Announcing the Final Examination of Ton Tu for the degree of Master of Science

Time & Location: November 4, 2016 at 10:00 AM in Engineering 2 426
Title: SINKHOLE MONITORING USING GROUNDWATER TABLE DATA

Sinkholes are geologic feature and naturally occur in karst terrain areas. Sinkholes play an important role to public health and safety because it causes structural damages, property losses, and dramatic impact on people lives. Sinkholes also threaten water and environmental resources by creating direct pathways between surface water to underlying aquifers. In the areas of developed pathways, surface contaminants can be transmitted into underlying aquifers causing degrade of ground water resources. Because of negative impacts of sinkholes on public health and safety and environmental resources, sinkhole detection and monitoring are the key factors to predict and reduce its risk levels. The work presented in this thesis is aimed to use piezometer sensors to monitor groundwater as well as locate points of water breaches.

In order to prepare for the field test, 24-tests were performed in the lab. The first 12 tests used soil thickness \( h \) of 150 mm, and the other 12 tests used soil thickness \( h \) of 200 mm. In each soil thickness, three tests for each groundwater table level, which was to 0.1h, 0.15h, 0.2h, and 0.30h, were performed. The hypothesis of this study was that sinkhole and fluctuation of ground water table have spatial-temporal relationships. Peak count analysis showed that at the same time sensors closer to the predetermine sinkhole had more peaks than those further away. The result also confirmed that more peaks were appeared during the sinkhole formation stage.

Twenty piezometer sensors were installed to monitor piezometric elevations for the site near Wekiva Parkway and State Road 26 Interchange in Lake county. Sensors were intended to install into raveled zones, so Cone Penetration Test (CPT) soundings was used to identified depths of these zones. Fluctuations of piezometric elevations over time were presented in a series of 2D images using moving average signal processing technique. Each frame showed the mean values of one day piezometric data. Frequency between two adjacent frames was set at 4 hours. After all frames had been generated, frames were put into sequence of time to see how water fluctuated over time.

Results from piezometer sensors agreed with results of Ground Penetrating Radar (GPR). GPR results indicated a huge point breach with approximate diameter of 120 feet near location of sensor 3-3. At the same time, sensor 3-3 showed its lowest piezometric elevation among sensors. The low piezometric elevations were also presented in sensors 1-1, 1-2 and 1-3 corresponding to GPR's result a long transect 7. Sensor 2-4 had the second lowest piezometric pressure among 20 sensors, but there was no GPR data at that location (out of GPR survey area). The existence of a point of breach probably located at or near location of sensor 2-4 based on the well matched between the two methods.

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Approved for distribution by Dr. Hae-Bum Yun, Committee Chair, on October 21, 2016.

The public is welcome to attend.