

Multi-objective genetic algorithms for flights amalgamation problem

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Abstract

Within the airline, any disturbance to normal operations has a dramatic impact, and usually imposes high additional costs. Because of irregular events during daily operations. When disruptions occur, flight schedules are affected due to the resulting infeasible flight schedule and improper assignments. Therefore, airlines need to recover disrupted schedule as soon as possible and minimize the extra cost as well as the impact on the airline image and customer satisfaction.

Approaches such as linear programming, network modeling, greedy heuristics and decisions support systems are well-known approaches in solving irregular airline operation problem. This paper presents an alternative approach based on Multi Objective Genetic Algorithm. The aim of this research is to introduce the concept of Genetic Algorithm as a tool to solve irregular airline operation, amalgamation problem and monitor the reasons of schedule disruptions. The proposed model could obtain optimal solutions within seconds based on real data from medium airline case.

Keywords: IAO; irregular airline operation; flights amalgamation; genetic algorithm; multi-objective optimization.

Published In: International Journal of Computer Applications in Technology

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Real-time aircraft turnaround operations manager

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Abstract

Aircraft turnaround operations are the activities conducted to prepare an inbound aircraft at an airport for a following outbound flight that is scheduled for the same aircraft. The activities of aircraft turnaround operations include both the inbound and outbound exchanges of passengers, crew, catering services, cargo and baggage handling. Hence, appears the importance of following up on all activities done during the aircraft turnaround stage to deliver the true picture to the airline operation control centre (OCC) automatically. This enables the OCC to take quick and proper decisions regarding how to face any obstacles to flight punctuality, determine responsibilities and evaluate performances in regard to all activities. These control and evaluation activities occur, at the present, using manual methods and telephone communications, which lead to unreliable data and delays. The data become more doubtful due to interference of the human factor and the necessity to monitor flights preparation. Our solution to these problems is to present the airline flight preparation management process during the aircraft turnaround and design and implement a rule-based system called Flight Activities Progressions System that is used to manage and monitor the flights preparation during the turnaround. Mobile computing devices, portable handsets and the wireless network technology General Packet Radio Service are used to implement the real-time system for an airline. The Project Evaluation and Review Technique (PERT) and Critical Path Method are modelled in the system. The goals of using PERT are to evaluate and improve the efficiency of airline operational procedures and to improve the efficiency of airline ground activities allocation. The system implementation results indicate that real-time operation can potentially reduce delays occurring from airline operations and optimise the aircraft ground stop time.

Keywords: Airline operation; aircraft turnaround process; flight management; delay propagation; real-time monitoring.

Published In: Production Planning & Control

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Real-Time Management System for Airline Operations

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Abstract

Through the day of operations Control Center (OCC) in an airline monitors all the flights checking if they follow the schedule that was previously defined by other areas of the company. Some problems may arise during this stage related with crew members, aircrafts and passengers. OCC includes teams of experts specialized in solving the above problems, seeking for solutions that minimize the negative impact on passengers, at the same time, minimizing the operational costs. This paper proposes a system that represents and handles all the OCC teams' actions, the coordination and negotiation processes between all OCC members to solve the schedule disruptions allowing them to take faster and better decisions. It shows how such a system can be designed using an object-Oriented and software engineering methodology and presents the implementation of the system in a real airline company, using widely available tools for airline professionals. The proposed system called BAMS (Broadcast Actions and Management System) and its implementation results indicate that real-time operation monitoring can potentially reduce delays and costs occurring from airline operations and measure the robustness of the airline schedule and the reasons of interruptions.

Keywords: Airline Operation, Flight Management, Delay Propagation; Real-Time Management System.

Published In : International Review on Computers and Software (I.RE.CO.S.)

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