

ABSTRACT

Trains are one of the public transportation options widely used by the community due to their efficiency, punctuality, and relatively affordable costs. However, the increase in passenger volume has not been accompanied by an optimal guaranty of operational safety, as reflected in the incidents of accidents that still occur. One important aspect of railroads is the monitoring and transmission of data between the station and the train in real time. The objective of this research is to design and implement a prototype of a wireless data communication system for trains to stations based on the nRF24L01+ module and integrated into the Internet of Things (IoT). The research method includes hardware and software design using Arduino IDE. The system operates when the ultrasonic sensor at the station detects the arrival of a train within a 15 cm range, then the nRF24L01+ module acting as a transmitter will send the station's identity and distance to the nRF24L01+ module acting as a receiver on the train. If the data is successfully received, it is then displayed on the 16×2 I2C LCD on the train and uploaded to the Google Sheets database for real-time monitoring and data storage. The testing was conducted for 20 cycles, and the entire process of wireless data transmission using nRF24L01+ and data sending to Google Sheets proceeded without any transmission failures. The research results show that the designed system is capable of performing wireless data communication effectively between two points, as well as real-time distance monitoring. The tests also indicate that the integration of the system with cloud data logging works well, allowing data to be accessed and analyzed continuously.

Keywords: *Arduino IDE, Cloud data logging, Internet of Things, LCD 16×2 I2C, nRF24L01+ Module, Monitoring, HC-SR04 Ultrasonic Sensor, Real time*