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Relationships of LA theorems for NRT structures by means of duality

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Abstract

The paper refers to previous works developed by the authors, dealing with the possibility of applying duality theorems to non-linear programs coming out from limit analysis (LA) of structures made by not resisting tension (NRT) or no-tension material. Under such perspective, after setting up the static or kinematic LA problem for NRT structures, the main task, for duality theorems to be applicable, is to demonstrate some convexity-related properties of the involved functions and domains. This feature, which is of basic importance for the whole procedure, is not trivial since all of the required conditions are to be accurately checked by analytical developments. Application of duality is finally demonstrated to give a complete and clear interpretation from a physical point of view about relationships relevant to LA approaches. © 2005 Elsevier Ltd. All rights reserved.

Author keywords
Convexity; Duality; Limit analysis; Non-linear programming; NRT material; Structural analysis

Indexed keywords
Engineering controlled terms: Bearing capacity; Finite element method; Mathematical models; Matrix algebra; Nonlinear programming; Optimization; Structural loads
Engineering uncontrolled terms: Convexity properties; Duality theorems; Limit analysis (LA) theory; Not resisting tension (NRT) material
Engineering main heading: Structural analysis
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Under such perspective, after setting up the static or kinematic LA problem for NRT structures, the main task, for duality theorems to be applicable, is to demonstrate some convexity-related properties of the involved functions and domains.

This feature, which is of basic importance for the whole procedure, is not trivial since all of the required conditions are to be accurately checked by analytical developments.

Application of duality is finally demonstrated to give a complete and clear interpretation from a physical point of view about relationships relevant to LA approaches.

Keywords
Structural analysis; NRT material; Duality; Non-linear programming; Limit analysis; convexity

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