is done by anganwadi workers. The IoT based monitoring device will sense the information and store it in the cloud. With the help of the mobile or web app any one can access the data. Using this proposed work will reduce manual works

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