ABSTRACTS

Structural Relationship of Sustainable Manufacturing Divers and Incentives

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This paper is to study the factors that encourage, drive or force companies to alter manufacturing processes in a way that simultaneously minimizes their environmental and social effects and is cost-efficient for the companies. The principal focus of this research is on the relationships of these drivers, and their mutual influence on each other. This research is descriptive, and a case study is conducted in automotive plastic parts industry in Iran. After recognizing the drivers of sustainable manufacturing, they were localized, and finally ten drivers were approved. Then the relationships between the drivers were analyzed applying Grey-DEMATEL method. The most effective and important drivers in the macro-environment are laws and media, and in the micro-environment, competitors and customers are the key drivers. Business benefits and partners transfer the influences of cause drivers to effect divers. Managers, owners and personnel are the most effected drivers.

Keywords: Grey DEMATEL, Sustainability drivers and incentives, Sustainable manufacturing.

A Genetic Algorithm for Integration of Vehicle Routing Problem and Production Scheduling in Supply Chain (Case Study: Medical Equipment Supply Chain)

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This paper studies a model for integration of vehicle routing problem (VRP) in a supply chain with order assignment to the suppliers and determining their production sequence. The considered supply chain consists of some suppliers, vehicles and a manufacturer. It is assumed that manufacturer purchases identify the raw material demand of suppliers in wholesale all at once. This provides the opportunity of receiving discounts and consequently decreasing final price. A transportation fleet composed of some vehicles, each of which may have a different speed and different transport capacity, is responsible for transporting purchased raw materials to suppliers and gathering completed parts from them aiming at minimizing the total tardiness of all jobs. After presenting the mathematical model of the problem, a dynamic genetic algorithm with two dimensional structures is proposed. The algorithm was applied to the supply chain of a medical equipment manufacturer and the results were compared with real results beforehand. Findings show that applying dynamic genetic algorithm results in improving the average of tardiness from 9.44 days to 2.11 days. Also the comparison of dynamic genetic algorithm with the optimum solution for the small size problems, and the algorithm proposed for the nearest problem in the literature to our problem shows the high efficiency of dynamic genetic algorithm.

Keywords: Genetic algorithm, Medical equipment, Router, Scheduling, Supply chain.

An Efficient Imperialist Competitive Algorithm for Resource Constrained Project Scheduling Problem

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In this paper, a new algorithm based on the framework of the imperialist competitive

algorithm for solving resource constrained project scheduling problem (RCPSP) will be proposed. In this problem, the activities are scheduled based on the resource and precedence relationships constraints in a way that the makes pan will be minimized. In order to model the assimilation process, a uniform crossover has been used, and to avoid premature convergence of the proposed algorithm, two revolution operators including one point revolution and multi-point revolution will be introduced. Also, in order to enhance the exploitation ability, a combined local search including permutation based local search (PBLS) and forward-backward improvement (FBI) is performed. The algorithm parameters are determined by designing Taguchi experiment, and the efficiency of proposed ICA is demonstrated by solving PSPLIB problems. Computational results and comparisons with some existing algorithms show that the proposed algorithm can produce near-optimal solution for small problems and competitive solution for large ones.

Keywords: Imperialist competitive algorithm, Optimization algorithm, Resource constrained project scheduling problem.

A Hybrid Algorithm to Solve a Bi-objective Location Routing Inventory Problem in a Supply Chain under Stochastic Demand

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Nowadays, fierce competition in global markets has forced companies to improve the design and management of supply chains, and provide competitive advantages. Decision integrity is one of the main factors which highly lead to a considerable reduction of supply chain costs, and higher costumer's satisfaction. Distribution network design is based on three major problems: location allocation, vehicle routing and inventory control. Since the effective role of reducing distribution costs in the survival of the supply chain is clear to all, in this paper, these three problems will be incorporated into an integrated model under demand uncertainty. This approach leads to the significant reduction of distribution costs, higher customer satisfaction, and also providing an efficient supply chain. Also in this study, in addition to minimizing the total cost including fixed cost of establishing depots, transportation costs and inventory costs, the customers' satisfaction will increase by reducing their waiting time. So, a bi-objective mixed integer non-linear model is presented by using chance constrained programming, where customer demands are assumed to have a normal distribution. Then, to solve the model, a hybrid algorithm based on simulated annealing and genetic algorithm is proposed, and is evaluated on a set of instances. The computational results illustrate the algorithm efficiency to solve a wide range of problems with different sizes.

