2018 CYTED Workshop

29-30 November 2018, School of Industrial Engineering (UPM)
Madrid- Spain

Thursday 29 November 2018

Opening Session | 9:00- 9:30

By Javier Faulin (UPNA)

Session 1 | 9:30 - 11:00

Chair: Antonio Mauttone (U. Republica)

A route optimization for SSS in the north of Europe. **Rosa Rios (UdC)**

Abstract. Short sea shipping can be an alternative to the intensive use of the road for freight transport, especially in Europe. Therefore, in this work we intend to use optimization methods for the definition of a shipping route capable of being economically viable, compared to road alternative. The optimization searches the number of ports, the order of supply and the fare that make it economically profitable. In order to study the profitably, the optimization algorithm uses the Net present value evaluation. In this presentation, first step of the model will be presented, joint with the optimization model.

An integrated robust method to solve the Fleet Balancing and Update of Scheduling under Demand Uncertainty problem. **Raul de Celis (URJC)**

Abstract. The arrangement of choices needed to obtain an operational flight planning is known as the Airline schedule planning problem. Because of tractability issues these days, it is difficult to determine an operative and optimal schedule with an integrated model which accounts every key airline related aspects. Authors propose a mathematical model to update schedules in terms of timetable and fleet assignments where robust itineraries are introduced to manage miss-connected passengers, while considering stochastic demand figures and uncertain operating conditions. A novel improved and accelerated Benders decomposition approach is proposed to solve the large-scale problem which is hard to be fathomed.

A parallel machine problem with eligibility, release and queue times of the jobs. **Manel Mateo (UPC)**

Abstract. Based on a real-life problem, a model with m parallel machines, each one with different level of quality, is presented. The set of jobs to be scheduled are also distributed among the same m levels. A job, from a level, can be manufactured in a machine of the same or higher level. But a penalty, depending on the assigned level, appears. Besides, there are release and queue times associated to each job. The problem is bi-objective with two criteria: minimum final date (the maximum for all the jobs of their completion time plus the queue time) and minimum total penalty generated by the jobs. The sub-problem of minimum final date on a single machine for jobs with release and queue times is first analysed. Next, an algorithm is proposed to approximate the set of efficient solutions and the Pareto front. This algorithm is composed of a depth search phase and a backtracking phase.

Modelling Turns in Transit Network Design. **Antonio Mauttone (U. Republica)**

We study the influence of turns over bus transit routes. Turns affect both user and operator cost, by increasing travel time. We compute turning costs at nodes by considering the length of the external arc defined by the three nodes involved in the turn. The trade-off between considering few routes with many turns vs. many routes with few turns is explored by applying the model to different cases, involving systems which comprise from 13 to 130 bus lines. Particularly, it is shown that hidden turning costs increase the real cost of optimal bus routes which are computed by ignoring turns.

Coffee Break | 11:00 - 11:30

Session 2 | 11:30 - 13:00

Chair: Joao P. Pedroso (U. Oporto)

Stochastic Optimization for Locating a Biorefinery in Navarre (Spain). **Adrian Serrano-Hernandez (UPNA)**

Abstract. This work presents a case study in which a biorefinery has to be sited in Navarre, Spain, considering uncertainty in prices and biomass availabilities. Stochastic optimization is presented as a multistage scenario tree, which is composed of strategic nodes and operational nodes. Furthermore, combinations of strategic nodes conform strategic scenarios while each operational node, which is rooted in a strategic node, represents an operational scenario. Finally, biorefinery stochastic optimization is achieved by solving a mixed integer linear programming model.

Promising results are obtained at strategic (location of the plant), tactical (location of warehouses), and operational (biomass purchase management) levels which clearly differ from the deterministic version of the problem.

Matheuristics for a routing in a courier company. **Guillermo Gonzalez (Baobab S.L.)**

Abstract. A matheuristic approach has been used to obtain near-optimal distribution routes of a corurier courier company. Different approaches to solve the model have been explored, combining MIP models, a greedy savings algorithm based on Clarke and Wright. The solving methology, initially devised to address a time horizon of a single day, has been extended a address a whole weekly with different types of demand days (computing saving when a route is used several days within the same week).

Stochastic last-mile delivery with crowdshipping. **Joao P. Pedroso (U. Oporto)**

Abstract. Sustainability concerns and the growth of e-commerce in recent years put pressure on companies dealing with last-mile delivery -- the last stage of the supply chain, where a parcel is delivered to the final consumer -- to develop new business models, for addressing issues in traffic congestion and pollution emission and still achieve fast, cheap and reliable delivery to customers. The aim of this work is to tackle the vehicle routing problem with casual carriers with a stochastic approach. We informally describe the model, propose a heuristic method, and delineate a prototype implementation for a dynamic compensation scheme in a last-mile delivery system with crowdshipping.

