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管制区短期空中交通流量管理的时隙-航线分配模型及算法

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Time-route Assignment Model and Algorithm for Short-term Area Traffic Flow Management

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摘要

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摘要

对管制区短期流量管理问题进行了研究,针对现有模型在约束条件和控制方法中的不足,不仅首次引入了流量控制事件的概念和相应的约束条件,而且在使用动态网络流理论建立了管制区短期空中交通流量管理模型过程中,还新增加了飞行高度层这一决策变量,使本文提出的时隙-航线分配模型与中国管制工作实际更加吻合。算例中采用中国华东空管中心实施的流量控制的真实数据,采用模拟退火遗传算法对其进行求解,求解结论直观、明确、可操作性强。仿真结果验证了模型及其求解方法的有效性和实用性。

关键词: 区域流量管理 空中交通流量管理 时隙-航线分配 动态网络流 遗传算法

Abstract:

In view of the weaknesses of current short-term area traffic flow management models in constraint conditions and control methods, a new concept and its corresponding constraint conditions of flow control events are established. In addition, based on dynamic network flow theory, a time route assignment model with flight level decision parameters for short-term area traffic flow management is proposed to meet the need of Chinese air traffic flow management (ATFM) work. Simulated annealing genetic algorithm is applied to seek the solution of the model, which is intuitionistic and explicit for the air traffic controllers. The model is then verified by real operational data from a flow control event that occurred in the East China air traffic control (ATC) center. The computational results indicate that the model and solving method are feasible and effective.

Keywords: area traffic flow management air traffic flow management time-route assignment dynamic network flow genetic algorithms

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