HACKFEST 24

TEAM - AMBU TRACKERS

TITLE :- CONTINIOUS PATIENT MONITORING DEVICE USING 5G IOT INTEGRATION AND AI

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PROBLEM ATTEMTING TO SOLVE

In the transition of patients from high acuity environments such as operating rooms (OR) or intensive care units (ICU) to lower acuity wards, significant physiological changes may occur due to the altered environmental conditions. Among these patients, individuals experiencing frequent seizure attacks and several critical health issues present in a particularly critical scenario, often necessitating immediate medical attention. However, the timely arrival of ambulance services may pose challenges, potentially exacerbating the patient's condition.To address this challenge, our solution entails the utilization of wearable monitoring devices capable of real-time data collection and analysis. By leveraging advanced hardware and software components , we establish a comprehensive monitoring system integrated with Internet of Things (IoT) and ML , cloud infrastructure, specifically utilizing the Blynk /UPI platform.
This system enables continuous monitoring of the patient's physiological parameters, including vital signs and seizure activity, during the transition period from high to low acuity environments and beyond. By aggregating and analyzing this real-time data, healthcare providers can remotely assess the patient's condition and make informed decisions regarding the necessity of hospital admission or discharge.

The implementation of this solution offers several key benifits including:-

Timely intervention:- Immediate detection of changing severe health condition of patients allows for prompt medical response, even in the absence of onsite healthcare professionals.

Cost savings:- By avoiding unnecessary hospital admissions for patients whose condition is stable, significant cost savings can be achieved within the healthcare system.

Enhanced patient outcomes:- Continuous monitoring facilitates early detection of signs of recovery, enabling timely discharge and improving overall patient outcomes.

In summary, our solution combines cutting-edge hardware, software, and cloud-based infrastructure to address the critical need for continuous monitoring of patients transitioning between high and low acuity environments. By leveraging wearable technology and IoT connectivity, we empower healthcare providers to deliver timely and effective care, ultimately improving patient outcomes and reducing healthcare costs.

EXPLANATION OF SOLUTION

PROJECT OVERVIEW:-

This project aims to develop a simple system for monitoring key health

parameters: pulse rate, temperature, blood pressure, and EEG signals.
The collected data will be transmitted to the Blink IoT platform and
subsequently displayed on a hospital dashboard for real-time monitoring
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Requirements and Components:-

1. Sensors and Measurement Modules: -

i. Pulse Sensor: To measure the pulse rate. A popular choice is the Pulse Sensor Amped, which is easy to interface with microcontrollers.
ii. Temperature Sensor: A digital temperature sensor like the DS18B20 or LM35 can provide accurate body temperature measurements.
iii. Blood Pressure Sensor: Modules like the MPX5050GP Pressure Sensor can be adapted for non-invasive blood pressure monitoring, though integrating such sensors may require additional signal processing expertise.

EEG Electrodes and Amplifier:- For EEG signal capture, the AD8232 ECG module can be repurposed, or specialized EEG modules like the Open BCI board can be used for higher quality signals.

2. Micro controller/Development Board:-

i. A development board with Wi-Fi capabilities, such as the ESP32, is ideal for this project. The ESP32 offers sufficient computational power for processing sensor data, Wi-Fi connectivity for data transmission, and compatibility with a wide range of sensors and modules.

3. Connectivity and IoT Platform Integration:-

i. Blink IoT Platform:- Utilize the Blink library for ESP32 to establish a connection between your device and the Blink IoT platform. You'll need to configure the Blink application to receive data from your device.
ii. Hospital Dashboard:- Develop a web-based dashboard or use existing dashboard services that can integrate with Blink, displaying the received data in an easily

4.Power Supply

Since it's a hobby project, a simple USB power bank or a 5V adapter can power the ESP32 and low-power sensors. Ensure stable power for accurate sensor readings.

5. Data Processing and Transmission:-

i. Signal Processing: Implement basic signal processing algorithms in the ESP32 to filter and extract meaningful data from the sensors.

