KuruKshetra-25(Hackfest)

- **Team ID – T084**
- **Problem Statement Title – Smart Assistive Glove**
- **Domain/Theme – Healthcare / IOT**
- **Team Name - Shield**
- **Team Leader Name – Vinayak Desai**

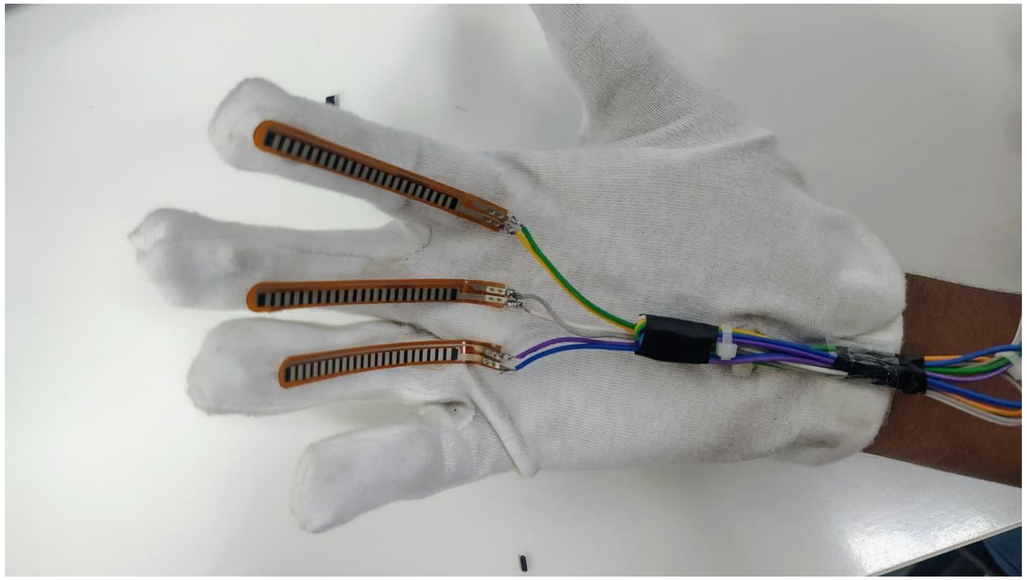
Proposed Solution

Problem Statement: Patients suffering from conditions like **paralysis**, **locked-in syndrome**, or **motor neuron diseases** often **lose their ability to speak or move** — making it extremely difficult to communicate their needs to caregivers, especially when unattended. In critical moments, the absence of timely communication can be life-threatening.

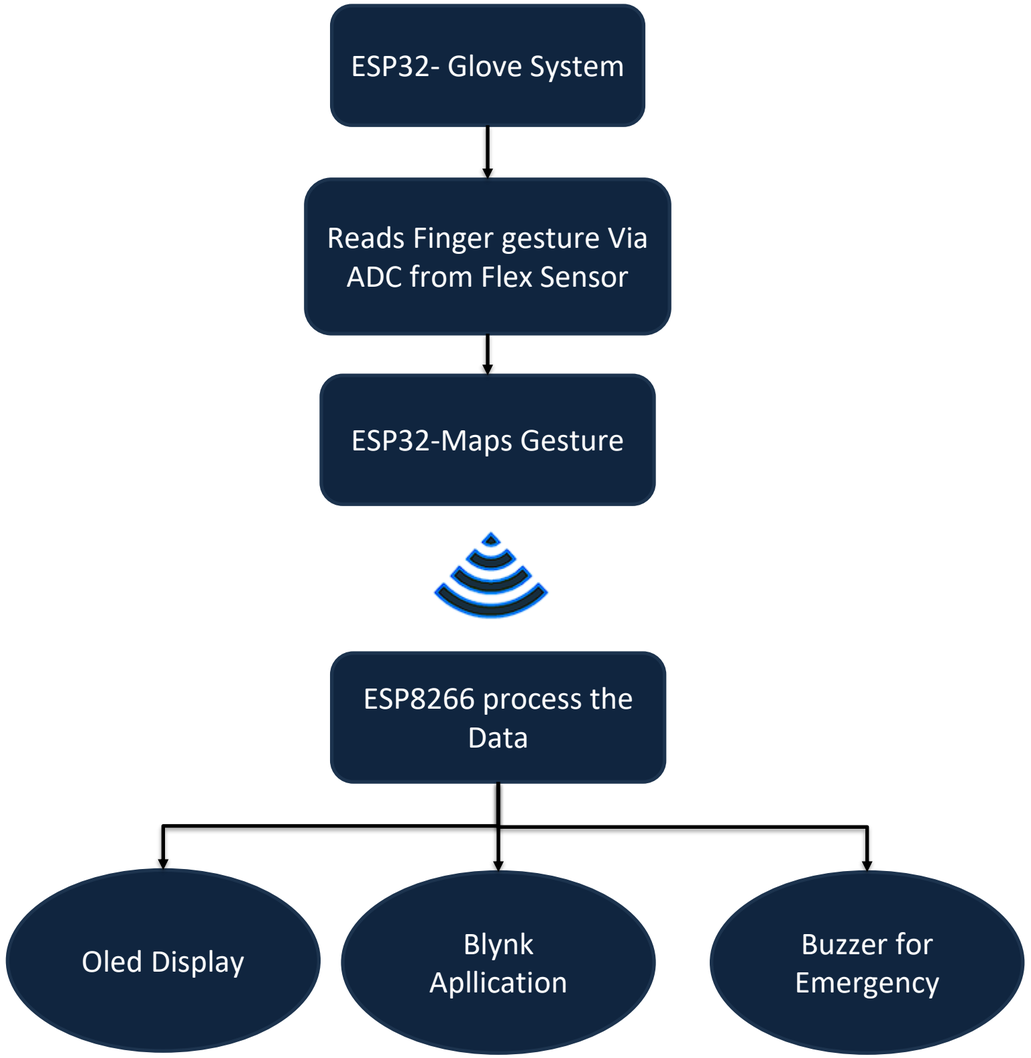
Patients recovering from surgeries or temporary injuries often face restricted movement, making it difficult to ask for help.

