■ TC59

59- Phoenix West- Hyatt

Optimal Control Policies II

Sponsor: Applied Probability

Sponsored Session

Chair: Ananth Krishnamurthy, University of Wisconsin-Madison, 1513 University Avenue, ME 3258, Madison, WI, United States of America, ananth@engr.wisc.edu

1 - Optimal Control of an Intersection

Erjen Lefeber, Technische Universiteit Eindhoven, Eindhoven, 5600MB, Netherlands, A.A.J.Lefeber@tue.nl, Dirk van Zwieten

In this paper we present a method to determine an optimal periodic orbit for a fluid model describing an intersection of urban traffic. We first determine the set of feasible modes (clique problem), subsequently the possible sets of modes to use during a cycle, then the sequence of modes (traveling salesman problem), and finally the duration of each mode (quadratic program). We apply this method to a crowded intersection in the city of Eindhoven.

2 - Optimal Harvesting Policies to Control Batch-to-batch Variability in Bioreactors

Tugce Martagan, University of Wisconsin-Madison, 1550 Engineering Drive, Engineering Cent, Madison, WI, 53706, United States of America, martagan@wisc.edu

Controlling batch-to-batch variability presents a significant challenge in biomanufacturing processes. In this paper, we model upstream biomanufacturing operations using Markov Decision Process model, and identify optimum harvesting policies to minimize expected cost in the presence of batch-to-batch variability. We subsequently assess the robustness of these policies to manufacturing uncertainties.

3 - Optimal Control of a Two-server Queueing System with Breakdowns

Jeffrey Kharoufeh, Associate Professor, University of Pittsburgh, Department of Industrial Engineering, 1048 Benedum Hall, 3700 O'Hara Street, Pittsburgh, PA, 15261, United States of America, jkharouf@pitt.edu, Erhun Ozkan

We consider controlling a two-server Markovian queueing system with heterogeneous servers, at least one of which is unreliable. Our objective is to dynamically route customers at arrival, failure, and repair epochs to minimize the long-run average number of customers in the system. We show the existence of an optimal threshold-type policy that depends on the number in queue and the status of the servers.

■ TC60

60- Remington- Hyatt

Impacts of Environmental and Quality Programs in the Airline Industry

Sponsor: Aviation Applications

Sponsored Session

Chair: Kushal A. Moolchandani, Purdue University, School of Aeronautics and Astronautics, 701 W. Stadium Avenue, West Lafayette, IN, United States of America, kmoolcha@purdue.edu

1 - Assessing the U.S. Aviation Environmental Impacts using a Duopoly Airlines Model

Kushal A. Moolchandani, Purdue University, School of Aeronautics and Astronautics, 701 W. Stadium Avenue, West Lafayette, IN, United States of America, kmoolcha@purdue.edu, Satadru Roy, Datu B. Agusdinata, Muharrem Mane, Daniel DeLaurentis, William Crossley

The operations of legacy and low-cost carriers in the U.S are simulated under various scenarios of economic conditions and policy implementations. The duopoly model is solved as a resource allocation set up to maximize airlines' profit while meeting market demand. This work also incorporates the ability to model airlines' decisions on retirement and acquisition of aircraft. This study helps assess the resulting emissions and noise impacts and could inform technological development and formulation of policies intended to reduce them.

2 - Impacts of Deploying Six Sigma Quality Control in Airline Operations

Ramesh Bollapragada, Professor, College of Business, San Francisco State University, 1600 Holloway Avenue, San Francisco, CA, 94132, United States of America, rameshb@sfsu.edu, Vivian Chan

The purpose of the paper is to investigate the financial and operational benefits when deploying Six Sigma (SS) methodologies in airlines operations. The Six Sigma continuous improvement methodology DMAIC is used in this study. SS statistical calculations are used to measure the current performance of each critical metric involving operations processes within international and U.S. domestic airlines industry.

3 - Analysis of Economic and Environmental Impact of New Aircraft Concepts via Allocation and Scheduling

Isaac Tetzloff, Graduate Student, Purdue University, 701 W. Stadium Ave., West Lafayette, IN, 47907, United States of America, isaact@purdue.edu, William Crossley

Engineering analyses can predict emissions of new aircraft or technologies; however, evaluating their impact on airline profit and the environment at the fleet-level requires studying the interactions between the new aircraft and the airline's current fleet. Through the use of an aircraft allocation and scheduling tool, decisions on how to deploy new aircraft technologies and concepts within an airline's fleet are quickly made while considering both airline profit and environmental impact.

4 - Does EU ETS Instigate AirCargo Network Reconfiguration? A Model-based Analysis

Ulrich Derigs, Department of Information Systems and Operations Research (WINFORS), University of Cologne, Cologne, Germany, derigs@informatik.uni-koeln.de, Stefan Illing

From 2012 on aviation is included in the European Emissions Trading Scheme (EU ETS) and operators have to hold one allowance per tonne of CO2 emitted on every flight departing from and/or arriving at an airport within the EU. Now two questions are of interest: Is it profitable for airlines to reconfigure their routes to reduce EU-related emissions and costs, and, will the schema be successful in the sense that emissions are reduced significantly. Here the potential for and the consequences of reconfiguration are different for the passenger and cargo business, respectively. In this paper we present a model-based simulation of network (re-)configuration/optimization at cargo airlines under different EU ETS scenarios and we discuss the results with respect to the two issues raised above.

■ TC61

61- Russell- Hyatt

Patrolling Problems in Security

Cluster: Applications in Emergency Management and Terrorism Security

Invited Session

Chair: David Alderson, Operations Research Department, Naval Postgraduate School, Monterey, CA, United States of America, dlalders@nps.edu

1 - Game Theory for Security: Key Algorithmic Principles, Deployed Applications, Lessons Learned

Milind Tambe, University of Southern California, Los Angeles, CA, United States of America, tambe@usc.edu

We will provide an overview of key principles of several game-theoretic applications developed by my research team at USC that are now deployed over multiple years with multiple security agencies: LAX police, Federal Air Marshals (FAMS), US coast guard in Boston and New York, and Los Angeles Sheriff Department.

2 - Security Games with Limited Surveillance

Bo An, University of Southern California, Los Angeles, CA, United States of America, boa@usc.edu, Yevgeniy Vorobeychik, David Kempe, Christopher Kiekintveld, Milind Tambe, Eric Shieh, Satinder Singh

We model the process of an attacker observing a sequence of resource allocation decisions and updating his beliefs about the defender's strategy. We present exact and approximate computational techniques for updating the attacker's beliefs and computing optimal strategies for both the attacker and defender, given a specific number of observations.