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Continuous, Discrete and Stochastic Optimization

Branch and cut method for solving integer indefinite quadratic bilevel programs

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The paper tackles a class of bilevel programming where the leader's problem and the follower's problem are integer indefinite quadratic programs. A new algorithm is proposed to solve the relaxed problem, then a branch and bound technique is applied to find an optimal integer solution for the leader's problem. If this solution is not optimal for the follower's problem a corresponding cut is built and added to the leader's problem and a new best integer solution is determined. After the presentation and validation of the algorithm, a small example is provided to visualize this algorithm.

Keywords: *Bilevel Programming, indefinite quadratic programming, integer programming.*

Enforcing Statistical Consistency via Hypothesis Testing

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Stochastic Constraint Satisfaction Problems (SCSPs) provide a powerful modeling framework for problems in which one is required to make decisions under uncertainty. A novel notion of statistical consistency for single-stage SCSPs in which some of the random variables' support set is infinite has been recently proposed in the literature. The essence of this novel notion of local consistency is to be able to make sound inference in the presence of infinite scenarios in an uncertain environment based on a restricted finite subset of scenarios with a certain confidence level and a threshold tolerance error. We propose a novel statistical consistency enforcing algorithm that is based on composite hypothesis testing and compare it against another approach based on confidence intervals. Our empirical study reveals that the new approach outperforms the one based on confidence intervals and is indeed an effective, robust, and practical method for enforcing statistical consistency.

Keywords: *stochastic constraint satisfaction problems, infinite chance constraints, propagation algorithms.*

A dynamic programming method to solve the minimax multi-period weighted substitutable resources allocation problem

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In this paper, we present a review model of the minimax multi-period weighted substitutable resources allocation problem. We present example in order to explain the dynamic programming method. We develop a dynamic programming method to solve the minimax multi-period weighted substitutable resources allocation problem. We present an experimental results of the formulated model and the developed method.

Keywords : *Dynamic Programming, Minimax, Multi-period, Resources Allocation, Weigh- ted Substitutable.*

A Multi-objective mathematical model to improve enterprises performances

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In this paper, we present the production on orders problem which consists on making a compromise between the inside (benefit) and the outside (tardiness and rupture) of the company. We apply the CPLEX solver to solve an instance of the presented model. We present a numerical example and experimental results.

Keywords : *CPLEX solver, Goal programming, Model, Production on orders, Scheduling.*

Graphs and Networks

On solving the Generalized Discrete Cost Multicommodity Network Design Problem

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We address a generalized version of Network Design Problems (NDP) called the Generalized Discrete Cost Multicommodity Network Design Problem (GDCMNDP) which is very common in many applications inspired from different real life areas such as transportation, telecommunication and logistics. The problem consists on identifying the optimal configuration by selecting the links to be included in the final version of the capacitated network in order to satisfy partially or totally the multi-commodity demands. The objective is to minimize the total system cost, computed as the sum of the fixed network costs and the penalties amount of unrouted demands while installing at most one facility/connection on each edge. The specificity of this variant can be summarized in the payment of a penalty for each unrouted demand unit.

For the GDCMNDP, we propose a compact mixed integer linear programming formulation that we solve exactly by a MIP solver. Moreover, we investigate a matheuristic based on genetic algorithm. Our algorithm generates the network and calculates the fixed cost for the designed network. Then, it calls a MIP solver to calculate the relative penalties. Preliminary computational results are reported to evaluate the performance of the proposed approach.

Keywords: *Metaheuristic, Genetic Algorithm, Network Design.*

New metaheuristic for the Maximum Weight Clique Problem

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this paper deals with the Maximum Vertex Weight Clique Problem MVWCP which consists in finding a complete subgraph (clique) of maximum weight in any weighted non-oriented graph. The aim of this study is to provide good quality solutions in reasonable computational times for the MVWVP. Therefore, we propose an Iterated Local Search method which explores the search space using a combined local search method and two levels of perturbation. Experimentations conducted on the weighted DIMACS benchmarks show that our approach compares favorably with the state-of-the-art methods.

