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ANNOUNCEMENT

Dear colleagues,

We are very proud to announce two new web sites on MCDA:

The MC_SC2 "Multiple Criteria Sorting, Classification, and Clustering" problems, which includes several sections (Software, Forum, Researchers, ...) and an on-line bibliography

http://monet.fe.uc.pt/mc_sc2/index.html

A Repository for Master and Phd Theses and Software.

http://monet.fe.uc.pt/thesessoftware/

Your contributions are welcome. Please, help us to improve theses two web sites.

Best regards,
Juscelino, Tommi, and Jose

Opinion Makers Section

La décision de groupe : l'application de méthodes de surclassement de synthèse

Khaled Jabeur et Jean-Marc Martel

Faculté des Sciences de l'administration, Université Laval, Ste-Foy, (Qc), G1K 7P4, Canada.

I. Introduction

La prise de décision déborde aujourd'hui le strict cadre du décideur traditionnel qui s'isole pour prendre une décision. À cet effet, plusieurs raisons peuvent être évoquées : l'évolution économique et concurrentielle, la modification de la structure hiérarchique, la maîtrise de la complexité, l'amélioration de l'efficacité, l'évolution technolo-gique, etc. En effet, la prise de décision au sein des organisations nécessite une synergie d'efforts de plusieurs membres ayant différents intérêts, compétences et expériences afin que chacun d'eux mette à contribution son savoir-faire. D'ailleurs, c'est grâce à cette synergie que les membres peuvent atteindre des résultats supérieurs à ceux qu'ils auraient pu réaliser individuellement. Pour l'ensemble de ces raisons, plusieurs travaux de recherche ont été entrepris pour améliorer le fonctionnement et la performance des groupes dans la résolution d'un problème de décision. Ces travaux ont essayé d'une part, de structurer ce processus en différentes étapes et d'autre part, d'élaborer un ensemble d'outils et de méthodes permettant à un groupe d'individus de progresser dans la résolution d'un problème de décision. Dans la littérature, ces travaux ont souvent étudié la décision en groupe selon trois grandes perspectives :

- Une perspective ***structurelle*** : les travaux développés selon cette perspective s'intéressent essentiellement aux structures et aux règles de fonctionnement des groupe restreints. Ainsi, ils cherchent à apporter des éléments de réponses aux questions relatives à la structuration des processus de décision en groupe, à la résolution des problèmes reliés aux interactions inter-personnelles, à la compréhension des attitudes et des comportements des individus dans ces processus ;

- Une perspective ***mathématique*** : les travaux développés selon cette perspective s'intéressent aux problèmes reliés à l'agrégation des préférences individuelles en vue d'établir une préférence collective ou de consensus. De ce fait, ils cherchent essentiellement à développer de nouvelles procédures d'agrégation qui peuvent être appliquées dans divers contextes décisionnels ;

- Une perspective ***technologique*** : les travaux développés selon cette perspective s'intéressent aux apports des Nouvelles Technologies de l'Information (NTI) pour supporter la prise de décision en groupe. Ainsi, ils cherchent, par exemple, à développer des outils permettant de faciliter l'accès des membres à

l'information appropriée, la communication, la collaboration et l'interaction entre ces derniers.

Dans cet article nous abordons essentiellement les deux premières perspectives. Ainsi, dans la prochaine section (section 2) nous présentons un processus de décision de groupe dans un cadre multicritère. La section 3 passe en revue différentes applications des méthodes de surclassement de synthèse dans un contexte de décision de groupe. Enfin, nous concluons à la section 4.

II. Les processus d'aide multicritère à la décision de groupe

Tout groupe possède son propre mécanisme de fonctionnement afin d'accomplir un ensemble d'objectifs. Ces mécanismes sont souvent représentés par des processus comportant différentes étapes qui dictent ou décrivent la conduite des discussions entre les membres d'un groupe. Dans la littérature, relative à la décision de groupe, les processus proposés pour structurer les différentes situations de décision de groupe peuvent être classés selon deux grandes familles (Fisher, 1974). Dans la première on retrouve les processus *descriptifs* qui proposent d'observer des groupes engagés dans un processus de décision pour dégager un ensemble de phases décrivant l'évolution des interactions inter-personnelles. Ces phases seront ensuite utilisées par d'autres groupes pour mener à terme leur processus de décision. La deuxième comporte les processus *prescriptifs* qui proposent de prescrire directement aux membres des lignes directrices qui leur permettent de progresser dans un processus décisionnel.

Dans cet article nous portons une intention particulière au processus prescriptifs proposés pour structurer, dans le cadre d'une analyse multicritère, une situation de décision de groupe. Ce choix est justifié par le fait que, dans ce travail, nous mettons l'emphase sur des procédures mathématiques permettant l'élaboration d'une préférence collective à partir des préférences individuelles. Notons toutefois que l'intérêt que nous portons aux processus prescriptifs ne nie pas l'importance des processus descriptifs qui permettent aux membres d'un groupe d'identifier et surmonter les difficultés reliés à la dynamique des groupes.

