

ABSTRACT

Mountaineers face significant risks if not supported by an adequate monitoring system. This final project designed and developed a monitoring system for human positions in mountainous areas utilizing GPS technology based on geofence and LoRaWAN communication. The system aims to monitor the climber's position in real-time and provide notifications when a climber goes outside the designated route or is in an emergency condition. The user device is equipped with a GPS module to obtain coordinates, an OLED display to show ID, latitude, longitude, status (in-route/out-of-route), and condition, an emergency button to manually send an emergency signal, a buzzer as a warning indicator, and a LoRa module to transmit data. An additional feature on the user device is the automatic transmission of an emergency signal if the user is detected out of bounds for more than 10 minutes. The test results showed that LoRa data transmission was successfully carried out at a maximum distance of 320 meters in LOS (Line of Sight) conditions, 60 meters in forest terrain, and 60 meters in areas with tall grass. The system successfully provided information on location, out-of-bound status, and emergency conditions, with an average display delay of approximately 10 seconds on the website. This system is expected to improve the safety of mountaineers.

Keywords: GPS, Geofence, LoRaWAN, Monitoring, Mountaineers