Valliappan, S.; **Tandjiria, V.**; **Khalili, N.**
Design of raft-pile foundation using combined optimization and finite element approach.
(English) [Zbl 0973.74051]

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	Cited in **1** Document
74P10	Optimization of other properties in solid mechanics	
74S05	Finite element methods applied to problems in solid mechanics	

Keywords:

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

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References:

[1] Cohn, J. Struct Engng. 120 pp 617– (1994)

[2] Chow, Comput. Geotech. 4 pp 43– (1987)

[3] Hoback, Eng. Struct. 15 pp 379– (1993)

[4] and , 'Optimal design of raft-pile foundation', Proc. 3rd Asian-Pacific Conf. on Computational Mechanics, Seoul, 1996, pp. 547-552.

[5] and , 'Optimization of raft-pile foundation system', Proc. 2nd China Australia Symposium Computational Mechanics, Sydney, 1997, pp. 195-204.

[6] Lasdon, ACM Transactions on Math. Software 4 pp 34– (1978)

[7] and , The Finite Element Method: Solid and Fluid Mechanics Dynamics and Fluid Mechanics, Vol. 2, 4th edn., McGraw-Hill Book Company, London, 1991.

[8] Introduction to Optimum Design, McGraw-Hill Book Company, New York, 1989.

[9] Imam, Int. J. Numer. Meth. Engng. 18 pp 661– (1982)

[10] Valliappan, Commun. Numer. Meth. Engng. 13 pp 999– (1997)

[11] Commercial Industrial Building Cost Guide New South Wales June 1995, Cordell Building Information Services, Sydney, 1995.

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