Dans le cadre d'une analyse multicritère, un processus prescriptif de décision de groupe peut s'articuler principalement autours des quatre étapes suivantes (voir Figure 1) :

1. Identification et définition du problème : au cours de cette première étape, les membres du groupe doivent reconnaître l'existence d'un problème. Nous désignons par membre toute personne concernée par la décision (une partie intéressée). Une fois que le problème est identifié, les membres s'engagent dans une démarche participative au cours de laquelle ils mettent à contribution leur expérience et leur savoir-faire. En effet, durant cette démarche les membres doivent définir et comprendre les termes qui constituent la formulation du problème, clarifier certains aspects critiques tel que la pertinence des besoins du groupe, déterminer les limites du champ d'investigation du problème, identifier et collecter les différentes informations utiles pour la structuration du problème. En fait, le but de cette démarche participative est d'établir un climat de confiance entre les membres.

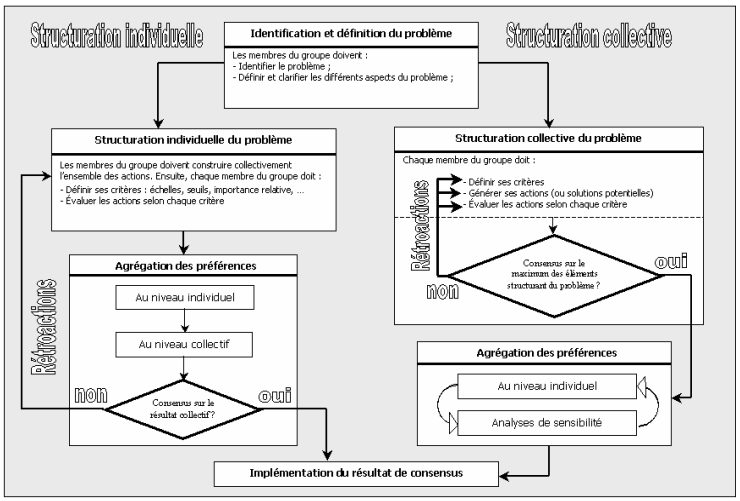

Figure 1 : Processus Prescriptif de décision de groupe.

2. Structuration du problème : durant cette étape chaque membre du groupe essaie d'identifier un ensemble d'actions potentielles, un ensemble d'objectifs/ critères et un ensemble d'évaluations des actions selon tous les critères. Cette étape est la plus délicate du processus. Dans la littérature, les travaux qui ont examiné l'étape de structuration des problèmes de décision de groupe adoptent deux grandes approches:

a. Dans la première, que nous appelons approche de structuration collective, les membres du groupe essaient de construire, en concertation, un consensus sur l'ensemble des actions, sur la famille des critères, sur les évaluations des actions et sur certains paramètres de la méthode multicritère (ex. seuils, importance relative des critères). De ce fait, les membres du groupe mettent en commun une partie de leur système de valeur. Pour ce faire, ils utilisent diverses techniques d'agrégation à savoir la moyenne arithmétique ou géométrique, le vote, les discussions, etc. À l'issue de cette structuration, les membres du groupe obtiennent un tableau multicritère collectif. Notons que ce dernier peut être incomplet du fait qu'il peut y avoir divergence entre les membres sur les valeurs de certains paramètres (souvent sur l'importance relative des critères).

b. La deuxième approche, que nous appelons approche de structuration individuelle, considère que chaque membre du groupe a ses propres motivations, attitudes et perception du problème. Par conséquent, elle laisse la liberté à chacun d'eux d'exprimer ses préférences au niveau de tous les éléments structurant du problème à l'exception de l'ensemble des actions. En fait, cette approche suppose que cet ensemble est commun à tous les membres du fait qu'il est construit collectivement. La famille de critères, les évaluations des actions et les différents paramètres de la méthode multicritère (ex. seuils, importance relative des critères) sont déterminés à titre individuel. À l'issue de cette approche, il y aura autant de tableaux multicritères que de membres impliqués dans l'étape de structuration.

3. Agrégation des préférences : cette étape est souvent considérée, du moins par les chercheurs opérationnels, comme l'une des plus importantes dans le processus de décision de groupe. La manière de procéder au cours de cette étape dépend de l'approche utilisée lors de l'étape de structuration :

a. Lorsque les membres du groupe décident d'adopter la première approche de structuration, l'étape d'agrégation se confond à une analyse de sensibilité au cours de laquelle les divergences individuelles sur certains paramètres seront examinées afin de dégager un résultat de consensus. En effet, au cours de cette analyse chaque membre du groupe introduit ses propres jeux de valeurs des paramètres, notamment ceux qui n'ont pas fait l'objet d'un consensus, dans le tableau multicritère collectif. Sur cette base, il procède à une agrégation pour établir un résultat individuel. Ces résultats individuels sont ensuite confrontés et discutés entre les membres pour dégager un résultat de consensus.

b. Si les membres du groupe optent pour une structuration individuelle du problème, l'étape d'agrégation comportera deux niveaux : i) l'agrégation des préférences au niveau individuel au cours de laquelle chaque membre du groupe utilise son propre tableau multicritère et obtient par conséquent un résultat individuel (ex. un pré-ordre) et ii) l'agrégation au niveau collectif dans laquelle les différents résultats individuels obtenus à l'étape (i) sont agrégés pour donner un résultat collectif. Notons que ce dernier peut ne pas être accepté par certains membres du groupe. Ceci dû au fait que peu d'effort de concertation n'a été fourni jusque là dans le processus. Par conséquent, il est naturel de faire des allers et retours, des rétroactions entre les étapes de structuration et d'agrégation afin d'aboutir à un résultat de consensus.