Keywords: *Maximum Weight Clique, Iterated Local Search, Combinatorial Optimization*

Artificial Intelligence, Fuzzy Systems and Computing

Web Service Selection with Parallel Cluster Based Partitioning Approach and Representative Skyline

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Optimizing the composition of web services is a multi-criteria optimization problem that consists in selecting the best web services candidates from a set of services having the same functionalities but with different Quality of Service (QoS). In a large scale context, there is a huge increase of the number of web services. This leads us to a great challenge: how to find an optimal web services composition while satisfying all the constraints within a reasonable execution time. Most of the solutions dealing with large scale systems propose a parallel skyline phase performed on a partitioned data space to preselect the best web services candidates. Then the global skyline is computed after the consolidation of all the local skylines and eventually the optimization algorithm is applied. However, these partitioning are only based on pure geometric rules and does not classify the web services according to their contribution to the optimal or sub-optimal solution search area. We will propose in this paper an intelligent partitioning approach based on cluster a based algorithm combined with the representative Skyline.

Keywords : *Web Service composition, QoS, Skyline, Representative Skyline, Cluster, Partition.*

Analytics, Data Science and Data Mining

Machine learning tools to determine the factors affecting poverty status in Palestine

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The poverty analysis covers all the basic methods related to poverty measurement and diagnosis, and applies these methods using household survey data. This study is based primarily on the results of Expenditure and Consumption Household Surveys for the year 2011. The data was collected by the Palestinian Central Bureau of Statistics (PCBS). This paper uses R rattle tools of data mining, more specifically; Decision Tree, Random Forest and Boosting approaches in order to find the most affective factors to predict poverty status of Palestinian social-economic indicators and list of goods.

Keywords : *Poverty; Decision tree; Random Forest; Boosting.*

Heuristics and Metaheuristics

A discrete Firefly algorithm to solve the transportation for disabled people with loading constraints and time windows

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Route planning and optimization are significant for disabled people transportation. Therefore, minimizing the total distance travelled is our objective. To treat this problem properly, a Discrete Firefly Algorithm (DFA) has been developed. This application is the first application of the firefly algorithm to any disabled people transportation. To prove that the proposed DFA is a promising technique, its performance has been compared with other well-known techniques. The contribution of this work is not only the adaptation of the DFA to the transportation for disabled people problem with loading constraints and time windows but also to get a good solution in a reasonable execution time, converging back to Best Known Solution (BKS) and using the Nearest Neighbor Search (NNS) operator. This operator incorporates the process of minimising the distance for a solution in the search process. Finally, through a computational experiment, the feasibility and effectiveness of the model and algorithm were verified. Simulation results showed that the DFA has outperformed the classic approaches.

Keywords : *Discrete firefly algorithm (DFA), heuristics, transportation for disabled people, optimization.*

Vehicle Routing Problem in Collaborative Environment : a Tunisian Case Study

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In this paper, we consider Horizontal Collaborative Vehicle Routing Problem with Soft Time Windows (HCVRPSTW). This problem is an extension of the well-known Vehicle Routing Problem (VRP) where carriers operating in the same urban area schedule joint routes planning using resources already deployed individually. In this study, customers may have demands addressed to multiple carriers and flexible time windows for deliveries are allocated. The scope of this paper is to solve this challenging collaborative logistic problem using hybrid heuristic. First, the proposed heuristic build subsets by dividing customers set into clusters. Then, random routes are established sequentially, using iterated local search, with an optimal customer number insertion procedure. Computational experimentations are conducted

on Benchmark instances from the literature and a Tunisian case study. Results show that better collaborative planning reduces the number of trucks, transportation deliveries costs and travel times.