Data Transmission: - Code the ESP32 to
send the processed data to the o Blink platform using HTTP requests or MQTT protocol, depending on your setup with Blink

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OUR APPROACH

1.We will use sensors like MAX 30102 pulse oximeter and AD8232 ECG sensor to collect the data from the patient's body to monitor the physiological changes

2.We will then send this data through ESP32 Microcontroller to process and transmit the data.

3.We will then send this processsed data through Blink IOT and Ubidots platform to the hospital dashboard that will update with patient’s condition.

4.We will use Techniques of Machine Learning algorithm to collect data via ECG electrodes through patient’s body and monitor the changes(using the coolterm software and converting the data into csv file for applying ML Model) .

The MAX30102 pulse oximeter and heart rate sensor is an I2C-based low-power plug-and-play biometric sensor. It can be used by students, hobbyists, engineers, manufacturers, and game & mobile developers who want to incorporate live heart-rate data into their projects.

ECG can be analyzed by studying components of the waveform. These waveform components indicate cardiac electrical activity. The first upward of the ECG tracing is the P wave. It indicates atrial contraction. The QRS complex begins with Q, a small downward deflection, followed by a larger upwards deflection, a peak (R); and then a downwards S wave. This QRS complex indicates ventricular depolarization and contraction. Finally, the T wave, which is normally a smaller upwards waveform, representing ventricular re-polarization.

TECH STACK USED: -
IOT, esp32,BLYNK SOFTWARE and Ubidots, AI/ML,CoolTerm Software(To Convert ECG dataset into csv file), WEB DEVELOPMENT

BASIC OVERFLOW :-
Assemble and test each sensor with the ESP32 individually.

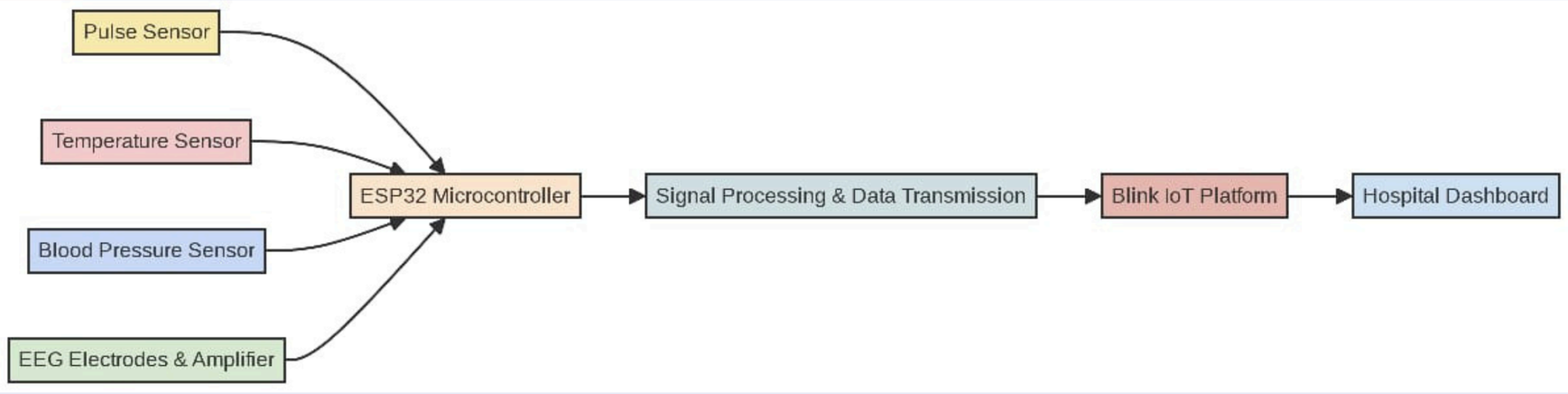
Integrate all sensors with the ESP32, ensuring stable simultaneous operation. Implement signal processing algorithms to extract clean data from the sensors.