proposed Solution: **Smart Assistive Glove**
We propose a **Smart Gesture-Based Glove Communication System** that empowers such patients to **communicate essential needs using just finger movements**.

The System Includes:
- Flex Sensors
- Esp32 Microcontroller
- Esp8266 Microcontroller
- Oled Display
- Blynk Application
- Buzzer
- Battery



Process flow diagram



Methodology used

Sensor Integration

- Flex Sensor placed on Index, Middle, Ring Finger
- Connected to esp32 Analog pin for Continuous Gesture Monitoring

Gesture Detection Logic

Each gesture corresponds to a specific message:

- Index Finger - "Need Water“
- Middle Finger - "Need Help
- Ring Finger - "Need Food"

Wireless Communication

- Data Transmitted on Wifi
- Enables Communication without Router
- Fast and low-power transmission.

Receiver Module Actions

- Display the Data on Oled display
- Also send the data on the Blynk application
- Activates Buzzer in the case of Emergency

- **Power and Portability**

The glove module is powered via **battery**

- System designed to be low-power and wearable

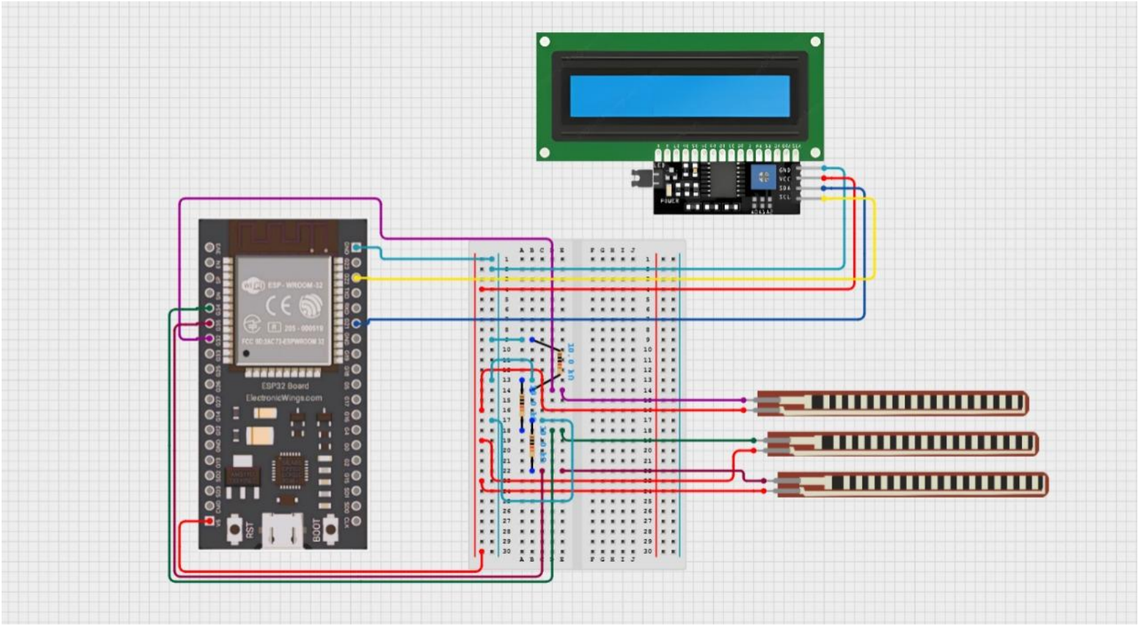
Solution Concept and Feasibility

- **Solution Concept:** The Smart Glove redefines patient-caregiver communication for individuals with limited mobility by using simple finger gestures to transmit urgent and essential needs — **eliminating the dependency on speech, buttons, or full-body movement.**

- It introduces **gesture-to-message mapping over a peer-to-peer wireless protocol (ESP-NOW)**, ensuring **instant, reliable, and internet-independent** communication in both home and clinical settings.