Keywords : *Vehicle Routing Problem Collaborative logistics Heuristics Iterated local search Set partitioning*

Scheduling problems in pharmaceutical laboratories: Minimization makespan

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Scheduling is one of the essential elements of industrial success. It consists of the assignment of starting and completion times for the various operations to be performed. For this purpose, the emphasis is placed on scheduling production in the pharmaceutical laboratories and the need to find a solution to this type of problems even if the company is being created. In the problems of scheduling production, we are trying to develop an algorithm that allows the optimization of production. We propose the Campbell, Dudek, and Smith (CDS algorithm) to solve the scheduling problem in pharmaceutical laboratories. This is done by using it as a method of resolution and by referring to the Johnson algorithm we will use also the cross contaminations as constraint. These algorithms allow to set the priorities of the final product with reducing the risk of the cross contamination and to reduce the time of cleaning.

Keywords : *CDS algorithm, Johnson algorithm, Scheduling problems, Optimization, makespan, cross contamination.*

Multiple-Criteria Decision Making and Optimization

A new procedure of criteria weight determination for ARAS method

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In most of multi-criteria aggregation methods, we need to elicit parameters, which are generally determined directly by the decision-maker (DM). Indeed, direct assigning of parameters and criteria weights presents a crucial and difficult step in the decision-making process. However, this kind of information is too subjective, which makes the results unreliable. To overcome this issue, we suggest a weighting method based on mathematical programming which involves indirectly the DM's preferences.

Keywords : *MCDA, preference disaggregation, ARAS, criteria weights.*

Dynamic Goal Programming approach variants for Menu Plan model

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Menu planning (MP) is an important part of personalized lifestyle counseling. It aims to find an optimal combination of food items that meets palatable, nutritional, balanced, economical and different requirements for an individual during a sequence of days. In automated MP problem, decision situations are frequently characterized by different, multiple and conflicting objectives. Goal Programming (GP) is considered as one of the most useful quantitative techniques available to solve such type of problems. Dynamic GP (DGP) represents an extension of classical GP to a context in which variables are depending on time. As a complex decision making problem, MP problem requires the development of methodologies able to incorporate different and conflicting goals incorporating the dynamic characteristics.

Keywords : *Standard/ Dynamic Goal Programming, Making decision, Menu planning.*

Development of an intuitionistic fuzzy set FlowSort method

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The real life problems are multidimensional in nature and it has a degree of ambiguity in some decision problems. So, it is difficult to express the evaluation criteria precisely and to determine the exact value of the attributes. To deal with fuzziness and vagueness, the intuitionistic fuzzy set (IFS) achieved great success in various researches. In this context, we propose an extension of the FlowSort, which is an ordinal MCDM classification method, based on Intuitionistic Fuzzy theory. To validate this new method, an illustrative example and an empirical comparison with other MCDM methods are presented.

Keywords : *Classification MCDM problem, Sorting problematic, Intuitionistic Fuzzy Set, FlowSort method.*

Application of the Choquet Integral in Clustering Method

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Preference models often represent a global degree of utility of an alternative in terms of an aggregation of several local utility degrees, each of which pertains to a specific criterion. Methods for learning preference models from observed preference data, have mainly focused on fitting the aggregation function while assuming the local utility functions to be given. This paper advocates the so-called Choquet integral as a mathematical tool for learning for classification. While being widely used as a flexible aggregation function in fields such as multiple criteria decision making, the Choquet integral is much less known in machine learning so far. Apart from combining monotonicity and flexibility in a mathematically sound and elegant manner, the Choquet integral has additional features making it attractive from a machine learning point of view. For example, it offers measures for quantifying the importance of individual predictor variables and the interaction between groups of variables, thereby supporting the interpretability of a model. Within the same concept, we get to interpret Choquet integral in a multicriteria distance to the most delegated, partition based clustering algorithms namely k-means. Where this aggregation function takes into consideration the interaction between criteria without losing criteria information. Moreover, the proposed approach is rather modest in multicriteria clustering, compared with the classical Euclidean distance. Where the approach makes the combination with k-means clustering and the famous aggregation function Choquet Integral. A generalized data was illustrate in the problem

which is compared with the usual k-means algorithm. By comparing the result of this practical approach, it was found that the results obtained are more accurate, easy to understand and above all need less time to process.

