ABSTRAK

RANCANG BANGUN *SMART GLOVE* PENERJEMAH BAHASA ISYARAT BERBASIS ESP32 MENGGUNAKAN SENSOR *FLEX* DAN MPU6050
(2026: 61 Halaman + 27 Gambar + 11 Tabel + Daftar Pustaka + Lampiran)

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Perbedaan media komunikasi antara pengguna bahasa isyarat dan masyarakat umum masih menjadi kendala dalam proses komunikasi. Oleh karena itu, dirancang *Smart Glove* berbasis ESP32 yang mampu menerjemahkan gerakan bahasa isyarat menjadi suara serta sistem *Speech-to-Text* untuk mengubah ucapan menjadi teks. *Smart Glove* menggunakan lima sensor *Flex* untuk mendeteksi tekukan jari dan MPU6050 untuk mendeteksi orientasi tangan. Data sensor diproses oleh ESP32 dan menghasilkan keluaran suara melalui *DFPlayer Mini* dan speaker.

Sistem *Speech-to-Text* menggunakan mikrofon INMP441, modul SD Card Reader, Deepgram API, dan LCD 16×2. Pengujian dilakukan melalui kalibrasi sensor dan pengujian sistem secara keseluruhan. Hasil pengujian menunjukkan bahwa MPU6050 mampu membedakan orientasi tangan dan *Smart Glove* mampu mengenali 10 gerakan kata dengan rata-rata keberhasilan sebesar 91%. Sistem *Speech-to-Text* menghasilkan rata-rata keberhasilan transkripsi sebesar 92% pada jarak kurang lebih 15 cm, serta hasil transkripsi dapat ditampilkan pada LCD. Secara keseluruhan, sistem mampu mendukung komunikasi dua arah melalui penerjemahan gerakan menjadi suara dan ucapan menjadi teks.

Kata Kunci: *Smart Glove*, ESP32, Sensor Flex, MPU6050, *Speech-to-Text*, Deepgram API.

ABSTRACT

DESIGN AND DEVELOPMENT OF AN ESP32-BASED SIGN LANGUAGE TRANSLATION SMART GLOVE USING FLEX SENSORS AND MPU6050
(*2026: 61 Pages + 27 Figures + 11 Tables + References + Appendices*)

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Differences in communication methods between sign language users and the general public remain an obstacle to effective communication. Therefore, an ESP32-based Smart Glove was designed to translate sign language gestures into speech, along with a Speech-to-Text system to convert spoken words into text. The Smart Glove uses five Flex sensors to detect finger bending and an MPU6050 sensor to detect hand orientation. The sensor data are processed by the ESP32, and the output is produced as audio through the DFPlayer Mini and speaker. The Speech-to-Text system uses an INMP441 microphone, an SD Card Reader module, the Deepgram API, and a 16×2 LCD. Testing was conducted through sensor calibration and overall system evaluation. The results showed that the MPU6050 was able to distinguish six hand orientations, while the Smart Glove recognized 10 word gestures with an average success rate of 91%. The Speech-to-Text system achieved an average transcription success rate of 92% at a distance of approximately 15 cm, and the transcription results were successfully displayed on the LCD. Overall, the system is capable of supporting two-way communication by translating gestures into speech and spoken words into text.

Keywords: Smart Glove, ESP32, Flex Sensor, MPU6050, Speech-to-Text, Deepgram API.