4. Implémentation du consensus final : une fois qu'un résultat de consensus est atteint, il reste à entreprendre sa mise en œuvre. Il est fréquent que les membres du groupe négligent cette dernière étape. Pourtant, au cours de la mise en œuvre d'un résultat de consensus il faut que le groupe puisse à tout moment vérifier si, par exemple, l'on respecte bien les diverses contraintes fixées (coût, ressources, temps, etc.). Une fois que l'ensemble de ces contraintes est vérifié, ils doivent s'assurer que ce résultat de consensus soit opérationnel.

Dans ce qui suit, nous allons indiquer comment et à quels niveaux les méthodes du surclassement de synthèse sont appliquées au cours du processus décisionnel de groupe présenté dans la Figure 1. L'intérêt particulier que nous portons à l'égard de ces méthodes est justifié par le fait qu'elles produisent des systèmes relationnels de préférence incorporant l'incomparabilité et permettant de nuancer l'expression des préférences individuelles. De plus, elles mettent en œuvre des principes de démocratie qui sont valorisés dans un contexte de décision de groupe.

III. L'application de méthodes du surclassement en décision de groupe

Dans leur forme originale, les méthodes de surclassement de synthèse ont été développées pour résoudre des problèmes de décision impliquant un seul décideur. L'application de ces méthodes dans les travaux relatives à la décision de groupe emprunte principalement l'une des deux approches de structuration présentées dans la Figure 1. Notons que l'hypothèse de départ de ces approches stipule que les décideurs arrivent à s'entendre sur un ensemble commun d'actions.

Dans une approche de structuration collective, chaque membre du groupe introduit ses propres jeux de valeurs des paramètres, notamment ceux qui n'ont pas fait l'objet d'un consensus, dans le tableau multicritère collectif. Il applique une méthode de surclassement de synthèse pour agréger ses préférences individuelles afin d'établir un résultat individuel (ex. un pré-ordre total ou partiel). Les membres s'engagent ensuite dans une analyse de sensibilité au cours de laquelle ils confrontent et discutent leur résultat individuel pour dégager un résultat de consensus. Notons que dans le cadre de cette approche de structuration les méthodes de surclassement sont appliquées au niveau des préférences individuelles. Les travaux de Simos (1990) et de Mayestre et al. (1994) s'inscrivent dans le cadre de cette approche.

Dans une approche de structuration individuelle, chaque membre, ayant le même ensemble d'actions, construit son propre tableau multicritère puis utilise une méthode multicritère pour établir un résultat individuel. Nous désignons par résultat individuel tout résultat obtenu soit après la phase d'agrégation (ex. indices de surclassement ou de crédibilité) ou soit après la phase d'exploitation (ex. un pré-ordre, un noyau). Une fois ces résultats individuels

obtenus, ils sont agrégés, au moyen d'un algorithme, en un résultat collectif ou confrontés et discutés en s'appuyant sur des outils graphiques, pour dégager un résultat de consensus. Dans une approche de structuration individuelle, les méthodes de surclassement de synthèse sont appliquées aux niveaux des préférences individuelles ou collectives. D'une part, elles sont appliquées par chaque membre pour déterminer les résultats individuels. D'autre part, elles sont utilisées pour exploiter, par exemple, des indices de surclassement collectifs obtenus suite à l'agrégation des indices de surclassement individuels. Les travaux de Bui (1987), Marchant (1996), Colson (2000), Ben Khélifa et Martel (2001), Leyva-López et Fernández-González (2003) et Jabeur et Martel (2004a, b et 2005) constituent des exemples typiques de cette deuxième approche.

Le tableau 1 présente une brève description de travaux qui proposent d'appliquer les méthodes de surclassement de synthèse dans un contexte de décision de groupe.

Auteurs	Approche de structuration	Problématiques décisionnelles	Méthodes d'agrégation des préférences individuelles / collectives
Bui (1987)	Individuelle	Choix	ELECTRE I / Le nombre de fois qu'une action surclasse les autres actions dans les graphes de surclassement individuels.
Simos (1990)	Collective	Rangement	ELECTRE III / Analyse de sensibilité graphique sur les seuils et les poids des critères.
Mayestre et al. (1994)	Collective	Choix, rangement et tri	Les méthodes ELECTRE et PROMETHEE /L'outil graphique SURMESURE proposé par Pictet et al. (1994).
Marchant (1996)	Individuelle	Rangement	ELECTRE I et II et PROMÉTHÉE I, II et III / L'outil graphique GAIA.
Colson et Mareschal (1994) ; Colson (2000)	Individuelle	Choix et rangement	ELECTRE I et II et PROMETHEE I, II et III / Outils graphiques basés sur la matrice de corrélation de Kendall, des fonctions de choix social, minimum des divergences des rangs, l'algorithme des ordres prudents, etc.
Ben khélifa et Martel (2001)	Individuelle	Rangement	ELECTRE III et PROMÉTHÉE I / Algorithme à choix itératif pour établir un rangement collectif à partir des préordres individuels.
Leyva-López et Fernández-González (2003)	Individuelle	Rangement	ELECTRE III / Algorithme génétique
Jabeur et Martel (2004a, b et 2005)	Individuelle	Choix, rangement et tri	Toute méthode multicritère (ou non) qui permet d'établir un système relationnel de préférence (s.r.p) incluant l'incomparabilité / L'algorithme d'agrégation AL3 et plusieurs procédures d'exploitation.

