at time T, they sell it in a retail market at a stochastic clearance price. This price depends in part on the realization of some financial market in which the retailers can trade dynamically. We solve for the Nash equilibrium.

2 - Simulation of Sourcing Strategies for Platinum used in Catalytic Converters

Dave Gonsalvez, Professor, Zaragoza Logistics Center, Edificio Nayade 5, Calle Bari 55 Plaza, Zaragoza, 50197, Spain, dgonsalvez@zlc.edu.es, Federico Vargas, Mozart Menezes

About US$ 50-100 of platinum is used in each automotive catalytic converter. It is sourced through a complex mix of long term purchase contracts with mines, buy and hold inventory policies, spot market purchases and hedging strategies. This paper develops a model to compare total procurement costs with and without hedging strategies.

3 - A Financial Perspective on Inventory Holding Cost

Alejandro Serrano, Lecturer, Zaragoza Logistics Center, Edificio Nayade 5, C/ Bari 55 - Plaza, Zaragoza, 50197, Spain, aserrano@zlc.edu.es, Santiago Kraiselburd, Rogelio Oliva

We study what is the correct value for the financial portion of the holding cost in the EOQ and the (R,S) Models. Even when the firm undertakes additional investments, the WACC of the firm is not appropriate to compute the holding cost. Instead, in the deterministic case, the risk-free rate should be used, and in the random case, the holding cost should reflect the impact of the demand function and the systematic risk. We find that the difference in firm valuation is up by an average of 18%.

■ MC13

Aula 364- Third Floor

Uncertainty in Planning

Cluster: Supply Chain Management in Natural Resources
Invited Session

Chair: Mikael Rönnqvist, Professor, Norwegian School of Economics and Business, Helleveien 30, Bergen, 5045, Norway, mikael.ronnqvist@nhh.no

1 - Robust Inventory Planning at Södra Cell

Mikael Rönnqvist, Professor, Norwegian School of Economics and Business, Helleveien 30, Bergen, 5045, Norway, mikael.ronnqvist@nhh.no, Patrik Flisberg, Dick Carlsson

Södra cell is a major pulp producer and manage a distribution network with a set of ship terminals. From these terminals a large number of customers are served with pulp products. The inventory planning at the terminals is an important part as there are long transport times using ships and trains. We propose a robust optimization model to support these planning activities.

2 - Revenue Management in the Lumber Industry

Rodrigo Cambiaghi Azevedo, FORAC-CIRRELT, 1065, Rue de la Medecine, Quebec, G1V 0A6, Canada, rodrigo.cambiaghi@cirrelt.ca, Sophie D'Amours, Mikael Rönnqvist

In this presentation, we review revenue management approaches to support order promising decisions within a lumber company. The proposed application builds on allocated available-to-promise and real-time booking limits to optimize the process. It also takes into account quotas and tax to reflet the context of Canadian lumber producers. Results show that the adapted revenue management approaches improve the value chain performance compared to the observed first in first served approach.

3 - Robustness in Biofuel Planning

Mikael Rönnqvist, Professor, Norwegian School of Economics and Business, Helleveien 30, Bergen, 5045, Norway, mikael.ronnqvist@nhh.no, Mikael Frisk, Patrik Flisberg

We describe how robust optimization can be used to plan activities in the supply chain for biofuel heating plants. Heating plants have a uncertain demand in energy due to the weather. We compare robust optimization against a deterministic approach with safety stock levels. The result show that robust optimization is more efficient and provide more insights. Computational studies from Swedish case studies will be reported.

■ MC14

Aula 365- Third Floor

Joint Session – Game Theory/Telecommunications: Bandwidth and Quality

Cluster: Game Theory and its Applications
Invited Session

Chair: Alfredo Garcia, University of Virginia, Charlottesville, VA, United States of America, ag7s@virginia.edu

1 - Evaluating the Perceived Quality of Internet Audio Systems using Statistical Learning Techniques

Sebastián Basterrech, Inria/Rennes - Bretagne Atlantique, Rennes, 35700, France, sbasterr@irisa.fr, Gerardo Rubino

Audio quality in the Internet can be strongly affected by network conditions. Quality can be evaluated using panel of real users (subjective testing). Automatically, PESQ is a well-known procedure providing an accurate evaluation by comparing original and received sequences. We describe an alternative to PESQ which does no need the original sequence, based on the use of statistical learning techniques.

2 - Efficient and Fair Routing for Mesh Networks

Enrico Malaguti, DEIS - University of Bologna, Bologna, Italy, enrico.malaguti@unibo.it, Andrea Lodi, Nicolas Stier-Moses

We study how a mesh network should use the energy stored in its nodes. We explicitly aim at the solution that minimizes the total energy spent by the whole network, but since this might be unfair for some nodes, we add a fairness constraint, thus optimizing social welfare and keeping user needs as constraints. We look both at centralized and decentralized algorithms to solve this problem, and show how fairness can be obtained with a limited increase of total energy.

