Device to Monitor Women's Health and Harmony

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ABSTRACT

In rural areas or working women's often face challenges accessing vital healthcare during pregnancy due to financial constraints and time limitations. To address this, a groundbreaking wearable device comprising a smart band and belt to monitor women's health throughout their pregnancy.

Keywords: Health Monitoring, Fetal Movement, Heart Rate, SPo2, IoT, ESP32, Gyro sensor, Maintenance cost.

INTRODUCTION

In an era of rapid technological advancement and growing awareness of gender-specific healthcare needs importance of prioritizing women's health has never been more urgent. Women face unique physiological and psychological challenges throughout their lives from pregnancy to menopause and mental wellness. However, access to holistic, integrated, and personalized healthcare solutions remains uneven. The concept of a dedicated device designed specifically to amplify women's health and harmony represents a progressive step toward closing this gap.

The proposed device seeks to be more than a traditional health tracker. Maternal health remains a global priority, as the gestational period involves complex physiological and psychological transitions that require continuous monitoring. Conventional prenatal care often relies on periodic clinic visits, which may fail to detect sudden complications such as pregnancy-induced hypertension or fetal distress. Furthermore, the emotional well-being or "harmony" of the mother significantly impacts fetal development, yet it is rarely monitored in real-time.

It is commitment to harmony an element often overlooked in conventional healthcare technologies. To bridge this gap, this research proposes a wearable IoT-based monitoring device specifically designed for pregnant women. The system integrates multi-sensory hardware to track vital maternal parameters and fetal activity simultaneously. By combining physiological data with stress-analysis algorithms, the device provides a holistic approach to maternal-fetal care. This paper details the design, implementation, and validation of the device, aiming to provide a non-invasive solution that ensures Both clinical safety and emotional harmony throughout the pregnancy journey.

Furthermore, the device can empower users with knowledge and autonomy, encouraging preventive care rather than reactive treatment. Through seamless mobile connectivity, it will offer educational content, telehealth integration, and Communities forums where women can able to share experiences and find peer support. Mothers to be often face challenges in adhering to regular check-ups crucial for ensuring the health of both themselves and their unborn child.

This device supports working women with busy lifestyles from helping them monitor their health, Women encounter health issues due to insufficient care and regular health parameters checks are vital for their well-being.

TABLE I LITERATURE SURVEY

AUTHOR	TITLE OF PAPER	METHEDOLOGY
NALINI R, PADMAPRIYAN N, PRABAKA RAN S.	Device to amplify Women's Health and Harmony (2023-24)	Emerges as a ground-breaking solutions that empowers women through the monitoring of vital health metrics
YUNUS SANTUR, SINEM GÜVEN SANTUR	Smart Pregnancy Tracker system using social Knowledge Networking for Women (2021-22)	Vaccination and growth tracking, percentile and body mass index monitoring
MANPING QIN,YOUN G XU	A wearable fetal movement detection system for pregnant women	Evaluating a wearable to detect and monitor fetal movement

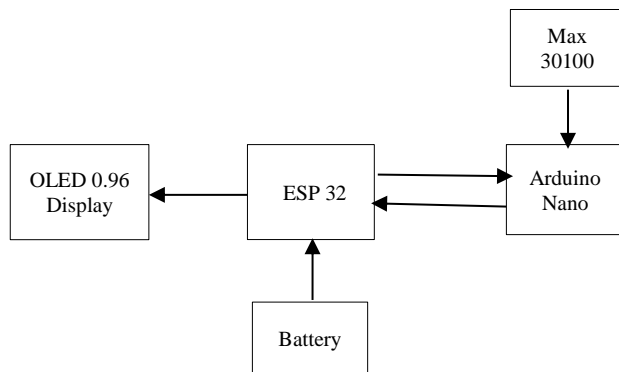# METHODOLOGY

Block Diagram of Smart Band:

Fig 1: Block diagram of Smart Band

A smart band for pregnant women is a wearable device designed to monitor and support maternal health throughout pregnancy. It typically includes sensors that track vital signs as heart rate, blood pressure, body temperature and oxygen saturation all of which are important indicators of a healthy pregnancy.