Tableau 1 : L'application de méthodes de surclassement de synthèse en décision de groupe.

IV. Conclusion

En analysant de près l'ensemble de ces travaux, nous remarquons qu'il existe plusieurs questions qui méritent d'être explorées. Nous pouvons citer à titre d'exemple les questions relatives à l'importance relative des membres, à la recherche d'un résultat de consensus à partir des résultats individuels et d'un résultat collectif obtenu à l'issue d'une procédure mathématique, à l'exploitation selon d'autres problématiques que celle du rangement. Jabeur (2004) a transcrit l'ensemble de ces questions dans une démarche générale d'aide à la recherche d'un résultat de consensus. La démarche qu'il propose comporte essentiellement quatre grandes étapes (voir Figure 2) :

1. Au cours de la première étape, chaque membre du groupe établit individuellement un système relationnel de préférence (s.r.p) sur un ensemble d'actions. Chaque s.r.p individuel peut être soit le résultat de l'application d'une méthode multicritère (ex. ELECTRE ou PROMÉTHÉE) soit proposé directement par le membre. Quelque que soit la méthode utilisée, chaque s.r.p individuel est construit sur la base d'une structure de préférence de type (préférence, indifférence, incomparabilité) ;

2. La seconde étape consiste à établir, à l'aide d'un algorithme itératif, un (ou plusieurs) s.r.p collectif(s) à distance minimum des s.r.p individuels et qui tien(nen)t compte des coefficients d'importance relative des membres. Notons que ces coefficients sont déterminés pour chaque paire d'actions (Jabeur et Martel, 2002);

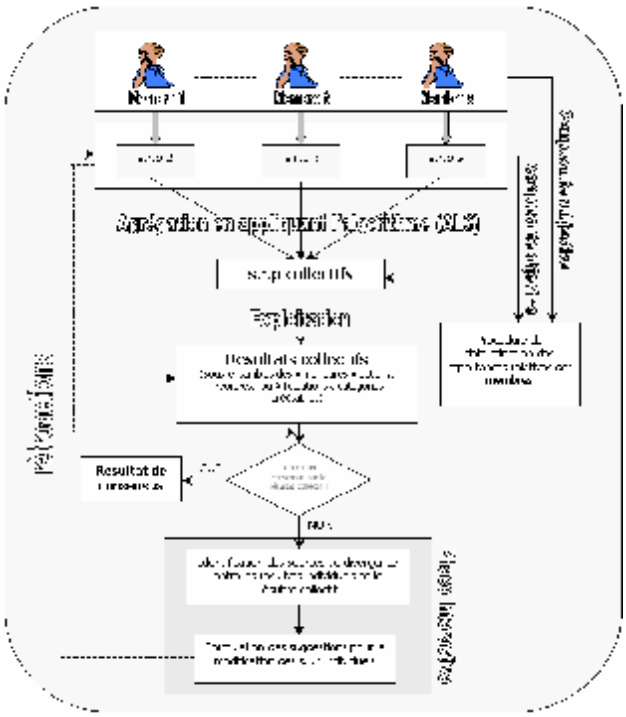

Figure 2: Démarche générale aidant les membre d'un groupe à la recherche d'un résultat de consensus.

3. La troisième étape consiste à exploiter chaque s.r.p collectif selon la problématique décisionnelle retenue (choix, rangement, tri) en vu d'établir un (ou plusieurs) résultat(s) collectif(s). Ainsi, un résultat collectif peut prendre l'une des trois formes suivantes : un sous-ensemble de « meilleure » actions, un préordre (total ou partiel) ou des affectations à des catégories préétablies ;

4. La quatrième étape consiste à vérifier s'il existe, parmi les résultats collectifs déterminés au cours de l'étape précédente, un résultat de consensus. Si un tel résultat existe alors la démarche s'arrête. Dans le cas contraire, c'est-à-dire qu'il n'y a aucun résultat collectif désigné comme consensus, il propose aux membres du groupe une phase interactive qui leur permet, à chaque itération, de vérifier s'il est possible de dégager un résultat de consensus. En effet, au cours de cette phase, les sources de divergence qui empêchent les membres d'atteindre un consensus sont identifiées. Ensuite, des suggestions sont faites aux membres sur la base desquelles ils peuvent modifier leur s.r.p individuel avec l'objectif de réduire leur divergence vis-à-vis un ou plusieurs résultats collectifs. Suite à ces modifications individuelles, de nouveaux résultats collectifs sont déterminés et par conséquent il est possible de vérifier de nouveau si un ou plusieurs de ces résultats peuvent faire consensus. Notons que cette phase interactive est répétée jusqu'à ce que au moins un résultat de consensus soit atteint ou qu'un nombre maximal d'itérations soit atteint[1].

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Forum

Robustness Algorithms for Multiple Criteria Optimization

Serpil Sayın

Koç University
College of Administrative Sciences and Economics
Rumeli Feneri Yolu
34450 Sarıyer, İstanbul, Turkey
ssayin@ku.edu.tr

Introduction

Various concepts and tools associated with robustness have been appearing more and more in the literature during the last few years. Many alternative definitions of robustness are made in different contexts. Moreover, there are different subjects of robustness, such as robust decisions, robust solutions, or robust methods and algorithms. In its general form, robustness refers to the ability of the subject to cope well with uncertainties. The different ways in which the performance of the subject is evaluated and the framework used for modeling the uncertainties lead to many alternative definitions of robustness. The concepts and definitions of robustness originally emerged as independent of the field of multiple criteria decision making (MCDM). In recent years, however, the relationship between robustness and multiple criteria decision analysis has been observed by a number of researchers (see, for instance, Roy (1998), Vincke (1999), Hites et al. (2003)). The previous issues of this newsletter have featured articles by prominent MCDM researchers contributing to the discussion of robustness mostly from the point of view of multiple criteria decision analysis. In this article, we will look at the issue more from an optimization perspective.