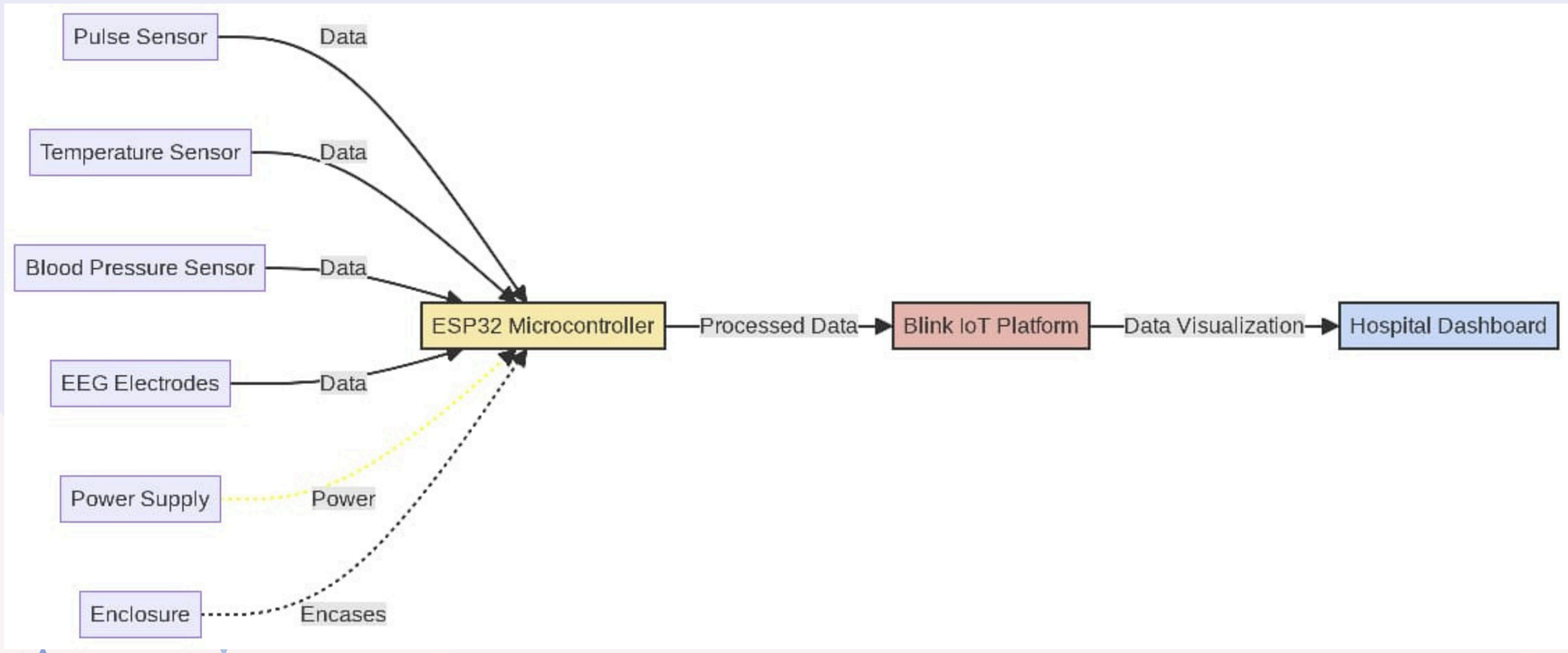
We will use Techniques of Machine Learning algorithm to collect data via ECG electrodes through patient’s body and monitor the changes(using the coolterm software and converting the data into csv file for applying ML Model) .

Establish connectivity with the Blink IoT platform and ensure reliable data transmission.

Develop or set up the hospital dashboard to receive and display patient data. Test the entire system for accuracy, reliability, and user experience.

