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Design of raft-pile foundation using combined optimization and finite element approach.
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Summary: This paper describes the application of a structural optimization approach combined with the finite element method for the optimal design of a raft-pile foundation system. The analysis takes into account the nonlinear behaviour of the soil medium and the piles. For the optimization process, the sensitivity analysis is carried out using the approximate semi-analytical method, while the constraint approximation is obtained from the combination of extended bi-point and Lagrangian polynomial approximation methods. The objective function of the problem is the cost of the foundation. The design variables are the raft thickness, cross-section, length and number of piles. The maximum displacement and differential displacement are selected as the constraints. The proposed method is shown to be efficient and accurate.

MSC:

[74L10](#) Soil and rock mechanics

[74P10](#) Optimization of other properties in solid mechanics

[74S05](#) Finite element methods applied to problems in solid mechanics

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Keywords:

structural optimization; finite element method; raft-pile foundation; sensitivity analysis; approximate semi-analytical method; constraint approximation; Lagrangian polynomial approximation

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