Robustness without probabilities

Since uncertainty is a critical element of robustness, taking a probabilistic modeling approach to the problem sounds quite natural. However, for the purposes of solution practicality and interpretation ease, it is possible to avoid a probabilistic approach and study the problem under a fully deterministic optimization setting. As such, the field of robust optimization has been the focus of several studies. One construct in robust optimization calls for introducing different scenarios into a single objective optimization problem to hedge against the uncertainties in the decision environment as it occurs with different realizations of data. Scenarios can be defined in two different ways, by defining continuous intervals (Averbakh (2004), Yaman (2001)) or by defining discrete scenarios. For the case of continuous intervals, there are certain parallels to parametric programming. Whether this class of research relates to previous studies in MCDM which considers multiple objective optimization with interval data poses an interesting question.

Robust Optimization and Multiple Objective Optimization

On the discrete scenarios front, the deviation robust decision, as Kouvelis and Yu (1997) have defined it, is a decision that minimizes the maximum deviation from individual criterion best values. This is what has been known as minimizing the Tchebycheff distance to the ideal solution of a multiple objective optimization problem in MCDM. Bowman (1975) introduced this approach as a means of characterizing efficient solutions. Kouvelis and Yu (1997) have noticed that the robust optimization problem and the multiple objective optimization problem have similarities when certain assumptions are met. This implies, obviously, that the relationship between the two different problems can lead to interesting developments for the solution of both.

The similarity between the discrete scenario optimization problem and the multiple objective optimization problem can lead to interesting new research topics. In general, the robust optimization problems that are dealt with have resulted in proposition of novel solution procedures and algorithms for efficient solution of the problem. Whether these solution approaches can be utilized to solve particular multiple objective optimization problems is a question worthy of investigation. Recently, Kouvelis and Sayin (2005) have studied the computational aspects of an algorithm for bicriteria discrete optimization motivated by ideas in robust optimization. Their algorithm performs an exhaustive search in the weight space while solving corresponding weighted robust optimization problems. The algorithm is originally designed to obtain all efficient solutions of the Multiple Objective Discrete Optimization problem but it can be customized to generate a representative sample of the efficient set as well.

A recent study that relates robustness to Multiple Criteria Optimization in a different way is given by Perny, Spanjaard and Storme (2004). Their work is representative of an alternative way of approaching the relationship between robustness and efficiency. By describing robustness in one particular way that guarantees efficiency of resulting solutions, they argue that an algorithm for finding robust solutions to a decision problem can serve as a means of creating a sample of efficient solutions since the set of efficient solutions may be too large to be useful especially in discrete optimization problems.

Another link between robust optimization and multiple objective optimization is possible via the max-ordering problem which calls for optimizing the worst of several objective functions and is therefore by definition a min-max type problem. Although this problem is not equivalent to the multiple objective optimization problem as it is, it is possible to generalize the problem definition

to lexicographic max-ordering, and then a further generalization of the objective function by the introduction of weights brings equivalence to multiple objective optimization (Ehrgott (1997)). Relating the max-ordering problem with studies that work on equivalent definitions of robustness may lead to further research questions.

As discussed above, we see more and more algorithms that use concepts of robust optimization for finding some or all of efficient solutions of the multiple objective optimization problem. When robustness is defined based on possible variations of data representations in the objective function of a single objective optimization problem, the parallelism is in a sense not surprising. As research in robust optimization has led to cultivation of many specialized algorithms to solve the defined robust problems, this approach provides a new opportunity for enumerating efficient solutions of certain multiple objective optimization problems.

Robustness in a probabilistic setting

There are also many unexplored alternatives, especially regarding probabilistic definitions of robustness. Although the parallelism between such studies of robustness and multiple objective optimization is not as straight forward as in the deterministic case, and the presence of probabilistic definitions might pose difficulties in terms of describing and interpreting the associated multiple objective optimization problem, such efforts might turn out to be quite rewarding since these robustness algorithms are usually computationally more efficient than their deterministic discrete scenarios counterparts. In particular, Bertsimas and Sim (2003) show that while the use of discrete scenarios lead to NP-hard problems even for cases where the simple single objective optimization problem is polynomially solvable, their definition of robustness leads to a polynomially solvable problem when the original problem is a polynomially solvable 0-1 programming problem.

Conclusion

We have seen that some definitions and tools of robust optimization are being used in multiple objective optimization to find the efficient solutions. In the future, working on alternative, perhaps more selective, definitions of efficiency might lead to establishing links to certain other forms of robustness that have been demonstrated to lead to computationally more tractable solution algorithms. In that respect, the bibliography of robust optimization given by Nikulin (2004) constitutes a good starting point.