3 - Network Bandwidth Allocation and the Tragedy of the Commons

Fernando Paganini, Universidad Ort, Uruguay, paganini@ort.edu.uy

The tragedy of the commons is a situation where sharing free resources by selfish agents results in a degraded performance for all. The sharing of Internet bandwidth is prone to this pathology, since there is no usage charge at the short time-scale of network congestion. Network protocols avoid these issues through cooperation, but there are always incentives for selfish agents to deviate or circumvent them. We will give an overview of these issues with examples from contemporary networks.

■ MC15

Aula 351- Third Floor

Data Mining for Health Care

Sponsor: Data Mining:
Knowledge Discovery and Data Mining for Decision Making
Sponsored Session

Chair: Louis Duclos-Gosselin, Applied Mathematics (Predictive Analysis, Data Mining) Consultant at Sinapse, Sinapse & INFORMS Data Mining Section, 1170 Boul. Lebourgneuf, Bureau 320, Quebec, QC, G2K2E3, Canada, louis.gosselin@hotmail.com

1 - Using Multicriteria Methods to Estimate the Skeletal Maturity in Children with Normal Occlusion

Fernando Lopez, Professor, Universidad Autonoma de Nuevo Leon, Av. Universidad s/n, Cd. Universitaria, Fac. de Ing. Mecanica y Electrica, Monterrey, NL, 66450, Mexico, ferny@yalma.fime.uanl.mx, Rodolfo Garza, Luis Miguel Prado

Before to establish the best ortodontic treatment for a patient it's grow potential (skeletal maturity) should be estimated. In this work it is shown that it is convenient to model the problem of estimating the skeletal maturity as a multicriteria classification problem. Some empirical results are presented; different classifications methods are compared and their efficiency is analyzed.

2 - Healthcare and Public Health Surveillance, Simulation, and System Management

Kwok L. Tsui, Professor, Georgia Institute of Technology, Atlanta, GA, United States of America, ktsui@isye.gatech.edu

Advance in surveillance, simulation, and health management is presented. In health surveillance, we will review and classify the various types of health surveillance research problems. In simulation, we review the latest research in disease spread simulation models and hospital operation simulation models. In system management, we explore the opportunities for integrating surveillance, simulation, diagnostics, prognostics, data mining, and bioinformatics for personalized health management.

3 - Development of an Ontology-based Approach for Mapping High Digestive Endoscopy Medical Reports into Structured Databases
Carlos Andres Ferrero, Laboratório de Bioinformática, Universidade Estadual do Oeste do Paraná, Av. Tancredo Neves, 673, Foz do Iguaçu, PR, 85867900, Brazil, anfer86@gmail.com, Wu Feng Chung, Huei Diana Lee, Carlos Andres Ferrero, Cláudio Saddy Rodrigues Coy, João José Fagundes, Renato Bobsin Machado, Luiz Dutra Costa

Medical data is usually presented in textual unstructured medical reports - MR, but Data Mining methods apply only to structured data. In this paper, it's developed a method to map unstructured MR into an attribute-value table - AVT. An ontology is developed, along with specialists, to model patterns of a MR set which is further mapped by the ontology supported algorithm into an AVT. It was applied to 609 High Digestive Endoscopy MR and 100% of the defined attributes were correctly mapped.

■ MC16

Aula 385- Third Floor

Metaheuristics for Real-World Problems

Cluster: Metaheuristics
Invited Session

Chair: Claudio Meneses, Adjunct Professor, Universidade Federal de Goiás, Instituto de Informática, Goiania, GO, 74001970, Brazil, claudio@inf.ufg.br

1 - Node-depth Encoding - An Efficient Representation for Evolutionary Algorithms Applied to Network Design Problems
Telma de Lima, Federal University of Goias, Campus Samambaia - IMF1, Goiania, Brazil, telma.woerle@gmail.com, Alexandre Delbem

Network design problems (NDPs) involve several real problems. In order to solve the limitations of traditional algorithms for NDPs involving real world networks, meta-heuristics, as evolutionary algorithms (EAs), have been investigated. Recent researches have shown that appropriate data structures can improve EA performance when applied to NDPs. One of these data structures is the Node-depth Encoding (NDE). In general, the performance of EAs with NDE has presented relevant results for NDPs.

2 - Hybrid Metaheuristic for the Aircraft Rotation Problem
Lucidio Cabral, Professor, Federal University of Paraiba, Department of Computer Science, João Pessoa, PB, 58059900, Brazil, lucidiocabral@gmail.com, Gilberto Sousa Filho, Alexander Pinto, Daniel Ramos

The Aircraft Rotation Problem is one of the most important steps in the process of defining the operation of flights from an airline, it refers to the designation of each airplane available such that all planned flights are covered. The objective is to minimize the number of aircraft needed to cover these flights. We describe an algorithm based on GRASP using VNS as local search. Some computational results are presented for a real world problem at Rio-Sul Brazilian Airline.

