

ABSTRACT

Individuals with physical limitations frequently encounter difficulties in conducting daily activities independently at home, particularly in accessing and controlling electronic devices such as lights, fans, and other household appliances. When forced to operate such equipment manually, there is a possibility of isolated incidents at home that may necessitate quick assistance. However, not all family members can provide timely assistance, particularly when constant monitoring is not feasible. To overcome these restrictions, a smart home system was created that includes voice control for managing household equipment, fall detection via camera-based monitoring for accident prevention, and the possibility to operate devices via a mobile application.

The ESP32-S3 microcontroller serves as the main processor for the voice control system, capturing speech instructions through a microphone and providing auditory feedback through a speaker. The fall detection system uses an ESP32-S3 Camera Development Board to collect real-time video, which is subsequently analyzed for fall detection. The mobile application, created with Flutter, has a user-friendly interface to ensure accessibility. All devices are integrated and processed by the Single Board Computer (SBC) HG680-P, which handles both voice command processing and fall detection before transmitting data to either the application or the controlled devices.

Testing results show that the voice control system can reply to orders within 6 seconds with an 80% success rate at a distance of 3 meters. Furthermore, the fall detection system can detect occurrences in an average of two seconds before providing messages to the application. Furthermore, the system can be established for a low initial investment and recurring monthly running costs.

Keywords: *assistive technology, ESP32-S3, fall detection physical disability, smart home, voice control*