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MCDA Research Groups

IDSS

Laboratory of Intelligent Decision Support Systems (IDSS) at the Poznan University of Technology, Poland

Chaired by

Roman Slowinski
Poznan University of Technology,
Poznan, Poland

The IDSS Laboratory has been established in 1990 within the Institute of Computing Science of the Poznan University of Technology. It groups today 26 researchers and academic teachers, including 1 professor, 3 associate professors, 11 assistant professors, as well as 11 assistants and Ph.D. candidates. There are, moreover, several external associates co-operating with us from both Poland and abroad. The research activity of the IDSS Laboratory is focused on **scientific methods of decision support**, in particular:

- multicriteria decision analysis, knowledge-based decision support, application of artificial intelligence in decision analysis,
- managing uncertainty and granularity of information in decision support systems using fuzzy set theory and rough set theory,
- rough set theory approach to knowledge and data engineering, in particular, to multicriteria decision analysis and approximate reasoning,
- preference modeling using decision rules,
- operational research problems and methodology, in particular, scheduling problems, including project and production scheduling, scheduling under fuzziness, water supply system programming,
- interactive methods for multiobjective mathematical programming,
- multiobjective metaheuristics for combinatorial problems,
- fuzzy linear programming with single or multiple objective functions,
- data mining and knowledge discovery,
- decision support in medicine, technology, economics and environmental studies,
- image processing and pattern recognition,
- feature construction and meta-learning,
- evolutionary computation and artificial life,
- text mining and Web mining,
- mobile decision support.

Within the area of intelligent decision support described by the above key topics, members of the IDSS Laboratory obtained original research results confirmed by many practical applications. Below, we present a brief characteristic of these results, together with a list of basic references.

A particular brand of this lab is an original knowledge discovery methodology for multiattribute and multicriteria decision support, which is based upon the concept of **rough sets** [A2,6], [B37]. Some important characteristics of the rough set concept make this methodology particularly useful in a variety of problems and concrete applications. For example, it is possible to deal with both quantitative and qualitative input data, and inconsistencies need not to be removed prior to the analysis. In terms of the output information, it is possible to acquire *a posteriori* information about the relevance of particular attributes and their subsets to the quality of approximation considered within the decision problem at hand. Moreover, the lower and upper (rough) approximations of decision classes, prepare the ground for inducing certain and possible knowledge patterns in the form of "*if..., then...*" decision rules.

Taking part in the development of rough set theory from the beginning, we adapted and extended its basic paradigm in many ways [A2], [B39,40]. For a long time, we also made attempts to employ rough set theory for decision support [B33]. The standard rough set approach was not able, however, to deal with preference-ordered attribute domains (criteria) and preference-ordered decision classes.

In the late 90's, adapting the classical rough set approach to knowledge discovery from preference-ordered data became a particularly challenging problem within the field of **multicriteria decision analysis**. Why might it be so important? The answer is related to the nature of the input preferential information available in multicriteria decision analysis and of the output of that analysis. As to the input, the rough set approach requires a set of decision examples. Such representation is also convenient for the acquisition of preferential information from decision makers. Very often in multicriteria decision analysis, this information has to be given in terms of preference model parameters,

such as importance weights, substitution ratios and various thresholds. Producing such information requires significant effort on the part of the decision maker. It is generally acknowledged that people often prefer to make exemplary decisions and cannot always explain them in terms of specific parameters.

For this reason, the idea of inferring preference models from exemplary decisions provided by the decision maker is very attractive. Furthermore, the exemplary decisions may be inconsistent because of limited clear discrimination between values of particular criteria and because of hesitation on the part of the decision maker. These inconsistencies cannot be considered as a simple error or as noise. They can convey important information that should be taken into account in the construction of the decision makers preference model. The rough set approach is intended to deal with inconsistency and this is a major argument to support its application to multicriteria decision analysis. Note also that the output of the analysis, i.e. the model of preferences in terms of decision rules, is very convenient for decision support because it is intelligible and speaks the same language as the decision maker.

An extension of the classical rough set approach which enables the analysis of preference-ordered data was proposed in [B7,8,9,11,13,38]. This extension, called the **Dominance-based Rough Set Approach** (DRSA) is mainly based on the substitution of the indiscernibility relation by a dominance relation in the rough approximation of decision classes. An important consequence of this fact is the possibility of inferring (from exemplary decisions) a preference model in terms of decision rules which are logical statements of the type "*if..., then...*". The separation of certain and uncertain knowledge about the decision maker's preferences results from the distinction of different kinds of decision rules, induced from lower approximations of decision classes or from the difference between upper and lower approximations (composed of inconsistent examples). Such a preference model is more general than the classical functional models considered within multi-attribute utility theory, or the relational models considered, for example, in outranking methods. This conclusion has been acknowledged by a thorough study of **axiomatic foundations** [A5], [B10]. DRSA has also been used as a tool for inducing parameters of other preference models than the decision rules, like the relational outranking model used in multicriteria choice problems [B15].

Since the first proposal of DRSA, we have presented many **extensions** of the approach that make it a useful tool for many specific decision situations [B1,2,5,12].

As to the **application side of the rough set approach**, it has been used for discovering regularities in complex phenomena, like stormwater pollution [B36], bankruptcy risk of firms applying for bank a credit [B41], finding indications for a surgery treatment [B32] and classification of Siberian forests [B3]. A special attention has been paid to application of the rough set approach in clinical practice, to support some diagnostic and managerial decisions in hospital emergency rooms. This application required extension of the rough set approach to handle incomplete data. The results were implemented as a "decision making core" of a clinical decision support system developed on a mobile platform [B45]. The system, called MET (**Mobile Emergency Triage**), supports triage of patients with various acute conditions. It underwent a clinical trial in the Children's Hospital of Eastern Ontario in Ottawa [B27,28].