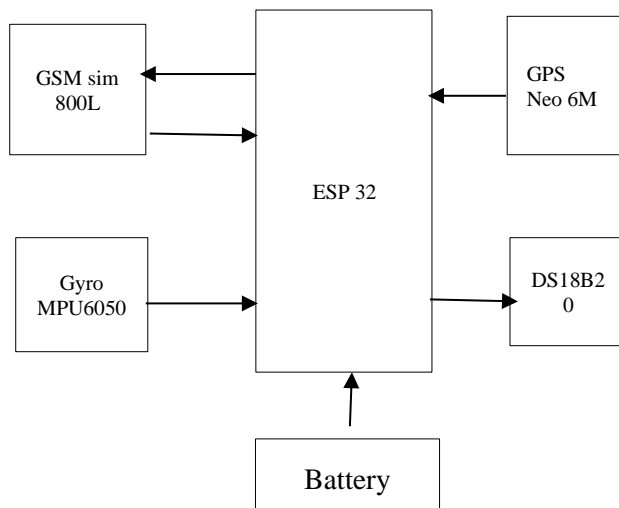**Block Diagram of Smart Belt:**

Fig 2 Block diagram of Smart Belt

The belt is responsible tracking the wearer's location, movement, temperature, and for sending emergency alerts.

At the main core of the system, the ESP32 microcontroller collects data from several sensors. The GPS (Neo 6M) provides real-time location data, while the MPU6050 gyroscope and accelerometer monitor motion and detect any falls or unusual movements. The DS18B20 temperature sensor measures the user's body or ambient temperature. All these readings are processed by the ESP32, which can then transmit the data through the GSM module (SIM800L) to a remote server or mobile phone via SMS or internet connection. This enables in emergency situations. The entire belt unit is powered by a battery, ensuring portability and continuous operation even without direct power supply.

COMPONENT SPECIFICATION

Microcontroller Interface:

The ESP32 NodeMCU board integrates the ESP8266 chip for seamless Wi-Fi connectivity with robust processing and storage, it seamlessly integrates with sensors via GPIOs. The ESP can be programmed to align with sensor usage, facilitating efficient data processing and transmission to applications via Wi-Fi with minimal external circuitry.

Arduino Nano:

Arduino Nano is a small and compact microcontroller board on the ATmega328P. It is easy to use and popular for electronics projects, especially when space is limited.

IoT Interface:

Sends health data or emergency alerts to the cloud or mobile using internet connectivity.

Mobile App Notification System:

Receives alerts from the belt and displays notification or emergency messages.

GPS Neo 6M:

The Neo-6M GPS module is a popular, low cast Global Positioning System receiver developed by u-box. The module typically operates with a supply voltage of **3.3V to 5V** and communicates using **UART (serial communication)**, making it easy to interface with microcontrollers like the **Arduino**, **ESP32.**

Gyro Sensor:

The Gyro is integrated with an ESP in the smart belt. This system aims to count fetal movements.

OBJECTIVES

1. Primary Research Objective: To develop an integrated wearable monitoring system that tracks maternal-fetal well-being by correlating maternal physiological data with pregnancy milestones, ensuring physical health and emotional 'harmony' throughout the gestational period."

2. Technical & Clinical Monitoring:

   - Maternal Vital Tracking: To design a non-invasive system for continuous monitoring of SpO2 and Heart rate to identify early warning signs of pregnancy-induced hypertension.
   - Fetal Activity Monitoring: To implement acoustic or motion sensors (accelerometer/Gyro) to track fetal kick counts and movements patterns, providing a digital record of fetal vitality.

3.   Data & Safety Objectives:

- Telemedicine Integration: To establish a secure data-sharing bridge between the wearable device and the attending obstetrician's dashboard for remote clinical supervision.
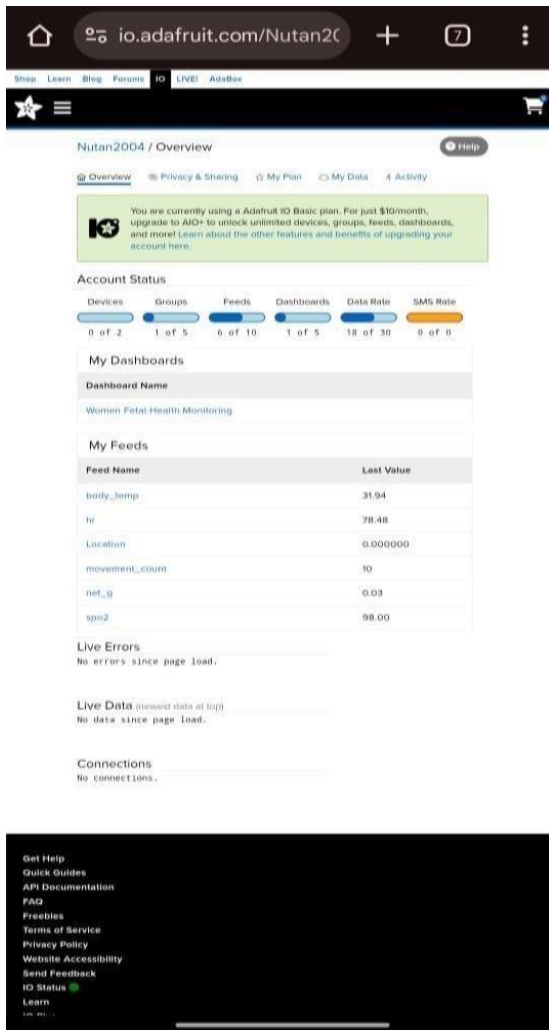

