ABSTRACT

The rapid development of telecommunication technology has encouraged the creation of various Internet of Things (IoT)-based innovations to support efficiency and convenience in daily life. Therefore, it is considered necessary yo realize a device that can facilitate monitoring of electricity and water usage as well as estimating boarding house billing costs in real-time through a web platform and by sending Telegram notifications to users.

The research methodology includes the design of both hardware and software that integrates the PZEM 004T sensor for measuring voltage, current, power, and electrical energy (kWh), as well as the YF-S201 sensor for measuring water flow rate. Data collected from these sensors are transmitted to the NodeMCU microcontroller, processed on a local server, displayed on a web-based dashboard, and sent to users in the form of payment notifications via the Telegram application.

Testing was conducted using electrical loads such as a 12-Watt lamp, a 48-Watt fan, and a 16-Watt laptop charger, as well as water flow as the test medium. The results indicate that the system achieved an accuracy of 99.09% for electricity measurement and 98.37% for water measurement. Therefore, this smart billing system is capable of providing real-time energy consumption data, automatically calculating billing costs, and delivering timely payment notifications, thus assisting boarding house owners in managing energy usage and billing processes efficiently and accurately.

Keywords: Nodemcu 8266, PZEM 004T sensor, water flow sensor, telegram.