Investigation on 3-D Deformation of Granular Materials under Compression Using Electronic Speckle Pattern Interferometry

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Granular materials such as soil and sand are ubiquitous. Particle size and shape of granular materials has great influence on their mechanical behavior, such as compressibility, yield strength and permeability. In this research, uniaxial compression experiment is carried out on sands, to study deformation evolution and force transmission of granular materials, by using electronic speckle pattern interferometry (ESPI). The testing sample is the dense mixture of different size sand particles. Three dimensional (3-D) displacement information is obtained by the 3-CCD color camera and phase-shifting method. Three different color laser lights (in Red, Green and Blue) and only one PZT transducer are employed to measure three components of the displacement simultaneously. The average strain of sand particles is further acquired by the methods of digital shearing and phase filtering.

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