The last experience has grown our general interest in **mobile decision support systems** constructed according to the methodology known as A3 (anytime and anywhere). The A3 methodology extends the static model of a DSS introduced by Sprague by assuming that a DSS should be assembled on request of a decision maker from an ontological model and a repository of generic building blocks, and then deployed on the access platform specified in the request. This allows one to construct versatile and flexible DSSs running on a variety of platforms (e.g., handheld computers, mobile phones, desktop computers) and supporting wide range of problems.

Our interest in **data mining and knowledge discovery** has not been confined, however, to the rough set approach only. A leading theme within this area has been induction of various types of rules from large data bases, including mining association rules from preference-ordered data. We developed algorithms for inducing minimal sets of classification rules and algorithms for discovering satisfactory sets of rules having good descriptive and classification properties [B43]. The resulting sets of decision rules have then been used in some newly proposed **classifiers** [B1]. Moreover, we proposed specialized multiple classifiers, including generalizations of the multi-class n^2-classifier and bagging with attribute selection, and new techniques for aggregation of sub-classifiers answers [B42]. We are also investigating methods of **machine learning** and **feature construction/synthesis** to transform the space of source data to facilitate learning. This results in simplifying descriptions of induced knowledge and obtaining robust behavior of the classifiers [B22].

Induction of decision rules or construction of accurate classifiers is not all one can expect from knowledge discovery process. Recently, we focused our research on an assessment of interestingness measures for decision rules, adapting some **Bayesian confirmation** measures [B14]. We proposed, moreover, a way of

measuring expected effects of **interventions** based on decision rules – it is particularly useful for marketing applications and customer satisfaction analysis [B6].

Special attention is also paid to techniques of attribute space reduction in data tables. The problem of analyzing data tables containing multidimensional representations of objects in terms of attributes is very common in statistics, knowledge discovery and machine learning. Irrespective of the techniques applied, such analysis may have descriptive or predictive character. In the descriptive analysis, the focus is on finding such representations of objects in terms of the attributes that satisfy particular requirements, e.g. representations that are minimal (subject to pre-defined objectives), easy interpretable (to the human) or quick to generate. In the prescriptive analysis, the focus is on finding good predictors, understood as procedures capable of foreseeing some unknown properties of objects. Both descriptive and predictive problems require good representations of objects in terms of attributes. Such representations expressed in terms of original attributes are often highly redundant, so a proper data reduction algorithm is required. Data reduction is either a pre-processing step in searching for a good description of considered objects, or a construction step of good predictors. It can also be used in object visualization, which requires low-dimensional object descriptions [B44].

Our research within data mining concerned also problems of obtaining human-perceivable information from systems of high complexity ranging from artificial neural networks to large collections of text documents. In particular, we developed new methods for supporting access to information gathered in electronic text resources, e.g. in the Web. Some new methods of text document clustering and labeling have been proposed [B31]. Among them, we elaborated an on-line method for **hierarchical clustering of Web documents** in order to discover an underlying topic structure of a document collection and thus support users in the process of efficient browsing for the desired information [B26]. The developed applications operate on snippets found by the Google browser.

Data mining and knowledge discovery are concerned also by image and sound processing, man-machine interaction, cognition and psychology. Modeling of **cognitive systems** is nowadays both challenging and still very difficult. The key problem is transition from low-level sensor data (e.g. image and/or sound) to high-level cognitive functions, such as recognition, planning, decision making, solving complex behavioral tasks, etc. Our research efforts include proposition of concepts representation which should be acquired and maintained automatically based on low-level features. A cognitive agent equipped with such a representation (knowledge) obtains world awareness which should help him to behave in the expected way [B22]. A parent topic for this area is man-machine interaction. There is a lot of real world problems concerning man-machine interaction which can be solved using psychological approach and computer science. For example, reading newspapers or books by blind or sight impaired persons could be supported by an electronic personal reading assistant. Such a system might consist of a tiny digital camera mounted in glasses, a digital signal processor (DSP), optical character recognition (OCR) and voice synthesis modules. A solution of the problem seems to be mainly an engineering task but there are a lot of scientific sub-problems which we are going to deal with.

In the field of **decision support based on pictorial information**, we developed a variety of approaches to feature synthesis that enable standard machine learners, like decision tree inducers, rule inducers, or neural nets, to learn directly from raster images and to use the acquired knowledge to perform various visual tasks, including object recognition and scene interpretation [A8]. For the task of feature synthesis, we proposed to use different paradigms of evolutionary computation. In such approaches, the learner performs a search in the space of image representations, i.e., features synthesized by the learning process. Given background knowledge in the form of elementary image processing and feature extraction operators, the evolutionary process synthesizes complex feature extraction procedures in a form of sequences or trees of elementary operators. The particular **evolutionary paradigms** include genetic programming, linear genetic programming, and cooperative coevolution [B24,25]. The developed methodology has been successfully applied to various real-world tasks, including recognition of 3D objects in visual spectrum, interpretation of medical imaging, and object recognition in radar imagery.

