THE APPLICATION OF TACTILE PRESSURE SENSORS IN GEOTECHNICAL ENGINEERING

Principal Investigator: Samuel G. Paikowsky
Graduate Research Assistant: Christopher Palmer (M. Sc.)
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Granular materials are comprised of multiple discrete units. These materials touch every aspect of our lives including food (e.g. sugar, grains, cereals, and flour), industrial powders (e.g. coal, metal, glass, and fertilizers), chemicals, and pharmaceutical products. Construction materials (e.g. sand and cement) used in foundations, buildings, and dams are also granular materials. The measurement of stresses associated with these materials are of great importance in design and construction of industrial facilities and processes as well as having many civil engineering applications.

Recent advances in tactile sensor technology have produced very thin sensors allowing the measurement of pressure at a considerable number of points over a relatively large area. In the past, measurements of stresses acting within or on the surface of granular materials were possible only through the use of relatively large load cells. This method could provide only a limited number of average measurements. In addition, the use of load cells was complicated due to the interference of the measuring device with the load distribution within the material and hence the resulting measurement. The thin nature of the tactile pressure sensors greatly reduces the interference caused by the measuring element and allows for a more accurate recording of the actual pressures within and at the boundaries of granular materials.

This research focuses on the utilization of the tactile pressure technologies in the measurement of stresses associated with granular materials. Past research has focused mainly on the calibration of the sensors and exploring their difficulties and properties when used with granular materials. Further research will explore the following subjects:

-Contact stress distribution against a solid surface and within a granular mass.

-Element compressing against granular material (e.g. model of a shallow foundation).

-Granular material under one dimension compression.

-Soil/structure interaction over underground structures (e.g. tunnels).

-Classic physics/ stresses under a pile of sand. Classic physics/stresses under a pile of sand.