Alonso-Ayuso, Antonio; **Escudero, Laureano F.**; **Martín-Campo, F. Javier**

A mixed 0-1 nonlinear optimization model and algorithmic approach for the collision avoidance in ATM: velocity changes through a time horizon. (English) Zbl 1349.90641

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Summary: In this paper a mixed 0-1 nonlinear model for the Collision Avoidance problem in Air Traffic Management is presented. The aim of the problem consists of deciding the best strategy for an arbitrary aircraft configuration such that all conflicts in the airspace are avoided where a conflict is the loss of the minimum safety distance that two aircraft have to keep in their flight plans. The optimization model is based on geometric constructions. It requires knowing the initial flight plan (coordinates, angles and velocities in each period). The objective is the minimization of the acceleration variations when the aircraft are forced to return to the original flight plan once there is no aircraft in conflict. A linear approximation by using iteratively Taylor polynomials is presented to solve the problem in mixed 0-1 linear terms. An extensive computational experience for a testbed of large-scale instances is reported.

MSC:

90C11 Mixed integer programming
90C30 Nonlinear programming
90B20 Traffic problems in operations research
90C10 Integer programming
90C90 Applications of mathematical programming

Keywords:

Air Traffic Management (ATM); collision avoidance; mixed 0-1 nonlinear optimization; Taylor approximations

Software:

CPLEX

Full Text: DOI

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