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Assistive Sign Language Communication System

Aniket Salunke, Janhavi Jagdale, Shreya Landge, Samruddhi Patil, Prof. Ms. Deepti Sahare
Diploma Student, Department of Computer Engineering
Pimpri Chinchwad Polytechnic, Pune, India
aniketsalunke1067@gmail.com, janhavijagdale92@gmail.com,
shreya.landge33@gmail.com, samruddhip191@gmail.com
Under the Guidance of
Department of Computer Engineering, Pimpri Chinchwad Polytechnic, Pune India deepti24sahare@gmail.com

Abstract: *Most sign language interpretation systems rely on vision-based techniques that require cameras, high computational resources, and controlled environments, which limit their usability in real-world assistive scenarios. This work proposes an Internet of Behavior (IoB)–driven assistive sign language detection system that interprets finger bending behavior as a primary communication signal.*
The system employs a four-finger flex sensor configuration to capture continuous behavioral motion data, which is processed directly at the edge using an ESP32 microcontroller. Instead of transmitting raw data for cloud analysis, the behavioral patterns are locally mapped to predefined semantic outputs, enabling low-latency and privacy-preserving gesture translation.
A distinctive feature of the proposed model is its dual-channel communication framework, where the interpreted message is simultaneously rendered on a local LCD interface and transmitted via Bluetooth to an online application, allowing both immediate and remote interaction. By reducing sensor count, avoiding camera dependency, and emphasizing behavioral data processing, the system achieves a cost-efficient, portable, and socially deployable assistive solution..

Keywords: Internet of Behavior, Flex Sensors, ESP32, Edge Processing, Sign Language Detection, Assistive Communication, Bluetooth, LCD Display

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