Development of an IoT-cloud based system and its application to structural health monitoring

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An IoT-cloud based system for landslide monitoring has been developed and applied in many areas. This system features low energy consumption, long-distance signal transmission, less environmental disturbance, and is suitable for mountainous areas. The system contains a MEMS-based tilt meter, LoRa router, and cloud web server. This system can continue and electronic record the inclination data of the monitored structure under presetting period. When the inclination angle is equal to or greater than the warning value, the system will send a message to the authorities for disaster risk reduction. Three elementary schools (Baoshan, Jiangshan, and Xinzhong) locates in the mountain area of Taiwan, indicated potentially progressive slope movement. In this research, the IoT-cloud based real-time monitoring systems installed in these three schools to monitor the slope movement. This monitoring system worked for almost one year. During a heavy rainfall event, a retaining wall of Xinzhong elementary school was detected apparent inclination. A warning message sent to the authorities in the meantime and then take the necessary disaster prevention activities. This paper introduces the IoT monitoring system, presents measured data, and discusses the trigger causes of Xinzhong heavy rainfall case.

Keywords: landslide, LoRa, IoT-cloud, real-time monitoring system, MEMS-based tilt meter, inclination