Malaysian Geotechnical Society

Webinar on
"Use of MEM Instruments in Practice of Slope Monitoring and Early Warning of Landslide"

20th April 2021 (Tuesday), 5.00 pm – 7.00 pm
BEM Approved CPD Hours: 2 Ref. No.: IEM21/PP/027/T (w)

SPEAKER'S PROFILE
PROFESSOR IKUO TOWHATA
Kanto Gakuin University, Yokohama, Japan

Prof. Towhata obtained all of his degrees from bachelor (1977) to Ph. D. (1982) at Civil Engineering Department, Univ. Tokyo. Afterwards, he worked at the University of British Columbia, Vancouver, the Asian Institute of Technology in Bangkok, and the Public Works Research Institute together with Univ. Tokyo. He was a professor at Tokyo from 1994 to 2015. Since then, he has been a director of an architectural design company and a technical advisor of a geotechnical consulting firm. He is a specially appointed professor at Kanto Gakuin University, Yokohama, while he was a Distinguished Visiting Professor in 2016 at IIT Bombay. What are important among his awards, Shamsher Prakash Research Award of Soil Dynamics, IGS-Chennai Chapter Biennial Prize for the Best Paper and 2018 Shamsher Prakash ISET Award 2018 for Significant Contribution in Geotechnical Earthquake Engineering. He was the Heritage Lecturer at 2005 International Conference on Soil Mechanics and Geotechnical Engineering and the 2019 Ishihara Lecturer of Technical Committee 203 on earthquake problems in Rome. In 2021, he was one of the key-note lectures and delivered a comprehensive lecture on earthquake-induced landslides. His majoring field is geotechnical disasters and mitigation with emphasis on seismic and landslide problems. Among his 490 international publications, Geotechnical Earthquake Engineering published by Springer is the most important achievement.

SYNOPSIS

It is of a universal concern nowadays that the risk of heavy rainfall and related disasters are increasing possibly as a consequence of the global climate change. While the issues of CO_2 emission are important, the planned web lecture will focus on mitigation of sediment disasters that are triggered by heavy rainfalls.

Unlike conventional prevention of landslide disasters, the mitigation of rainfall-induced landslide disasters has such difficulties as the short time between the initiation of rainfall and the ultimate slope failure and the lack of geotechnical investigation in the vulnerable slopes. The short time means often several hours only that does not allow elaborate site investigation or installation of stabilizing structures. Because there are numerous unstable slopes, it is financially impossible to carry out geotechnical investigation in all of them. Hence, strength of soil/rock is unknown, and the local hydrology is totally unknown. Thus, soil-mechanic approach cannot handle the problem of rainfall-induced landslide.

Nevertheless, civil and geotechnical engineering has to solve this problem and one of the promising solutions is slope monitoring coupled with early warning. Monitoring is expected to detect minor phenomena (precursor) that imply the imminent slope failure. Early warning enables local people to evacuate in advance and survive the disaster, although properties are unlikely saved.

The issues on monitoring are where and on what the monitoring is conducted. Because it is impossible to exactly identify the part of slope that will fall during the next heavy rain, a precise but expensive instrumentation is not a good idea. It is believed that the number of sensors deployed over a large area is more important than their precision so that a few of them may detect precursor. Noteworthy is that heavy rain often occurs during midnight when photographing of a slope is difficult. Heavy rain further reduces the visibility of a slope. Satellite imagery has a long interval time and cannot capture the slope appearance immediately before the failure. Because of these reasons, image analysis is considered useless and the proposed monitoring technology makes use of MEMS inexpensive displacement sensors that are connected to the web network.

This technology has been in practice for more than 10 years internationally in Japan, China, Taiwan, India, Bhutan, New Zealand and a few more in near future. The planned lecture will address field validation tests and case histories that have created a threshold to issue an evacuation order. Moreover, recent efforts are introduced towards high-density installation of sensors and monitoring of ground shaking etc. Last but not least, the displacement monitoring focuses on the risk involved in individual slopes that may affect important facilities or human settlements at their base, while the well-known rainfall monitoring concerns regional mitigation of disaster and does not address individual slopes.

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