Keywords: Facility location, Integrated supply chain, Inventory control, Metaheuristic algorithms, Vehicle routing.

A Simultaneous Location, Routing and Scheduling Model for Transporting Evacuees with Time Window and Multiple Depots

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After natural disasters and unexpected events, one of the most vital actions of disaster response phase is to transport evacuees from disaster areas to safe places. In this paper, decisions of the location of shelters and routing and scheduling of relief vehicles at the same time are modeled for a two-level network including depots of vehicles, affected areas, and shelters. In the evacuation operation, the possibility of servicing to evacuees in each affected area by several vehicles, existence of multiple depots of heterogeneous vehicles and time window constraints are considered. To solve the proposed model and demonstrate its efficiency, a numerical example was solved by exact method, and it was done the sensitivity analysis on the problem main parameters. Results show that the number of shelters to locate evacuees and capacity of relief vehicles effects on total times for vehicles to get to affected areas and shelters.

Keywords: Disaster management, Location of shelters, Routing, Scheduling.

A Hierarchical Approach for Lot-sizing and Production Scheduling of Complementary Product Packages

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The lot sizing and scheduling problems for quick response to the diverse customers' demands through the optimal utilization of resources and reducing the costs has a particular importance. In this paper, it is investigated the lot sizing and scheduling problem for complementary products. Each package consists of several complementary products with certain portions and different processing times, producing on the parallel production lines in a make-to-stock environment. To solve the problem, it is proposed a hierarchical approach with the objectives of minimizing the package costs, bound and stock, and maximizing the capacity utilization at the first level, and the aim of minimizing the completion time of complementary products at the second level. The second level model is difficult-to-solve in the large-sized instances; therefore, a rolling horizon heuristic solution algorithm is developed whose comparing performance to the exact solution as well as a proposed lower bound in different numerical examples, show the solution quality and its appropriate computation time. To validate the model, the actual data of a tile factory have been employed. Results show that the production plan, costs and times to complete the packages are improved, compared to the current process in the factory.

Keywords: Complementary product package, Heuristic algorithm, Hierarchical planning, Lot-sizing, Production scheduling.

Location-Routing Problems: A Review of Concepts, Models, Methods and Research Gaps

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A location-routing problem is a kind of location problem with the routing aspects. Although the basic idea of simultaneously solving the two problems started on 1961, and it has been done a lot of researches on this issue, but a comprehensive review of the problem literature in this paper, has identified research gaps, which indicates the potentiality of this problem in new studies.

This paper surveys 303 related published researches. in which the large number of survey focuses on the location-routing problem in different periods, in this research, based on a comprehensive review of the problem definition, it is studied the different aspects and indexes, type of LRPs, type of objectives, categories of LRPs and solution methods with the authors' proposed reforms. Finally, research gaps and recommendations for future studies are explained.

Keywords: Depot, Location-routing problem, Vehicles.

Minimizing Net Present Value of Costs in Lot-Sizing in a Two-Echelon Inventory System

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In this paper, a two-echelon supplier-manufacturer system has been studied through net present value (NPV) approach. The production rate is finite and constant in both echelons. Also it is assumed that there is a lead-time between the first echelon and it is getting to the second echelon. It is also assumed that the lot-size of manufacturer (second echelon) is m times larger than the supplier's factors (first echelon), and the supplier can receive wares (the raw material) from the manufacturer in a cycle through several shipments, due to the point that shortage is not allowed. So, it is supposed that the supplier's production rate is greater than manufacturer's. The aim is to determine the optimal lot-size of each echelon such that the NPV of the total cost of system is minimized. After approximating the NPV objective function via Maclaurin expansion in both zero and non-zero lead-time cases, an exact algorithm is presented to find optimal solution of the presented model. Based on the results, the two approaches of average cost and NPV do not lead to a same result, and non-equivalency is occurred in this case.

Keywords: Economic production quantity, Lead-time, Time values of money, Two-Echelon inventory system.