Lunch | 13:00 - 14:30

Session 3 | 14:30 - 16:00

Chair: Priscila Machado (UFRJ)

Combining forecast and mathematical optimization methods for the automation of replenishment orders. **Luis Pita (Baobab S.L.)**

Abstract. This is real-world case where the combination of a forecast model and a mathematical (MIP) model is used to generate replenishment orders for the points of sale of a company, reducing the distribution cost meanwhile adjusting the stock level to the desired value. The approach considers combined orders to serve two or three predefined sets of locations. This existing model could be extended to search close points of sale to replenish them on the same route, beyond the predefined ones.

Addressing aggregation errors in location models. **Carolina Castañeda (UPF)**

Abstract. Large and discrete location problems are time consuming or intractable, in terms of traditional solution methods, due to the presence of a large number of demand points, that usually are aggregated to obtain smaller models. This aggregation introduces errors in the solution and produces inaccurate values of the objective function and decision variables. We propose a heuristic framework that integrates the reduction of aggregation error and the solution of classical location models in networks. Solving large location problems accurately provides valuable support in decision making processes and has recognized application in many real-world systems in public and private sectors.

Automatic crime report classification with weightless neural networks. **Priscila Machado (UFRJ)**

Abstract. Anonymous crime reporting is a tool that helps to reduce and prevent crime occurrences and that can also influence urban logistics. The classification of the crime reports received by a call center is necessary for the data organization and also to stipulate the importance of a particular report and its relation to others. The objective of this study was to determinate if a weightless neural network could be used for anonymous crime reports classification and for the development of a system that assists the call center's operator by recommending classification to new reports. The system used a weightless neural network that automatically attributed a class to a report. Experiments showed the feasibility of the technique.

Coffee Break | 16:00 - 16:30

Session 4 | 16:30 - 18:00

Chair: Scott Grasman (Kettering U.)

Understanding travelers' behaviour through Big Data. **Gines Leon (TiTSA S.A.)**

Abstract. Too many people are moving at the same time everyday, specifically to go to work and to school. Most times they use their personal vehicle, and so this create truly traffic problems. It is not easy to solve this problem, but technology and Big Data could help. If we want to succeed, we really need to stop using the personal vehicle, and start using other alternatives to move. Big Data can help us to understand travelers' behaviour and to find a smarter and more elegant solution through movement patterns.

Multi-Criteria Approaches for Green Logistics in Food Distribution Companies. **Bartosz Sawik (AGH) & Elena Perez (UPVal)**

Abstract. This research presents multi-criteria approaches for green vehicle routing problems. The problems deal with green logistic for four food distribution companies. First one is located in Poland, second on is operating in Spain, third in Germany and fourth in Great Britain. Several criteria related with G-VRP model are taken into consideration and validation. Implemented multi-criteria approaches are responsible for finding optimal routes with consideration of the travelled distance by the running vehicles, the minimization of the negative environmental impacts caused by the fuel consumption, carbon emission and noise. Optimal number of trucks essential for fulfilling the demand is also considered.

Kettering University: The Future of Education Built a Century Ago. **Scott Grasman (Kettering U.)**

Abstract. Kettering University is a national leader in experiential STEM education, integrating an intense academic curriculum with applied professional experience. Through this proven approach students are inspired to realize their potential and advance their ideas by combining theory and practice. Kettering University is dedicated to achieving the extraordinary through technological innovation, leadership and service, built on values that foster respect, integrity, creativity, collaboration and excellence in growth, global leadership, community outreach and an engaged community of stakeholders. This talk will highlight the 100-year history of Kettering University, focusing on unique aspects of its teaching/learning model. In addition, opportunities to form partnerships for collaborative research/scholarship, along with student, faculty, and staff exchange will be presented.

Friday 30 November 2018

Keynote Session | 9:30 - 10:30

Chair: Javier Faulin (UPNA)

Richer modelling of logistics problems using spatial data. **Peter Keenan (UCD)**

Abstract. Modern business needs to increasingly incorporate distribution strategies which combine multiple objectives, both and economic efficiency and broader objectives such as sustainability. These objectives require specific data about business operations in addition to spatial data on the geographic area of operation of the business. Business in different sectors will operate in the same geographic area and will benefit from the availability of information on this region. Spatial data is now available in greater quantities at a lower cost than before and the integration of modern modelling algorithms with Geographic Information Systems (GIS) facilitate addressing more complex logistics problems than before.

