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SATELLITE GROUND SENSOR TERMINAL DESIGN: USE OF LORA TO TRANSMIT REMOTE
SENSOR DATA FROM NEPAL'S HIMALAYAN REGION FOR DISASTER MITIGATION

Abstract

Frequent data collection from different sensors allows us to predict natural phenomena and changes. This plays an important role in disaster prevention and management. There are a variety of monitoring and data collection systems, ranging from ground-based networks to space-based networks. While current Automated Weather Stations are in wide use, they either require an expensive satellite communication channel or cellular connections to collect data. This is especially true while collecting data from remote sensors. Nepal's 2015 Earthquake is a good reminder that a country requires reliable systems that can provide data before and after disasters when all other systems are down. This paper proposes a low-cost, stand-alone sensor terminal for the collection and transmission of data. RF transmission is based on the LoRa modulation technique. The Ground Sensor Terminal provides regular data regardless of ground-based communication network status. The initial deployment of the terminal was done at Panchpokhari lakes, a group of Glacial lakes situated above 4000m. The results of the deployment showed the terminals' capability to operate for four continuous days without sunlight. The terminal is powered by a 3000mAh battery and 20W solar panel. The self-reset capability of the terminal ensures the continuous data collection and monitoring even in case of unexpected errors. Long duration test for six months showed continuous operation without human intervention. Built-in LoRa allows direct communication with satellites for store and forward applications. The terminal has the adaptability to integrate any sensors and allows monitoring of a diverse category of natural disasters that occurs in Nepal. The system has the potential to monitor and mitigate Glacial Lake Outburst Floods, Seasonal Floods, and Avalanches while saving lives.