Keywords : *Choquet integral, Aggregation function, Fuzzy measure, k-means algorithm, Data clustering.*

A Multicriteria Approach for Selecting Valorisation Techniques of Oil Mill Wastewater in Tunisia

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The olive oil industry has increasingly occupied an important role in the Tunisian economy since this country is currently the world's second producer of olive oil after Spain. The massive oil production has brought about a crucial environmental issue related to the management of oil mill wastewater. Various engineering treatments and reusing techniques are available to handle effluent but their implementation requires certain technical and economical conditions. In this paper an empirical study is conducted to learn more about the appropriateness of the techniques used and a multi criteria approach is proposed to help decision makers choose the set of techniques that makes effluent cost-effective and environmentally friendly.

Keywords : *Multi-Criteria Decision Making, Olive Oil Waste Management, Promethee Method, Tunisia.*

Development of the CODAS-TRI approach

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Based on CODAS ranking multi-criteria aggregation method, a new sorting method (CODAS-TRI) is proposed for assigning actions to completely ordered categories defined either by limiting profiles or by central profiles. The CODAS-TRI assignment rules are based on the Euclidean and taxicab distances. There are based on the difference between the two distances and we divided them into two types one is by the limiting profiles and the other by the central profits. We have illustrated an example for the application of the developed method.

Keywords : *Multicriteria decision aid, CODAS, Sorting, Euclidean and Taxicab distances, CODAS-TRI.*

A multicriteria analysis for choosing the best water resource for the irrigation of the olive trees

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The problem of choosing the best type of water for the irrigation of the olive trees is one of the decisions having a crucial impact on the hydraulic resource management. To solve this problem we propose a multi-expert approach, implying several quantitative and qualitative criteria, and based on AHP method and the entropy of Shannons probability method. At first, using AHP method, the priorities of all criteria of the various hierarchical levels and the alternatives are determined, as well as a ranking of the water alternatives according to every one of the four experts is deduced. Secondly, we used the entropy of Shannon because the data supplied by the experts are contradictory and uncertain and therefore, is quite unreliable. The proposed approach showed that the irrigation of the well water is selected as the best alternative of water. The re-use of handled wastewater is classified in the second rank followed by the desalination of the brackish water and finally by the desalination of the seawater.

Keywords : *Olive tree irrigation, Multicriteria decision aid, multi-expert, AHP, Incertitude, Entropy of Shannon.*

MAISSA-SP: A Multi-Attribute Inferiority and Superiority Selection Approach Based on Superiority Portions

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This contribution is about developing an original and useful Multi-Attribute Inferiority and Superiority Selection Approach referred to as MAISSA-SP using what we named superiority portions. Dominatingness and dominatedness measures are defined and used to derive the degrees of desirability of non dominated alternatives. The details of the proposed approach are described herein and its applicability and effectiveness are illustrated by means of a logistics service provider selection case problem.

Keywords : *Multi-attribute selection, Dominatingness measure, Dominatedness measure, Superiority portion.*

Optimal irrigation water allocation with hybrid Fuzzy AHP and MOP models

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A hybrid fuzzy AHP model and multi-objective programming model for irrigation water allocation was developed, considering conflicting objectives and uncertainties. Based on the aggregate water experts opinions about the importance to obtain the weight of each water resources from pair wise comparisons of Analytical Hierarchical Process (AHP) methodology using the geometric means, the optimal irrigation water allocation was solved using a programming method. It model balances contradictions among economical objectives and experts opinions results in irrigation systems that are based on the conjunctive use of natural water sources (surface water and groundwater) and potential non-conventional water resources (desalination of seawater, treated waste water, and water harvesting). The model was applied to Sfax irrigation district, southern Tunisia. Results indicated that the combination of Fuzzy-AHP model and MOP model provided effective linkages between water experts' opinions, multi-water source allocation, and offers insights into tradeoffs for irrigation water management under uncertainty.

