ABSTRACT

This research develops a landslide detection system using MPU6050 sensor and NodeMCU ESP32 to monitor changes in soil slope in real time and soil moisture sensor to detect moisture conditions. The system is integrated with Blynk application to provide early warning notification. Tests show that the MPU6050 sensor provides notifications with an average delay of 1.04 seconds in various initial positions of the Y-axis angle. Test results show excellent performance in accuracy and consistency of angle measurements. On the X-axis, the average percentage error was 0.45%, with the largest error being 1.6% at 60° and the smallest being 0.05% at 180°. On the Y-axis, the average error is 0.61%, with the largest error of 2.5% at 30° and the smallest error of 0.1% at 240° and 270°. On the Z-axis, the data showed consistent and accurate results. High soil moisture can reduce the cohesion of soil particles, increasing the risk of slope instability. This is exacerbated by extreme ground slopes, which, if they reach or exceed 180°, can be an early indication of landslides. The integration of soil moisture and slope sensors in this system provides an effective tool for early detection and mitigation of landslide risk. The configuration of the landslide warning system using Blynk is done by setting the data stream on the virtual pin. Virtual pin V1 is used to send alert notification to Blynk application. When the Y-axis tilt angle reaches or exceeds 180°, the ESP32 sends a signal to Blynk via virtual pin V1, which then triggers a notification to the user. The test results show that almost all MPU6050 sensor positions successfully provide alerts without any failure or significant delay. The test results table shows the smallest delay of 0.77 seconds and the largest delay of 1.74 seconds.

Keywords: Arduino, Internet of Things (IoT), Landslide, MPU6050, Soil Moisture