ON THE RESOLUTION OF A FUNDAMENTAL SOIL-STRUCTURE INTERACTION PROBLEM BY ELASTICITY

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The classical elasticity solution of a footing resting on an elastic half-space has been the cornerstone for the field of dynamic and static soil-structure interaction. When it is applied to granular soils in particular, however, a number of problems have been encountered. These include the observations that (i) the predicted contact stress distribution is vastly different from reality, (ii) the physical vertical response is contact pressure-dependent, (iii) the real coupled horizontal- rocking response is much softer than predicted, all happening even in small-amplitude motions. Attempts to handle and explain these problems include pre-supposing contact stress distributions that are uniform or parabolic instead of the classical square-root singular solution, adopting some adhoc rules to estimate a soil modulus, the assumption that the use of a depth dependent power-law modulus profile will provide a prediction improvement, and the proposal to use separate shear moduli for the same soil for different modes of vibration, all with limited success and fundamental criticisms. In this communication, the main conceptual flaws of these past approaches will be discussed and proved via the theory of elasticity.

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