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Design and Implementation of a Gesture-Based Smart Assistive Glove Using ESP32 for Real-Time Communication in Paralysis Care

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Abstract: *This paper presents the design and implementation of a gesture-based smart assistive glove using an ESP32 microcontroller to enable effective communication for paralysis patients who face difficulties in expressing their basic needs. The proposed system utilizes flex sensors mounted on a wearable glove to detect finger movements, which are processed by the ESP32 to recognize predefined gestures corresponding to essential requests. Upon gesture identification, the system transmits real-time alerts to caregivers through a GSM-based short message service, ensuring timely assistance even in the absence of nearby support. A vibration motor provides haptic feedback to confirm successful message delivery, enhancing user confidence and reliability. The device is powered by a rechargeable battery and designed to be lightweight, portable, and suitable for continuous daily use. Experimental evaluation demonstrates accurate gesture recognition, low response time, and dependable communication performance. The proposed assistive glove offers a low-cost, user-friendly, and scalable solution that improves patient independence and strengthens caregiver–patient interaction in healthcare environments.*

Keywords: Solar energy, Electric vehicle charging, Renewable energy, MPPT controller, Smart charging station, Sustainable power, Energy storage

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