Keywords : *Water experts' opinions, Fuzzy MCDM model, MOPM, Multi-water source allocation, Irrigation water allocation.*

Hub port location choice in Tunisia: application of the PROMETHEE multicriteria method

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The problem of regional segregation in Tunisia represents a major constraint in the location of the Hub port, because some politicians oppose the decision taken by the former authorities to implement this project in the region of Enfidha which is considered according to them as unjustifiable. The choice of location of a hub port in Tunisia is a strategic decision that needs to be studied taking into account several dimensions each composed of a set of criteria of different importance on the location of the Hub port. Hence the need to use a multicriteria evaluation method such as the PROMETHEE method.

Keywords : *location, hub port, multicriteria decision making, location criteria, weighting, PROMETHEE.*

Decision Analysis, Decision Support Systems, DEA and Performance Measurement

Efficiency measurement of Tunisian seaports : Application of data envelopment analysis (DEA)

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The broader aim of this research is to measure the performance in terms of technical efficiency of 6 selected Tunisian commercial ports (Rades, Bizerte, Sousse, Sfax, Gabs, Zarzis) for the period 2000-2014. This study is essential for these ports. It makes a benchmarking between them; in which each seaport is compared against each other in order to detect and explain the causes of their anomalies. The methodology used in this work is the nonparametric approach of Data Envelopment Analysis (DEA) In particular the BCC-DEA version. The model is specified with only one output category and 8 inputs, under the input- oriented hypothesis. The results show that among 6 seaports, only 3 seaports (Rades, Bizerte, Sfax) are efficient over the whole period. On the other hand, only one port (Zarzis) was not efficient during the period. While, the ports of Sousse and Gabes were declared efficient at least once during the study period. We concluded first, that inefficiency sources were explained, mainly by the overstaffing (observed in all inefficient ports). Second, a more efficient allocation of handling equipment plays a very important role in optimizing port activity. Third, exogenous factors are hidden factors, incorporated into visible factors.

Keywords : *Data envelopment analysis; Technical efficiency; Seaports; Tunisia*

Profitability criteria for portfolio selection: A DEA Game Cross Efficiency Approach

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Our paper contributes to literature by providing a new approach to portfolio selection based on Data Envelopment Analysis (DEA) game cross efficiency model in which every financial asset is seen as a player who looks to boost his own efficiency. The proposed model incorporates the DEA game cross efficiency into Profitability-Efficiency (PE) model by considering return and efficiency of portfolio. Albeit cross efficiency goes a step further than DEA by providing an efficiency measure in terms of the best multiplier bundle for the unit and all the other DMUs, it is not always unique leading to more than one DMU to be DEA efficient. In addition, looking

at the situation from the perspective of non-cooperative game theory and due to the fact that only some financial assets will be selected; we may view those financial assets as players in competition. We obtain game cross efficiency scores which constitute a Nash Equilibrium point thus more reliable results for financial process. In addition, incorporating game cross efficiency into PE space permits to determine optimal portfolio selection. We apply the proposed approach to firms listed on the Paris stock Exchange, and demonstrate that the resulting portfolio yields higher risk-adjusted returns than other benchmark portfolios for a 6-year sample period from 2010 to 2015.

Keywords : *DEA, portfolio selection, game theory, cross efficiency, profitability-efficiency tradeoff.*

Secondary Schools Performance: Analysis with Regression Trees

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The purpose of this paper is to identify the key factors that impact schools academic performance through a two-stage analysis based on a sample of secondary schools in Tunisia. In the first stage, we use the Directional Distance Function (DDF) methodology to deal with undesirable outputs. We estimate the DDF using Data Envelopment Analysis (DEA) method. In the second stage we apply a machine learning approach to identify and visualize variables that are associated with a high school performance. The first stage analysis shows that only 21.90% of schools are efficient and with the given resources, they could improve their students educational performance by 15.6%. Regression trees results show that the most important factors associated with higher performance are school size, competition, class size, parental pressure and proportion of girls. We notice that school location has no impact on school efficiency.

