

## Non-Contact Measurement of Soil Deformation in a Cyclic Triaxial Test

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**Abstract :** Deformation in a conventional cyclic triaxial test is normally measured by using point-wise measuring device. In this study, non-contact measurement technique was applied to be able to monitor and measure the occurrence of non-homogeneous behavior of the soil under cyclic loading. Non-contact measurement is executed through image processing. Two-dimensional measurements were performed using Lucas and Kanade optical flow algorithm and it was implemented Labview. In this technique, the non-homogeneous deformation was monitored using a mirrorless camera. A mirrorless camera was used because it is economical and it has the capacity to take pictures at a fast rate. The camera was first calibrated to remove the distortion brought about the lens and the testing environment as well. Calibration was divided into 2 phases. The first phase was the calibration of the camera parameters and distortion caused by the lens. The second phase was to for eliminating the distortion brought about the triaxial plexiglass. A correction factor was established from this phase. A series of consolidated undrained cyclic triaxial test was performed using a coarse soil. The results from the non-contact measurement technique were compared to the measured deformation from the linear variable displacement transducer. It was observed that deformation was higher at the area where failure occurs.

**Keywords :** cyclic loading, non-contact measurement, non-homogeneous, optical flow

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