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IoT-Based ICU Patient Monitoring System

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Abstract: *In today's rapidly evolving healthcare environment, the ability to continuously and remotely monitor patients' vital signs is essential, especially in rural or non-clinical settings where traditional monitoring methods fall short. To tackle this challenge, our project presents a smart, IoT-based health monitoring system designed to provide real-time tracking of patients' physiological data and support timely medical intervention.*

The system is built around the NodeMCU microcontroller, which handles data collection and wireless transmission. It is integrated with key biomedical sensors such as the DS18B20 (temperature), MAX30102 (heartbeat and oxygen saturation), and an ECG sensor for capturing heart activity. These components work together to deliver consistent, live updates on patient health indicators like body temperature, pulse rate, and cardiac rhythms.

Collected data is transmitted in real-time to the ThingSpeak IoT platform via the ESP8266 module, enabling healthcare professionals to access organized and visualized patient metrics remotely through a secure online dashboard. To further enhance emergency responsiveness, the system incorporates a GSM module (SIM800L/SIM900A), which sends SMS alerts to medical personnel or caregivers when critical deviations in patient data are detected, making it reliable even in areas with limited internet access.

This adaptable and scalable solution is suited for deployment in various healthcare contexts, including hospitals, rural clinics, elder care, telehealth services, and post-operative monitoring. By enabling continuous, remote health tracking, the system promotes proactive care, reduces unnecessary hospital visits, and supports more efficient use of healthcare resources.

Keywords: *healthcare environment*