

Instituto de Engenharia de Sistemas e Computadores de Coimbra
Institute of Systems Engineering and Computers
INESC - Coimbra

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No.5

2006

ISSN: 1645-2631

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An effective algorithm for obtaining minimal cost pairs of disjoint paths with dual arc costs

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Abstract

Routing optimisation in some types of networks requires the calculation of the minimal cost pair of disjoint paths such that the cost functions associated with the arcs in the two paths are different.

In the first part of this report an exact algorithm for solving this NP-complete problem is proposed. A formal proof of the correctness of the algorithm is presented. Extensive experimentation is presented to show the effectiveness of this algorithm: most solutions are optimal and are calculated very quickly; only a very small fraction of the solutions is sub-optimal. In real time applications this algorithm can be modified to ensure that a solution (that is either optimal or sub-optimal) is obtained in a bounded CPU time.

In the second part of this report it is shown that the previous algorithm can be extended to collect all the minimal cost pair of disjoint paths. A proof of the correctness of this extension is presented. Experimental results are shown for directed networks.

Keywords OR in telecommunications, paths with minimal cost sum, dual arc costs, disjoint paths

Part of this work is presently submitted for publication.

⁰Work partially supported by programme POSI of the III EC programme cosponsored by FEDER and national funds.