3 - The One-dimensional Cutting Stock Problem with Usable Leftover. Mathematical Models, Metaheuristics and Parallel Programming on GPUs
Santiago Ravelo, INF/UFG, Campus II, Goiânia, Goiás, Brazil, Goiânia, Brazil, santiago_valdes_ravelo@yahoo.com, Maristela dos Santos, Claudio Meneses

We consider the one-dimensional cutting stock problem in wich the non-used material in the cutting patterns may be used in the future, if large enough. We analize the existing mathematical models and propose new models. Also we give a heuristic and two metaheuristic approaches, improving their performance by using parallel progamming on GPUs. We solve instances from the literature, practical and randomly generated instances, being the computational experiments quite good to all tested instances.

■ MC17

Aula 387- Third Floor

Using Metaheuristics to Solve Military Problems

Cluster: Metaheuristics
Invited Session

Chair: August Roesener, Assistant Professor of Operations Research, Air Force Institute of Technology, AFIT/ENS, Bldg 641, 2950 Hobson Way, Wright-Patterson AFB, OH, 45433, United States of America, August.Roesener@afit.edu

1 - A Hybrid Genetic Algorithm Approach to the Airlift Loading Problem with Insufficient Aircraft
Shane Hall, Assistant Professor, Air Force Institute of Technology, Department of Operational Sciences (ENS), 2950 Hobson Way, WPAFB, OH, 45433, United States of America, Shane.Hall@afit.edu, August Roesener

The Airlift Loading Problem with Insufficient Aircraft (ALPIA) is frequently faced by companies and governments conducting airlift missions. The ALPIA is a combination of assignment and packing problems; items are assigned to pallets which are to be loaded into an aircraft in a specific pallet position. These pallets are then packed in a manner to optimize both the pallet and aircraft characteristics. We present a hybrid genetic algorithm, called ALPIA-GA, to solve this problem.

2 - An Advanced Tabu Search Approach to the Mixed Payload Aircraft Loading Problem
August Roesener, Assistant Professor of Operations Research, Air Force Institute of Technology, AFIT/ENS, Bldg 641, 2950 Hobson Way, Wright-Patterson AFB, OH, 45433, United States of America, August.Roesener@afit.edu, James Moore, R. Larry Nance

This presentation details a new Tabu Search based two-dimensional bin packing algorithm which produces high quality solutions to the Mixed Payload Airlift Loading Problem. This algorithm surpasses previously conducted research because it can accommodate a mixture of pallets and rolling stock cargo (i.e. tanks, trucks, HMMMVs, etc.) while still maintaining aircraft feasibility with respect to aircraft center of balance, mandatory cargo separations, aircraft floor structural limitations, etc.

3 - Military OR in the Iraq Theater of Operations
Greg Parlier, Institute for Defense Analyses, 255 Avian Lane, Madison, AL, 35758, United States of America, gparlier@ida.org

This presentation provides an overview and observations on the organization, applications, challenges, and contributions of military operations research in the Iraq Theater of Operations (ITO) as United States Forces- Iraq (USF-I) transitions from a focus on counter-insurgency operations to stability operations, foreign internal defense, development, and governance capacity.

■ MC18

Aula 384- Third Floor

Transportation and Logistics III

Contributed Session

Chair: Kang-hung Yang, Assistant Professor, Chung Yuan Christian University, 200, Chung Pei Rd., Chung Li, 32023, Taiwan - ROC, kanghungyang@cycu.edu.tw

1 - Brazilian Port Performance in Operation Containers: A Multicriteria (MCDA) Approach
Armando G. Madeira Junior, PHD Candidate, Instituto Tecnológico de Aeronáutica - ITA, Praça Marechal Eduardo Gomes, 50, Vila das Acácias - CTA, São José dos Campos, 12.228-900, Brazil, madeira_ita@yahoo.com.br, Mischel Carmen Belderrain, Anderson R. Correia

The ports are the main elements to the flow of foreign trade to Brazil, is strategically important for the country due to regulation of the activity. To this end, this paper presents a model of performance evaluation for port container terminals based on multicriteria methodology. To reduce the size of the operational indicators was used multivariate technique of factor analysis. The proposed model proved to be satisfactory in the ordering of container terminals.

2 - Scheduling Pipe Layer Vessels using Tabu Search
Andre Mendes, Professor, University of São Paulo, Av. Prof Mello Moraes, 2231, Cidade Universitaria, São Paulo, SP, 05508-030, Brazil, andbergs@usp.br, Maciel Queiroz, Victor Moura

Pipe layer vessels play important role in the development of new offshore oil fields. These vessels are requested for laying pipes on the ocean floor and connecting them to other subsea structures. This is a variation of the unrelated parallel machine scheduling problem with weighted completion time. A tabu search heuristic is proposed for solving this problem, for a set of randomly generated instances, which were also solved by column generation.