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OR for Better
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Multimethodology is the concept of combining different operations research (OR) methods for solving complex problems. This work deals with a broad range of OR methods, including both hard and soft approaches. Different classification criteria are presented in order to constitute a framework for choosing and combining different methods in a practical problem-solving process. A principal finding is that problem-solving for messy problems can be arranged as a search-learn-debate process based on so-called communicative rationality. Finally, conclusions and a research perspective are presented.

2 - A method of analyzing ordinal data

Tohru Ueda, Faculty of Science and Technology, Seikei University, 3-3-1 Kichijoji-Kitamachi, 180-8633, Musashino-Shi, Tokyo, Japan, ueda@st.seikei.ac.jp

Nishisato proposed a simple method of analyzing ordinal data, which are obtained by asking N subjects to rank M objects according to the order of their preference. He assigned a predetermined score for each order of objects, but the score is similar to an initial value in conjoint analysis. A method of determining scores which should be given for ordinal data is proposed, where variance among stimuli is maximized. For the purpose of treating variance among subjects a special formulation is also proposed.

3 - Comparing the Aggregation Method in Analytic Hierarchy Process

Chang-tzu Chiang, Graduate School of Management, Ming Chuan University, 250, Chung Shan N. Road, Sec.5., 11103, Taipei, Afghanistan, ctcamber@mail.yust.edu.tw, *Lin Chin-Tsai*

In AHP, individual judgments can be aggregated in several ways, and the most useful are the aggregation of individual judgments and the aggregation of individual priorities. There were some articles discussed arithmetic and geometric means and propose their suggestions. In this article the simulation work are used to generate the weights of judges and then generated the AHP weights by arithmetic and geometric means. After the statistic test for the relative mean square errors between parameter and estimator from simulation, we propose suitable situation that these method should used.

4 - The Dominance-based Rough Sets Approach Applied to Multicriteria Countries Classification Problem by Economic Growth

Iwona Gruszka, Operation Research, The Karol Adamecki University of Silesia, Ul. Bogucicka 14, 40-287, Katowice, Poland, gruszka@ae.katowice.pl

The rough set approach is a method belonging to artificial intelligence area. The method allows solving the multicriteria classification problem in the presence of uncertainty. This is the main reason of applying mentioned method to the regarded decision problem. Furthermore, the created decision model of "if then" terms is easy to interpret and is explaining the decision maker's preferences. The aim of the paper is to solve the multicriteria countries classification problem by economic growth.

■ TB-40

Tuesday, 10:30-12:00
SOC VR11 V-257

Environmental OR Applications

Stream: Environmental Planning (c)

Invited session

Chair: *Peter Kolesar*, Business, Columbia University, 408 Uris Hall, 10027, New York, NY, United States, pj4@columbia.edu

1 - Optimizing biomass facility layout and delivery based on a pure MILP model

Ferenc Brachmann, Faculty of Business and Economics, University of Pécs, Rákóczi str. 80., 7621, Pécs, Baranya, Hungary, brachmann.ferenc@ktk.pte.hu

The role of the facility layout problem is a pivotal one in the case of biomass systems: environmental and social aspects have to be included in any decision concerning these investments.

To tackle this complex decision-space, the Research team at the University of Pécs developed a pure MILP model which aims to place 7 core-functions (fuel logging, transport, condensation, burning, byproduct disposal, energy distribution and energy consumption) in an optimal layout based on the complex goal structure with a set level of biomass input and energy consumption.

2 - Allocation of refuse bins for selective urban waste management

Joaquín Bautista Valhondo, Nissan Chair, Universidad Politécnica de Cataluña, Av. Diagonal 647, planta 7., 08028, Barcelona, Spain, joaquin.bautista@upc.edu, *Jordi Pereira*

One of the problems found in Municipal Waste Management is the allocation of refuse bins to different collection areas where waste is left by the citizens. This paper is focused on the allocation of refuse bins under availability and space constraints as it is faced by most Spanish municipalities. The relationship between the studied problem and the apportionment of seats in a parliament is tackled and it is used to develop an ant algorithm approach to solve the problem. The algorithm is then compared to an exact procedure for a real life instance found in the metropolitan area of Barcelona.

3 - Fisherman versus Landscapers: Water Release Policies in the Delaware River

Peter Kolesar, Business, Columbia University, 408 Uris Hall, 10027, New York, NY, United States, pj4@columbia.edu

The Delaware River is both the source of half of New York City's water and a habitat for wild trout.

We aim to revise the water release rules from the dams to benefit the fishery while not increasing the City's drought risk. Our policies are conservative in that they decrease reservoir levels less in dry years than in wet years. In wet years the difference is larger, but it matters less since reservoir levels are much higher. Side benefits are increased flood protection and a simpler structure to administer. We focus on the complex political environment and on the analysis.

4 - Cost-based Sensitivity Analysis in Reverse Logistics

Peter Letmathe, FB 5: Wirtschaftswissenschaften, University of Siegen, Chair of Value Chain Management, Hoelderlinstr. 3, 57068, Siegen, Germany, peter.letmathe@uni-siegen.de

The presentation first shows how to calculate and assign internal costs of returns (reverse product flows). The complexity of cost assignment is caused by several cyclical relations. Second, sensitivity analysis is used to demonstrate the impact of return volume, recycling rate and quality of returns. This information can be used to optimize volume and quality of return flows as well as to improve quality management and return processing. Since these measures are related to additional costs, it is crucial to determine tradeoffs to allow minimization of overall costs.

■ TB-41

Tuesday, 10:30-12:00
SOC VR11 V-258

Monitoring and optimizing working conditions in Europe

Stream: Human Centered Processes

Invited session

Chair: *Andranik Tangian*, WSI, Hans Boeckler Foundation, Hans Boeckler Str. 39, 40476, Duesseldorf, Germany, andranik-tangian@boeckler.de

1 - TUTORIAL: A composite indicator of working conditions in the EU-15 for policy monitoring and analytical purposes

Andranik Tangian, WSI, Hans Boeckler Foundation, Hans Boeckler Str. 39, 40476, Duesseldorf, Germany, andranik-tangian@boeckler.de