Keywords : *Machine Learning, Decision Trees, Efficiency, Education, Data Envelopment Analysis, Directional Distance Function.*

Energy productivity in the Mediterranean countries: A Malmquist index analysis

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The aim of this paper is to examine the energy productivity in the Mediterranean countries over the period 2009-2014. To do so, we use the Malmquist productivity index (MPI) based on the Shephard distance function. Results show that Mediterranean countries experienced a growth of energy productivity of 1.53% between 2009 and 2014 which was primarily driven by technological progress. Furthermore, northern countries achieved higher energy productivity growth than southern countries.

Keywords : *Data envelopment analysis, Malmquist Productivity Index, Mediterranean Countries, Efficiency.*

Modeling Constant Attack Rate processes in the presence of intelligent threats using game theory

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In this paper, we treat a model that falls in the area of protecting targeted systems from intelligent threats. We introduce the concept of system survivability, in the context of continuous attacks, as the probability that a system under attack will continue operation up to some fixed time t . We define a constant attack rate (CAR) process as an attack on a targeted system that follows an exponential distribution. We consider the superposition of several CAR processes. From the attacker side, we determine the optimal attack strategy that minimizes the system survivability. We also determine the optimal strengthening strategy that maximizes the system survivability under limited defensive resources. Next, we model the problem as a non-zero-sum game and prove that Nash equilibrium holds.

Keywords : *survivability, game theory, CAR processes, defense/attack strategies.*

Supply Chain Management

Joint replenishment problem in petroleum supply chain under stochastic demand

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In this paper, a stochastic two-echelon supply chain model is proposed for petroleum products; with a fuel depot at the upper echelon and petrol stations at the lower echelon. The petrol stations face stochastic stationary demand; where inventory replenishment periods are uniformly fixed over the echelons. We formulate a finite state Markov decision model where states of a Markov chain represent possible states of demand for kerosene and diesel products. The inventory cost matrix is generated by multiplying the unit (replenishment, holding and shortage costs) by the demand and inventory positions of products. The objective is to determine over each echelon of the planning horizon, an optimal replenishment policy of products so that the long run inventory costs are minimized for a given state of demand. Using weekly equal intervals, the decisions of whether to replenish or not replenish additional fuel are made using dynamic programming over a finite period planning horizon. Furthermore, use of the model is tested on a real case extracted from Oilcom fuel depot with petrol stations based in Kampala, Uganda. The model demonstrates the existence of an optimal state-dependent replenishment policy and inventory costs of kerosene and diesel products in the management of the fuel supply chain.

Keywords : *Joint replenishment, petroleum, supply chain, stochastic demand*

Approaches for the Supplier Selection Problems: A Literature Review

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The problem of choosing suppliers is one of the strategic decisions that has a crucial impact on the company's long-term performance and survival. Several studies have appeared in the literature showing the importance of this problem. The aim of this paper is to provide a state of the art review of the main approaches used to resolve the supplier selection problem. This paper also intends to explore the evolving trends of publications on the main techniques developed from 1997 to 2017. By using a methodological research, 309 international journal articles are selected. These articles are roughly classified into two main groups according the different techniques used (1) The exact approaches and (2) The fuzzy approaches. In these approaches, 33 DM techniques are identified from three main categories: (1) Multi-Attribute Decision Making Techniques (MADM), (2) Mathematical Programming (MP) techniques, (3) Technical hybrid methods. We examined each of

the 33 techniques and analyzed ways to integrate these techniques for supplier selection. The statistical analysis was conducted with the "Excel" software to better understand the trend of research. This paper has the advantage to consolidate the existing research efforts related to SS problems and to provide the recommendation for future study in this area.

