ABSTRACT

Smart home systems are a solution for improving the efficiency of electricity consumption in households. This study aims to design an electricity load monitoring and scheduling system based on Mamdani fuzzy logic and the Weighted Fair Queueing (WFQ) method. The system uses a PZEM-004T sensor to monitor voltage, current, power, and energy, as well as a Raspberry Pi as a local server with a Node.js backend and MQTT protocol. Fuzzy logic is used to determine the priority score of devices based on power input and duration, then the score is used as a weight in the energy distribution process using WFQ. Testing was conducted on 10 devices with a scenario without a schedule and some devices scheduled. The test results show that the system successfully distributes energy quotas fairly, keeps energy consumption within the specified limits, and provides optimal scheduling recommendations. Sensor accuracy shows an average voltage error of <1% and current accuracy of >97% after calibration. The system also has a response time of <3 seconds to control commands from the Android application. With the integration of local and online systems (Ngrok), this system works well, thereby helping with smart household energy management.

***Keywords**: Fuzzy Mamdani, Power Monitoring, Load Scheduling, SmartHome, Weighted Fair Queueing*