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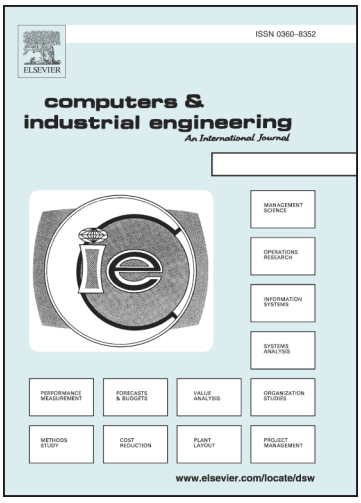

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A non-time segmented modeling for air-traffic flow management problem with speed dependent fuel consumption formulation

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ABSTRACT

Aircraft en-route flight planning is one of the major challenges for Air Traffic Control operations. Poor planning results in undesirable congestion in the air-traffic network, causing major economic losses for both airline companies and the public. Furthermore, heavy congestion generates flight safety risks due to increased possibility of mid-air conflict. To address these problems, this paper introduces a non-time segmented en-route flight plan formulation with rerouting options for aircrafts in a 3-dimensional (3D) capacitated airspace. Novelty of the proposed mathematical model is the non-time segmented formulation that captures exact arrival and departure times to/from each air-sector. The proposed formulation also incorporates sector capacity changes due to changing weather conditions during planning horizon. Moreover, the speed dependent fuel consumption rate is introduced as a factor in the zone-based air traffic flow management problem. In order to handle the problem sizes similar to those in real-world cases, we proposed a sequential solution heuristics. The performance of the sequential solution method is demonstrated through various test cases.

Keywords: Air traffic flow management; non-time segmented formulation; conflict-free flight; re-routing; fuel consumption; dynamic air-sector capacity