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Disease Recognition and Health Monitoring System

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Abstract: *This research paper presents a low-cost, portable disease recognition and health monitoring system utilizing an ESP32 microcontroller. The system integrates medical sensors such as the MAX30102 for heart rate and SpO_2 monitoring, and a TFT display for real-time data visualization. The innovation lies in a web-based diagnostic interface accessible via local Wi-Fi, enabling users to input key blood parameters (WBC, RBC, Platelets, Glucose) and receive instant feedback on possible health conditions. The paper highlights its significance in remote and rural areas lacking internet infrastructure, and discusses potential expansions including cloud integration and AI-based diagnostics.*

Keywords*:* ESP32, Disease Recognition, Health Monitoring, IoT, Web Dashboard, Vital Signs, MAX30102

I. INTRODUCTION

The rise in chronic diseases and limited healthcare access in remote areas necessitates affordable diagnostic tools. The ESP32-based system offers real-time monitoring of vital signs and basic diagnostic capabilities without internet dependency. Combining microcontroller power with medical-grade sensors, the system bridges the gap between modern healthcare and underserved populations.

II. LITERATURE REVIEW

Medical instrumentation advancements have enabled compact, low-power sensor integration for healthcare. Prior research [1][2] emphasizes the importance of real-time monitoring using embedded systems. Projects integrating ESP32 [3] and MAX30102 [4] for wearable and mobile diagnostics prove feasibility. Web-based diagnostics via HTML interfaces offer intuitive user interaction and local data analysis, essential for decentralized healthcare solutions.

III. WORKING

The ESP32 creates a local Wi-Fi network to host a web interface where users can input health data. Simultaneously, the MAX30102 sensor measures SpO_2 and heart rate, while temperature is read via onboard analog sensors. Data is displayed on a TFT LCD and optionally announced using a JQ6500 voice module for accessibility. Upon receiving input (WBC, RBC, Platelets, Glucose), the system processes values and suggests conditions like infection, anemia, or diabetes based on thresholds. Live sensor readings continuously update via JavaScript, enhancing interactivity.

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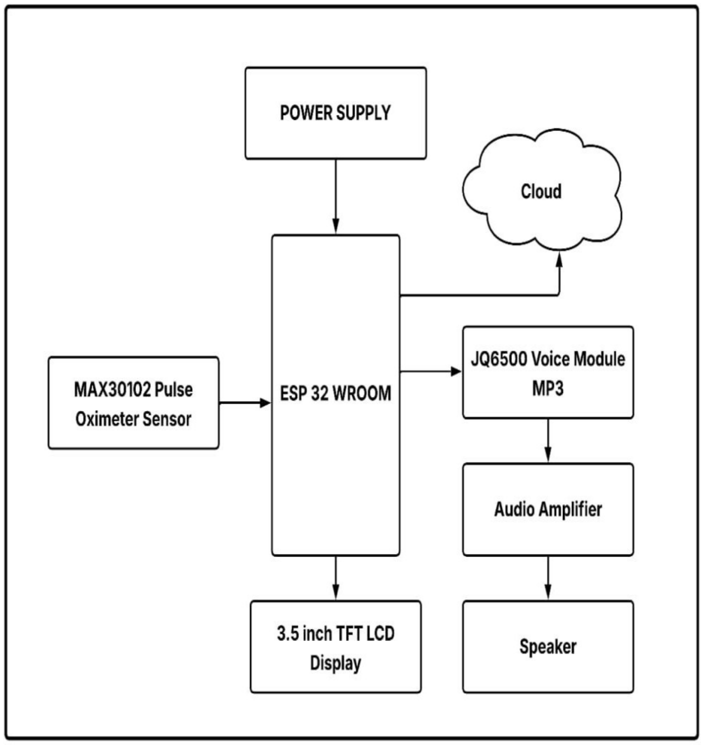

FIG. BLOCK DIAGRAM

The system consists of:

- ESP32 (core controller & Wi-Fi access point)
- MAX30102 (SpO_2 and pulse)
- TFT LCD (real-time display)
- JQ6500 (audio feedback)
- Power supply
- Optional amplifier and speaker

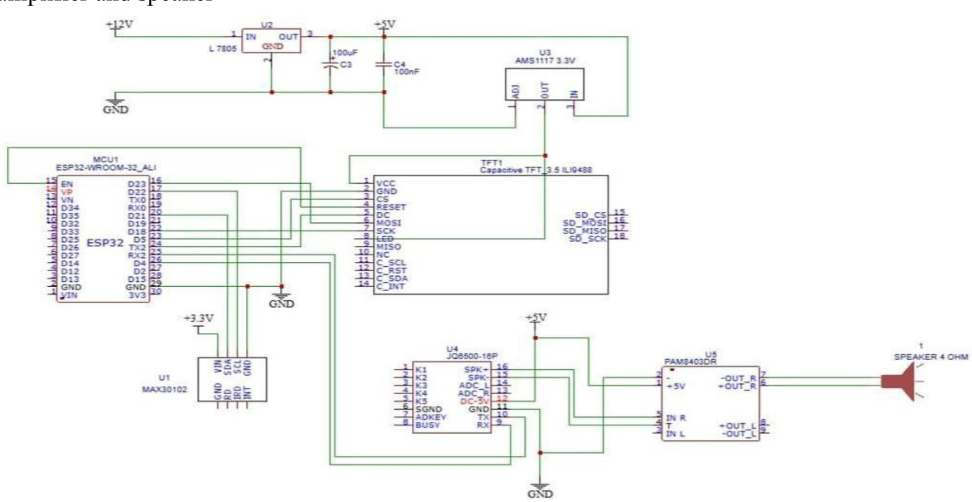

FIG. CIRCUIT DIAGRAM

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The ESP32 interfaces with sensors via I2C (MAX30102) and SPI (TFT LCD). Power is regulated using AMS1117 and 7805 for 3.3V and 5V rails. UART connects the JQ6500 voice module. The design includes capacitors for stability and ensures noise isolation for medical data accuracy.