FLOWCHART


Pulse Sensor
Temperature Sensor
Blood Pressure Sensor
EEG Electrodes & Amplifier
ESP32 Microcontroller
Signal Processing & Data Transmission
Blink IoT Platform
Hospital Dashboard


Pulse Sensor
Temperature Sensor
Blood Pressure Sensor
EEG Electrodes
Power Supply
Enclosure
Data
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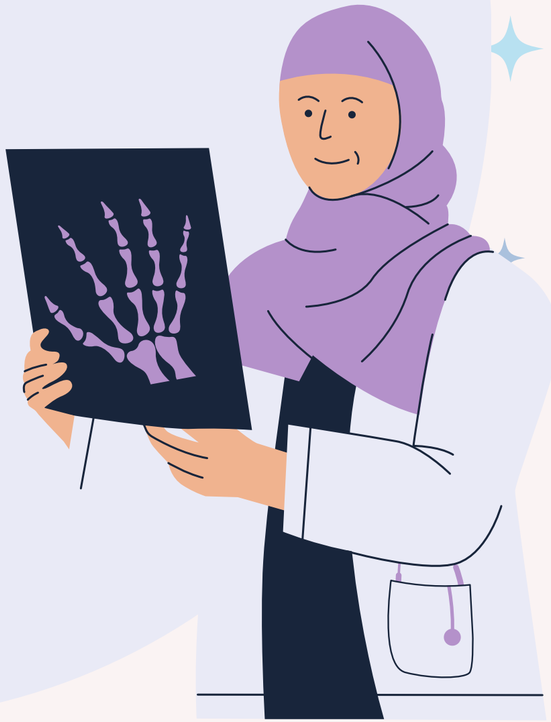
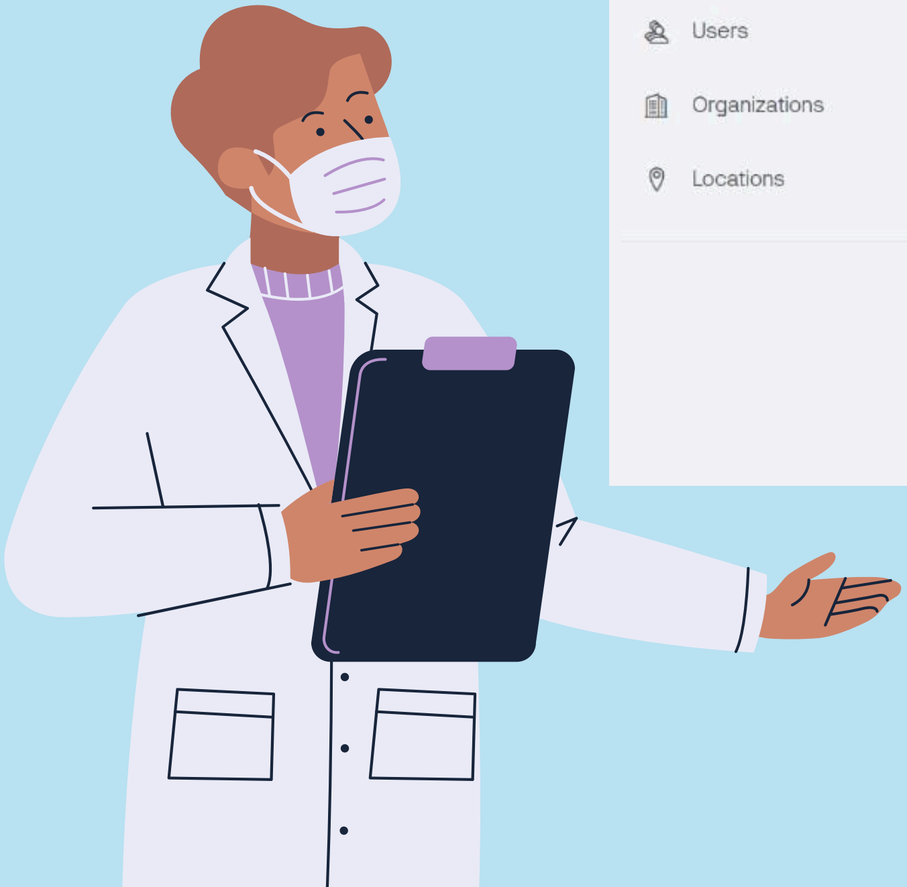
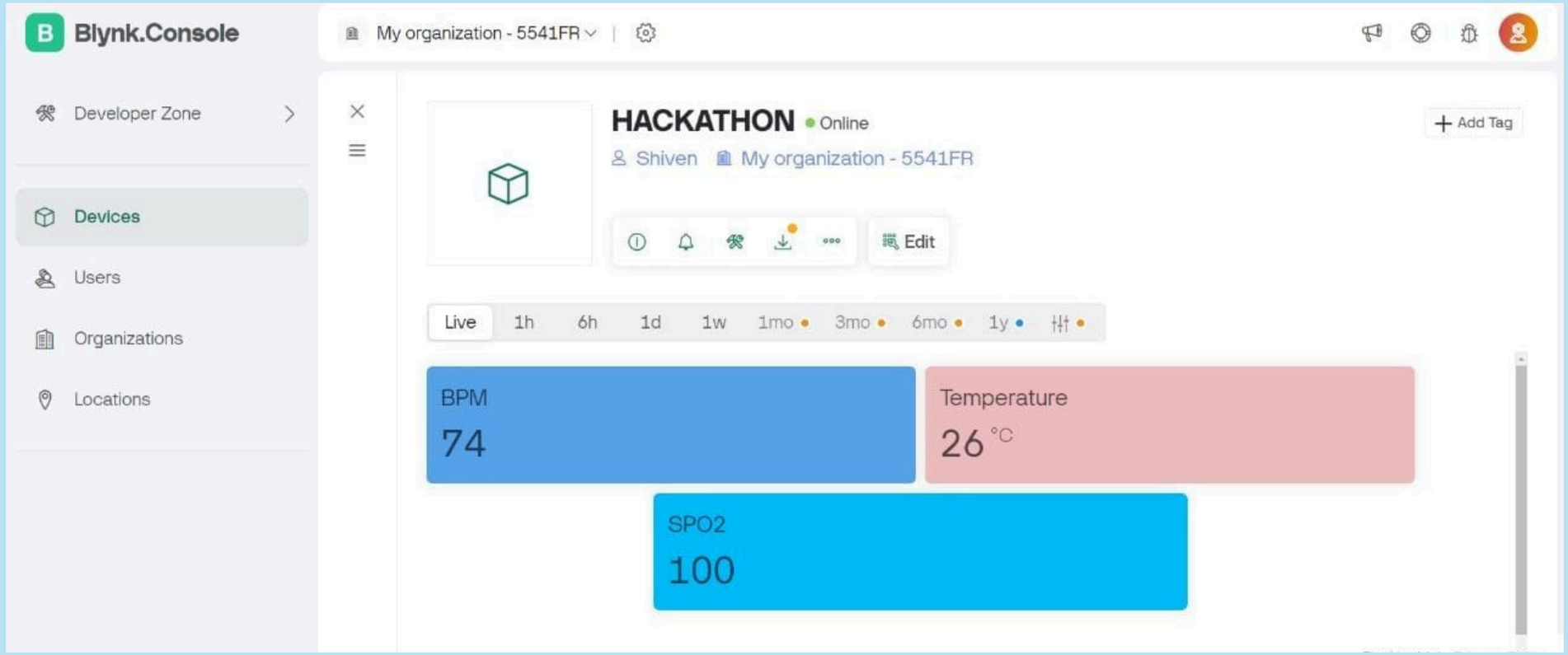
Power
Encases
ESP32 Microcontroller
Processed Data
Blink IoT Platform
Data Visualization
Hospital Dashboard



OUR HOSPITAL DASHBOARD





FUTURE SCOPE

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1.We will try to integrate the blynk software with the web dashboard and integrate Chatbot Assistant AI which can communicate with the user regarding the health details of the person.

2.Also we will try to integrate API Gemini Maps in the web dashboard where the ambulance can reach the nearby hospitals.

Health Dashboard

SpO2:	82%
BPM:	74
Temp:	30°C

Hi! What can I help you with?

hi

Hello! How can I assist you today?

Nearby Hospitals

Thank you for your attention