Coffee Break | 10:30 - 11:00

Session 5 | 11:00 - 12:30

Chair: Jose A. Moreno (ULL)

Decision support for e-grocery operations facilitating consumer preferences and product shelf life data. **Christian Fikar (WU)**

Abstract. This work presents a simulation and optimization-based decision support system to assist setting up e-grocery operations. The focus is on store-based delivery of fresh fruits and vegetables to customers' premises. An agent-based simulation generates demand throughout multiple weeks of operations based on results of a study surveying preferences of over 400 urban consumers. Integrated dynamic vehicle routing procedures and food quality models plan delivery routes and estimate products' shelf lives depending on storage duration and temperatures. Performed computational experiments investigate the impact of providing customers varying service offers on food waste, customer satisfaction and travel distances to facilitate sustainable operations.

Assessing business rules in routing decisions. **Adela Pages (UdL)**

Abstract. The efficient delivery of physical goods is a complex decision making problem. Many companies however rely on experience to decide how to plan the route to the different customers. In this work we analyse the effect of considering several business rules, such as partitioning the customers by amount of demand, and we compare it to the optimal routes with respect to distance or time. The optimization model is based on a Capacitated Vehicle Routing Problem with Asymmetric costs and Time Windows. The study is performed for a company delivering dairy products in Chile.

Integrated Design and Scheduling of Flexible Manufacturing Plants in the shipbuilding industry: A MILP-based Decomposition Algorithm and Case Studies. **Carlos Mendez (INTEC (UNL-CONICET))**

Abstract. This work introduces a new decomposition strategy based on a mixed integer-linear programming (MILP) formulation to the integrated design and scheduling of flexible manufacturing plants with multipurpose units and multiple assembly operations in the shipbuilding industry. The main goal is to efficiently generate the best schedule that minimizes the makespan by simultaneously considering the full set of units and alternative plant configuration. Due to the inherent combinatorial complexity of real-world industrial problems, the rigorous optimization approach often results into large model sizes involving a high computational burden. To overcome this drawback, we propose a very efficient MILP-based iterative procedure to obtain near-optimal solutions for large-size problems with acceptable CPU time effort by applying multiple iterative rescheduling actions.

Intelligent Eco-efficient Waste Collection in La Palma Island. **Jose A. Moreno (ULL)**

Abstract. The current collection of blue and yellow portions of reciclable waste is improved by applying an intelligent approach that combines the use of historic data on the collection levels in every container and a metaeuristic optimization procedure for the dairy route optimization in a multiple days planning horizon taking into account real constraints and several eco efficiency quality indicators provided by the waste managers.

Closing Session and Discussion | 12:30 - 13:00

Lunch | 13:00 - 14:30

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9:00	9:30	**Opening Session**	
9:30	10:00	**Session 1; Chair: Antonio Mauttone (UR)** Rosa Rios (UdC) Raul de Celis (URJC) Manel Mateo (UPC) Antonio Mauttone (U. Republica)	Chair: Javier Faulin (UPNA) **Keynote: Peter Keenan (UCD)**
10:00	10:30		
10:30	11:00		**Coffee Break**
11:00	11:30	**Coffee Break**	**Session 5; Chair: Jose A. Moreno (ULL)** Christian Fikar (WU) Adela Pages (UdL) Carlos Mendez (INTEC (UNL-CONICET)) Jose A. Moreno (ULL)
11:30	12:.00	**Session 2; Chair: Joao P. Pedroso (UO)** Adrian Serrano Hernandez (UPNA) Guillermo Gonzalez (Baobab S.L.) Joao P. Pedroso (U. Oporto)	
12:00	12:30		
12:30	13:00		**Closing Session**
13:00	13:30	**Lunch**	
13:30	14:00		
14:00	14:30		
14:30	15:00	**Session 3; Chair: Priscila M. (UFRJ)** Luis Pita (Baobab S.L.) Carolina Castañeda (UPF) Priscila Machado (UFRJ)	
15:00	15:30		
15:30	16:00		
16:00	16:30	**Coffee Break**	
16:30	17:00	**Session 4; Chair: Scott Grasman (KU)** Gines Leon (TiTSA S.A.) Bartosz Sawik (AGH) & Elena Perez (UPVal) Scott Grasman (Kettering U.)	
17:00	17:30		
17:30	18:00		

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