ABSTRACT

The recording of water meter readings by the Regional Water Company (PDAM), which is still mostly done manually by visiting customers' homes, is considered inefficient and time-consuming. This study aims to design and build an automatic water meter reading system to address this issue. The system was developed using Research and Development (R&D) methods. The core technology utilized is the ESP32-CAM module to periodically capture images of water meters, which are then sent to a Laravel-based backend server. Optical character recognition (OCR) to convert images into numerical data is performed by a Python script utilizing the Application Programming Interface (API) from Gemini. All reading data is stored in a MySQL database and presented through a Next.js-based website platform that can be accessed by users and administrators for real-time monitoring. Based on the research results, the ESP32-CAM-based hardware system has been successfully designed and functionally integrated with the server platform for data acquisition and visualization. The implementation of the Gemini API shows very high accuracy performance, reaching up to 100%. However, the system still has weaknesses in its physical design, which is susceptible to shifts and visual disturbances such as dirt or light reflections, which can potentially cause data reading errors. For future development, several improvements are recommended, focusing on hardware and system functionality enhancements. This includes developing an automatic cleaning mechanism for the meter and improving the device design to make it more stable and less prone to shifting. Additionally, it is recommended to use communication protocols such as Socket or MQTT to enable real-time data requests and integrate solar panels as a power source to enhance the device's portability and energy independence.

Keywords: OCR, ESP32-CAM, Gemini, Water Meter, Internet of Things (IoT)