Keywords : *Supplier selection, exact approaches, Fuzzy approaches.*

A generic model for reorganizing the maternity service supply chain

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The maternity unit is of great interest in the hospital systems because of its urgency. An assessment reveals that this unit faces many constraints due to the complexity of queue management and lack of organization. The dimensioning of the human and physical resources will be interesting to solve such problems. The aim of this article is to propose a generic model for reorganizing the maternity service. To achieve this objective, we follow the methodology ASDI (Analysis, Specification, Design, Implementation) which is based on the ARIS tool and the UML language.

Keywords : *Modeling, ASDI methodology, Knowledge model, Maternity.*

Lean Production in hospital sterilization process

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Recently health care units have explored the application of lean thinking to reduce rising medical expenses. In this study, Value Stream Mapping method was used to improve the efficiency of a hospital sterilization process. Improving solution was proposed and its feasibility was verified by using system simulation.

Keywords : *lean healthcare, VSM method, hospital sterilization process, simulation.*

Routing, Location, Logistics and Transportation

Assignment of Ships to berths in a versatile port, Case of the commercial port of Sfax

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The aim of this research is to solve the problem of allocating ships to berths in the dynamic case, that with maximizing customer satisfaction . A mathematical model will be proposed and solved for the first time by the CPLEX solver then by a meta- heuristic which respecting the imposed constraints. The new solution will be able to react according to conditions of the scheduling plan and the unexpected case inside a versatile port like the commercial port of Sfax.

Keywords : *Optimization, Decision support system, Dynamique, Assignment, Versatile port, Metaheuristic, CPLEX.*

A VRP variant dealing with the problems of Infrastructure-defaults SVRDPC: Safety Vehicle Routing Diagnosis Problem with Control

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In this paper, we will discuss the problem of routing a fleet of different vehicles from a central depot to different types of infrastructure-defaults with dynamic maintenance requests, time windows and control of default maintained. Our mathematical model "Safety Vehicle Routing Diagnosis Problem with Control": SVRDPC which will be developed and applied to multi-vehicle maintenance problems. SVRDPC is a variant of VRP an optimal vehicle plan that facilitates the maintenance task of different types of infrastructure-defaults. This task will be monitored after the maintenance, based on its priorities, the degree of danger associated with each default and the neighborhood at the black-spots.

Keywords : *VRP, infrastructure-defaults, SVRDPC, road safety, transport system, maintenance, task, black-spots.*

Planning Problems in a containers terminal: A Literature Review

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The objective of this paper is to present the state of the art of research into the different planning problems in a containers terminal, with a view to : 1) identify the important operational problems studied in seaport containers terminal since the year 2000, 2) present two principal classes of problems, such as the planning problems at the dock and the planning problems in the courtyard, and classify them according to the type of problem, 3) show that these two classes of problems are independent and can be processed simultaneously (dock-courtyard) for the competitiveness and efficiency of containers terminals. Finally, the paper goes on to offer a brief summary of works, the methodology of research and proposes new opportunities relative of the type of problems, that should be addressed by future research.

Keywords : *Planning problems, Containers terminal, Classification, Literature Review*

Recent applications in OR

Using Lexicographic Goal Programming with dynamic and discrete Satisfaction Function to model the nurse timetabling

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In this paper we treat the nurse rostering problem, in order to help the supervisor of the hospitals intensive care unit (ICU) of Habib Bourguiba Hospital to plan the schedule of nursing work. We formulated this problem as a Lexicographic Goal Programming with dynamic and discrete Satisfaction Functions. Our contribution in this research is to apply the method of Lexicographic Goal Programming with dynamic Satisfaction Function on a real hospital case taking into account the dynamic change of nurses absence in the decision maker preferences.

