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A BEM-FEM MODEL FOR DYNAMIC SOIL–STRUCTURE AND STRUCTURE–SOIL–STRUCTURE PROBLEMS IN ELASTIC OR POROELASTIC SOILS

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This work presents a time-harmonic BEM-FEM three–dimensional model for the dynamic analysis of structures founded on elastic and poroelastic soils. This model is suitable to study soil–structure and struture–soil–structure interaction problems, the effects of the torsional eccentricity of non-symmetrical structures or the influence in the response of the soil saturation level.

This model is a development of a previous (see for example [1]) multi-domain BEM code. This new version is able to consider perfectly rigid domains, the modelling of the superstructure using two-noded beam finite elements and the extension of the excitation model including a field of vertically–incident planar waves in poroelastic domains. In case of viscoelastic media, the incident field can be defined as SH, SV, P or Rayleigh waves with a general angle of incidence. Figure 1 shows a sketch of a group of four nearby buildings as an example of what can be studied using this model.

The foundation and soil domains can be modelled as elastic or Biot poroelastic media using boundary elements. When the hipothesys of infinite rigidity is applicable, it is possible to consider the foundation as a perfectly rigid domain applying compatibility and equilibrium at the soil-foundation interfaces (see [2]), yielding a considerable reduction in the number of degrees of freedom of the problem. The reference point of the rigid domain will be used for coupling the equations of motion of the superstructure to the system of equations that defines the behavior of the soil and the foundation. The superstructure shear deformation and torsional eccentricity for non-symmetrical cases are included in the elemental stiffness matrix.

In short, the model presented in this paper is able to rigorously represent the essential aspects of the problem while being, at the same time, more versatile and computationally

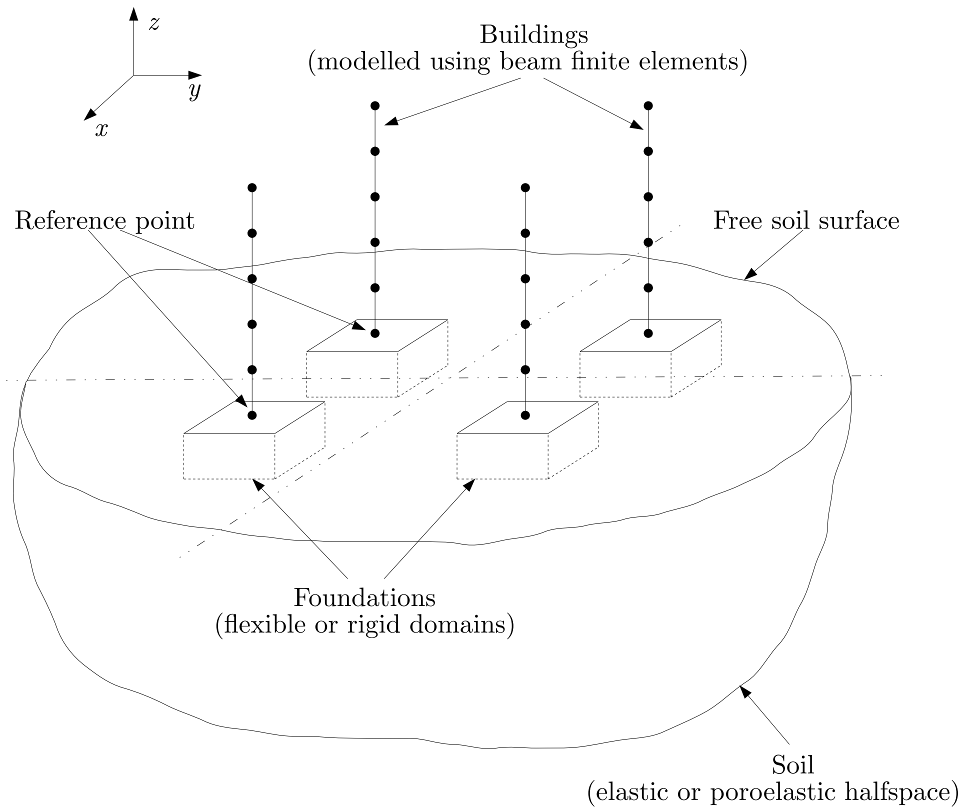

Figure 1: Example of application. Group of four nearby buildings.

efficient than the previous version of the code. The model could be used to address problems involving several buildings, wind turbines or other type of structures.

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