A New Approach for Disruption Management in Airline Operations Control

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The relevance of this book is mainly to show how the multi-agent system paradigm can be used to solve a very relevant real life real size problem. The book introduces a new concept for disruption management in current Airline Operations Control Centers, taking into account their organization, tools, problems, methods and costs. Most of the research efforts dealing with airline scheduling have been done through off-line plan optimization methods. However, nowadays, with the increasingly complex and huge traffic at airports, the real challenge is how to react to unexpected events that may cause plan disruptions, leading to flight delays.

Moreover these disruptive events usually affect at least three different dimensions of the situation: the aircraft assigned to the flight, the crew assignment and, often forgotten, the passengers’ journey and satisfaction.

This book includes answers to this challenge and proposes the use of the Multi-agent System paradigm to rapidly compose a multi-faceted solution to the disruptive event taking into consideration possible preferences of those three key aspects of the problem.

Figure 1. M ASDIMA user interface displaying, on the left, problems encountered and proposed solutions, including costs and, on the right, flights being monitored by the system. On top right we may access relevant information for each dimension (Aircraft, Crew, Pax) of selected flights.
Negotiation protocols taking place between agents that are experts in solving the different problem dimensions (regarding aircrafts, crew and passengers), combination of different utility functions and, not less important, the inclusion of the human in the automatic decision-making loop make MASDIMA, the system described in this book, well suited for real-life plan-disruption management applications.

Antonio Castro was born in 1965 in Porto, Portugal and studied at Porto Polytechnic Engineering Institute where he got his degree in Information Systems Engineering in 1997. In 2007 he got his Master Degree in Artificial Intelligence and Intelligent Systems from the Faculty of Engineering, University of Porto and the Ph.D. in Computer Engineering from the same institution in 2013. Additionally, he has a postgraduate course in Air Transport Operations from ISEC in 2008. Antonio works for TAP Portugal since 1990 and currently he is a Board Advisor for IT/IS projects and responsible for projects related with airline operations control. Antonio is also the CEO of MASDIMA (http://www.masdima.com), a start-up company created together with two other colleagues, from the research made during his Ph.D. where a Multi-Agent System for Disruption Management applied to Airline Operations Control was proposed, that includes the passenger point of view in the Irregular Operations Management Process (IROPs).

Ana Paula Rocha got her degree in Electrical and Computers Engineering at the University of Porto in 1990. She got her Ph.D. in Computer Engineering from the same institution in 2002. Currently, she is Auxiliary Professor at the Department of Informatics Engineering, University of Porto. She participated in European as well as national funded projects concerning the use of intelligent agents advanced features for applications. Her main current research topics of interest include Agent-based frameworks for B2B, Multi-Agent Learning, Negotiation, Argumentation and Trust. She was co-organizer of Artificial Intelligence and Multi Agent Systems related workshops. She is member of DAIAS (Distributed Artificial Intelligence and Agent-based Simulation) group at LIACC (Laboratory of Artificial Intelligence and Computer Science) since 1990. She is also member of APPIA (Portuguese Association for Artificial Intelligence).

Eugénio Oliveira is full professor at the University of Porto, Faculty of Engineering. He is director of the Doctoral Program in Informatics Engineering and Coordinator of the scientific research AI Lab (LIACC). He got his Ph.D. in 1984 at the New University of Lisbon in Logic Programming for Knowledge-based Systems. He was Guest Academic at IBM-IEC, La Hulpe, in 84-85. He was, during several sabbatical terms, at the University of London (QMWC), University of Nice, University of Utrecht, URJC (Madrid) and INPG (Grenoble). He was awarded with Gulbenkian Prize for Science and Technology. His main interests are on Distributed Artificial Intelligence, Multi-agent Systems, Trust And Reputation models and Text Mining. He supervised more than 20 Ph.D. students in these mentioned subjects.