Fig 3: The Dashboard Window
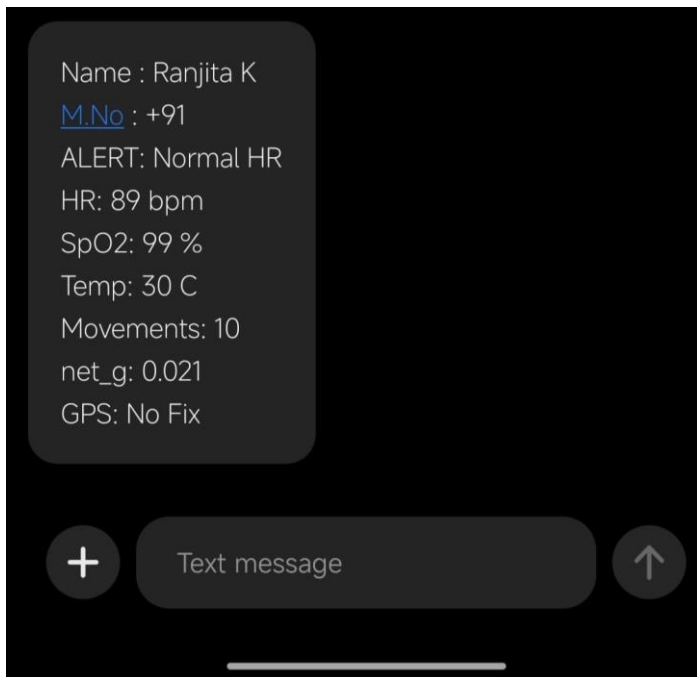

Fig 4: Tested with Pregnant Women

Fig 5: Alert Message

OPERATIONAL FRAMEWORK

Step1: Sensor Initialization and Placement

- The user (Pregnant Women) wears the device, typically as a smart belt and smart band.
- Upon powering on, the device performs a self- calibration. The integrated sensors (e.g., Heart Rate, Temperature and Gyro) establish a base line reading of the users vitals.

Step2: Real-Time Data Acquisition

- Continuous monitoring of maternal and fetal parameters.
- Sensors collect heart rate and Spo2.

Step3: Signal Processing and Cloud Transmission

- Filtering and sending data.
- The raw data is processed on board microcontroller (like ESP32) to remove noise (interference from the mothers movements). The "cleaned" data is first transmitted via Wi-Fi to a dedicated mobile number and a secured cloud data base.

Step4: Intelligent Analysis and Feedback

- If abnormal parameters are detected (e.g., a sudden drop in fetal movement or a spike in maternal blood pressure), the system sends an automated SOS alert to the doctor and emergency contacts.

SUMMARY

A **Smart Band for pregnant women** is a wearable device that monitors the health of both the mother and the baby during pregnancy. It tracks vital signs as heart rate, blood pressure, body temperature and oxygen levels and many also monitor fetal movements and contractions.

A **Smart belt** is a safety and tracking device designed to monitor the user's location, movement and temperature while enabling remote communication.

The device to monitor women's health and harmony is a Smart wearable designed to support women's overall well- Being by tracking physical, emotional and mental health Indicators. It provides personalized insights and promotes Preventive care. The device includes wellness tools.

Fig 6 : The Belt and Band models

CONCLUSION

In conclusion, the Device to Monitor Women's Health and Harmony represents a significant step toward personalized, holistic, and inclusive healthcare for women. By integrating advanced technology with emotional and mental wellness tools, it goes beyond conventional health tracking to offer a truly supportive experience. This device empower s women to understand and manage their health proactively, encourages balance in daily life, and bridges the gap between self-care and professional healthcare. Its thoughtful design, rooted in privacy, accessibility and cultural sensitivity, makes it a promising innovation for enhancing women's well-being across all stages of life.

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