IV. SYSTEM REQUIREMENT

The system requirements for disease recognition and health monitoring system include both hardware and software components essential for its operation. On the hardware side, the setup consists of an ESP32 –WROOM-32,MAX30102 Pulse Sensor,3.5’’TFT LCD,JQ6500 MP3 Module,PAM8403Arduino Amplifier, Speaker, Power Supply(12V DC+ Regulators), Buttons, Cables ,Connectors. The software requirements include the Arduino IDE,HTML/C SS/JS, WiFi/WebServer Libraries, JSON Parsing.

V. HARDWARE REQUIREMENT

The proposed Health Monitoring System and Disease Recognition platform is primarily based on the ESP32-WROOM microcontroller module, chosen for its powerful dual-core processor, integrated Wi-Fi and Bluetooth connectivity, and low power consumption, making it ideal for real-time health data acquisition and wireless communication. The system integrates biomedical sensors, such as the MAX30102 for heart rate and SpO_2 monitoring, and a digital temperature sensor for accurate body temperature measurement. These sensors are interfaced directly with the ESP32 via its GPIO and I2C lines, enabling efficient and fast data transmission. A TFT display module is employed to provide a local visual interface for the user, displaying real-time vitals including heart rate, blood oxygen saturation, and body temperature. Power regulation is managed through a 7805 voltage regulator to ensure stable 5V supply to all components. The ESP32 also serves as a mini web server, pushing collected data to an HTML-based dashboard linked with the Vice-Chancellor's API interface. This allows remote access and monitoring of patient vitals through a web application, enabling healthcare providers or administrators to receive alerts, assess patient health, and recognize potential disease conditions early. Overall, the hardware configuration is designed to be compact, cost-effective, and suitable for portable and scalable medical applications.

TABLE 1

Sr. No	Component name
1.	ESP32 –WROOM-32
2.	MAX30102 Pulse Sensor
3.	3.5’’TFT LCD
4.	JQ6500 MP3 Module
5.	PAM8403 Arduino Amplifier
6.	Speaker
7	Power Supply(12V DC+Regulators)
8.	Buttons, Cables ,Connectors

VI. SOFTWARE REQUIREMENT

- Arduino IDE
- HTML/CSS/JS
- WiFi/WebServer Libraries
- JSON Parsing

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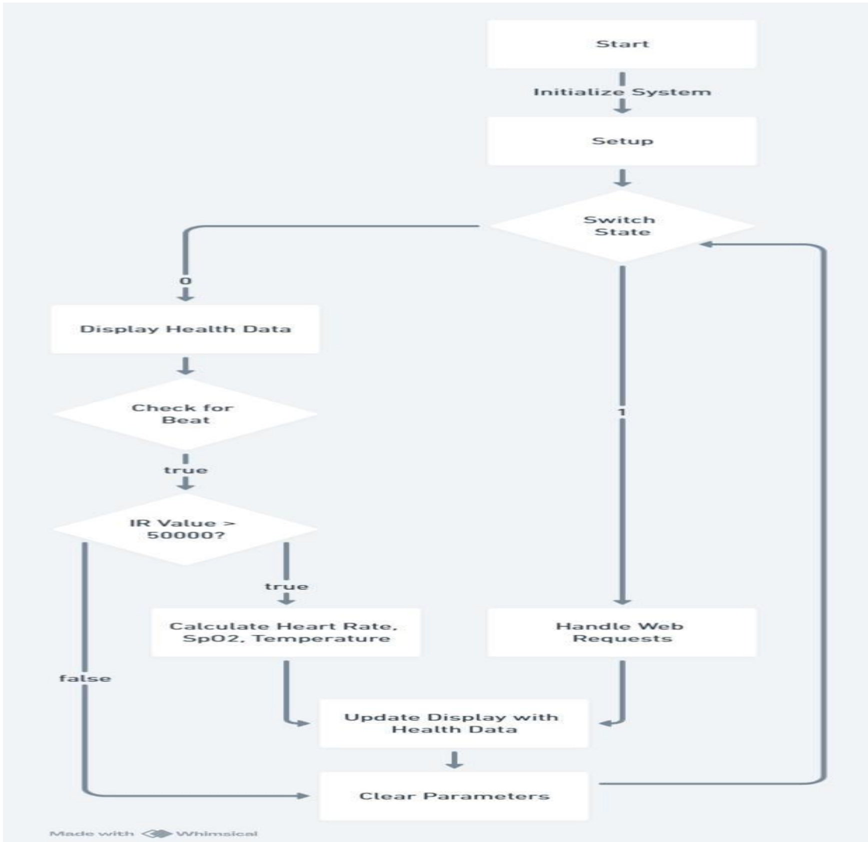

FIG. SOFTWARE FLOWCHART

VII. CONCLUSION

This ESP32-powered system showcases the potential of affordable health monitoring devices in public health. It simplifies diagnostics for users in remote regions and promotes early intervention. The integration of real-time monitoring and offline web functionality enhances usability and flexibility.

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