Keywords : *Nurse timetabling, Intensive Care Unit, Goal Programmin, Satisfaction Function.*

The two machines chain-reentrant shop with no-wait constraint :new results

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We consider a chain reentrant shop problem with two machines, in which a no-wait constraint is imposed. The objective is to minimize the overall completion time. Based on a dynamic algorithm, we prove that the problem is polynomial when the permutation of the tasks is fixed. For the resolution of the general problem we use this algorithm in a local search heuristic. A mathematical model is also provided with numerical experiments.

Keywords : *Chain-reentrant shop, no-wait, dynamic programming, heuristics, mathematical model, makespan.*

Could hiring Costs explain the relationship between Education and Employment

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This short paper provides a theoretical model in which hiring costs are not exogenous and constant as in matching and human capital models, but proportional to the workers qualification degree. Indeed, we think that hiring costs generally increase with skill requirements for job applicants and that hiring a secretary is costless than hiring a director. By doing so, our model displays a positive relationship linking education and unemployment which agrees with reality.

Keywords : *Employment, Education, hiring cost.*

Health and Environment

Risk management in the pharmaceutical supply chain:case of Habib Bourguiba hospital

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The hospital systems are distinguished by a variety of activities frequently interrelated. This interaction leads into unexpected situations related to several risks. With the aim to improve the quality of care, the Habib Bourguiba hospital of Sfax is involved to implement important strategies to improve its efficiency. Thus, this hospital leads a project of revision of its downstream supply chain, considering in particular, the activities of dispensing of drugs in care services. The present study, undertaken in the pharmacy of this hospital, aims to assess the pharmaceutical supply chain. We propose a new risk analysis method, called Functional Resonance Analysis Method (FRAM) versus a reference method, the Failure Modes and Effects Criticality Analysis (FMECA).

Keywords : Risk Management, pharmaceutical supply chain, FMECA, FRAM.

Analysis of public hospitals' technical efficiency in Tunisia using DEA

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These last years, Tunisia pursued a national policy of health directed towards the performance. Public expectations are high and there is a huge knowledge gap of health facilities performance. Although the lack of adequate resources presents the most important constraint, the efficiency with available resources are being utilized is another challenge that cannot be overlooked. The objective of this study aims to assess the technical efficiency (TE) of a sample of Tunisian public hospital using the non parametric approach of Data Envelopment Analysis (DEA). In this perspective, we started with measuring and analyzing the TE of a sample of Tunisian public hospitals, then to investigate the difference in the level of efficiency by district and finally to Guide the decision and the policy makers in their decision making process through the developed decision making tools. The model estimates the technical efficiency for the whole sample as well as for each hospital. The study identifies the inefficient hospitals and provides the magnitudes by which specific input per inefficient hospital ought to be more managed or to be reduced through a developed decision making tools. It emphasizes also the disparity by districts in term of percentage of efficient and inefficient hospitals.

Keywords :

Industrial Engineering and Systems Management

Modelling of an integrated production-distribution planning problem with multiple transportation modes

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One of the key issues in the current research area of Supply Chain networks is modelling an integrated production-distribution planning taking into account a multi-stage, multi-product, multi-period, multi-plant, and multiple means of transport. The objective is to minimize the costs associated with production, transportation, and inventory over a tactical given time horizon. A linear integer programming is developed and an illustrative example of the problem is considered to show the prospects of using this model.

Keywords : *modelling; Supply Chain network; production planning; distribution planning.*

Joint optimization of maintenance, inventory and quality control policies

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We consider a single machine subject to a degradation process that directly affects the quality of the produced items. The purpose of this paper is to develop a model that captures the underlying link between the maintenance level, the buffer stock and the economic design of an x-bar control chart. The preventive maintenance strategy consists in carrying out perfect maintenance actions every product quality inspections. A major maintenance (overhaul) is undertaken once the control limits are exceeded. The objective is to determine the optimal values of the preventive maintenance period, the buffer stock size, the sample size, the sampling interval and the control chart limits, which minimize the average total cost per time unit.

Keywords : *Optimization, integrated model, preventive maintenance, process quality, buffer stock.*

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