Feasibility

- Cost Effective: less than **RS2000**
- No Router Dependancy
- Portable
- Low Power Consumption: 0.4 -0.6W
- Scalable: can increase its Range in Km for Remote Monitoring using GSM Module
- Reliable



Use cases & Description

🏠 Home Care for Paralyzed Patients: Paralyzed or stroke-recovering patients at home can use simple finger gestures with the glove to alert family members for water, food, or help — without speaking or full movement.

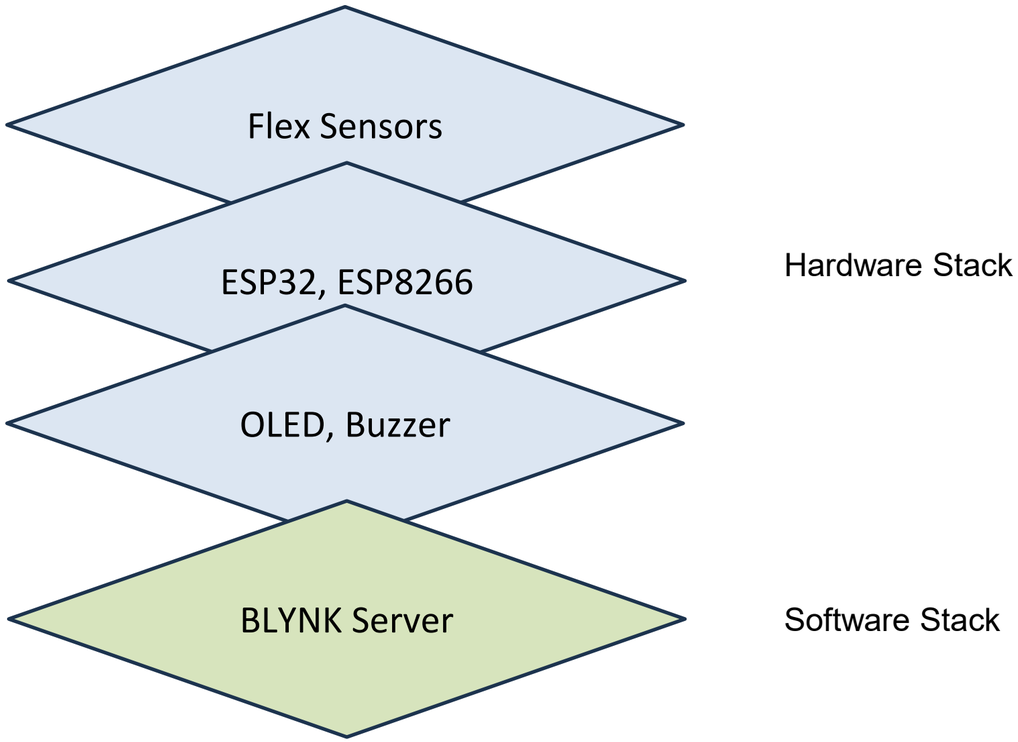
👵 Remote Elderly Care:Elderly individuals in remote areas can use the glove to alert caregivers via Wi-Fi or Blynk when they need help.

🧠 Locked-in Syndrome : Patients with minimal finger movement due to ALS or Locked-in Syndrome can use the glove to communicate basic needs.

🩺 Post-Surgery or Temporary Paralysis Cases: Patients with restricted movement after surgery can temporarily use the glove to request assistance without physical strain.

🏥 Hospital ICU & Bedridden Patients: Hospital patients with limited mobility or sedation can use the glove to send wireless alerts for faster, non-verbal communication with medical staff.

Technology stack used



Constraints

Considerations

- Cost: The system must remain affordable for low-income or home care users.
- Scalability: Should allow for more gesture mapping, more patients, or remote alerts.
- Power Efficiency: Must operate on battery for extended periods.
- Reliability: Needs consistent gesture detection without false positives

Challenges

- Keeping hardware cost low while maintaining durability and functionality
- Handling noise and variability in sensor values for accurate gesture detection
- Ensuring long battery life for portable, wearable use
- Maintaining stable ESP-NOW communication in real-world conditions

Solutions

- Use of ESP32 and flex sensors keeps hardware under ₹1000
- Implement gesture thresholding and debouncing logic for accuracy
- Optimize code and use ESP32's low-power modes to reduce consumption
- Test and tune ESP-NOW settings for robust wireless range and reliability