Another field of our research is **computer modeling and simulation**, applied to biological and physical phenomena. The motivation is either to use ideas present in nature to solve real-life problems or to investigate computer models of reality to increase knowledge of natural processes. In particular, we work on simulation of embodied agents (robots) situated in an artificial environment. This research concerns the fields of **artificial life**, biologically inspired systems, evolutionary robotics, complex systems, cognitive science, sensor evolution, and neuroscience. It involves evolution (directed or spontaneous and open-ended) of neural control and design using various genetic representations [A7], [B23].

We do not ignore, of course, classical topics of operational research and classical approaches to multicriteria decision analysis. We proposed **interactive methods** for **multiobjective programming** [B21], including **fuzzy multiobjective linear programming** [A1,3], [B35], as well as metaheuristic procedures for approximation of efficient frontiers in **multiobjective combinatorial optimization**, like Pareto simulated annealing [B17]. Recently, our main interest is focused on hybrid evolutionary (memetic) algorithms; we proposed a Pareto memetic algorithm that proved to perform well on several hard combinatorial problems, e.g. traveling salesperson problem or set covering problem [B19,20]. We are also interested in evaluation of multiobjective metaheuristics which should allow for quantitative comparison of various methods of this kind among them, as well as for comparison of these methods with other competitive approaches [B18,19].

Among multiobjective combinatorial optimization problems, we considered also a special assignment problem with incompatibility and capacity constraints [B34]. Within the area of multicriteria decision analysis, we proposed a method for inferring an outranking model parameters from assignment examples [B29,30] and a graded quadrivalent logic for ordinal preference modeling [B4].

We continued also our long lasting interest in multi-mode and multi-category resource constrained **project scheduling**, fuzzy project scheduling, software project management and vehicle routing problems [A4], [B16,17]. In all these problems, fuzzy sets were used to model both uncertainty of time parameters and flexibility of time constraints. A part of our lab was involved in intensive research concerning application of project management methods to **software engineering**. This resulted in participation in two European projects: OPHELIA (5^{th} FP) and CALIBRE (6^{th} FP). The first aimed at research on open platforms and methodologies for development tools integration in a distributed environment, while the latter focused on free and open source software engineering for open development platforms for software and services.

The IDSS Laboratory is responsible for two Master's specializations at the Faculty of Computer Science and Management of the Poznan University of Technology (PUT):

- Intelligent Decision Support Systems
- Software Development Technologies

Lab members give also courses at the Doctoral School of Computer Science at PUT.

The **Web page** of the IDSS Laboratory can be found at: http://idss.cs.put.poznan.pl

Some of our home-made **software** is available

at: http://idss.cs.put.poznan.pl/site/software.html

Major Publications of members of the IDSS Laboratory

A. Books, monographs and edited volumes

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Roman Slowinski, Poznan, February 23, 2005

Consultancy Companies

Bureau d'aide à la décision
(Bureau AD)

Jacques Pictet
Dominique Bollinger
info@aide-decision.ch
www.aide-decision.ch

Bureau AD
Case postale 116
CH-1000 Lausanne 16
Switzerland

Introduction

In a previous issue of the newsletter in 1999 (NL 2/14), we explained in some details the transition from the Institute for environmental engineering at the Swiss Federal Institute of Technology in Lausanne (EPFL) to the present private company.

Founded in 1998 by the two authors, the company developed its activities with MCDA as a central competence. The first year was particularly difficult, spending most of our time in explanations about what MCDA was all about and a few small contracts. Seven years on, we are still in the business…

We will describe below our activities before taking the opportunity to practice some introspection.

Consultancy

Environmental planning

This field – taken in the broad sense – was the first to develop and remains the main one. Due to our previous activity, we had the connections and the knowledge; even so, it took time to convince the people that quitting EPFL did not changed us dramatically (taking into account that Prof. Maystre kindly accepted to be our mentor at the company launch).

Energy
Our first (small) contract was in that field to investigate how MCDA could help the local planning of energy supply (Canton Geneva). Later, we have been involved – as a support to an EPFL laboratory within the international Alliance for global sustainability – in a study about the energy supply and demand for a whole Chinese province (Shandong) [Haldi, Pictet, 2003].

Waste
Waste management was a major topic at the EPFL and is still one in the Bureau AD. This connection was clear in one of our early contract to analyse the Swiss waste incineration plants in search of potential over- and under-capacities (Prices survey agency). It holds true for a very recent contract to compare proposed processes to treat incineration residues, as an update of a study realised during the EPFL era [OFEFP, 1998].
Over the years, we have audited one Canton building wastes control system (C. Geneva) and the comparison of sanitation processes for the Swiss second largest industrial landfill (C. Jura).
Most of our public procurement contracts are connected with this field (see below).

Waste water / Sewer sludge
This field has a lot in common with the previous one. We have been involved in a comparison of sewer sludge treatment processes with political innuendoes (C. Fribourg). More recently, we participated in projects to choose the location of two small or intermediate waste water treatment plants (C. Geneva).

Water
"How much water for the fishes downstream of a dam?" was the central question of a negotiation between a Canton, its energy utility and the fishermen associations (C. Fribourg). Another on-going contract for a French utility deals with internal and external legitimisation of a big canal renovation priorities (Société du canal de Provence).

Regional planning
We have been involved in a broad study to analyse alternative ways to deal with floods at a regional level for an area gained at the beginning of the 20th century over marshes. In this project, we had to deal with two groups of decision-makers (33 people) and numerous groups of experts (20 people) (C. Vaud) [Bollinger, Pictet, 2003; Pictet, 2004].

Transportation
A first study was about priority among various town-centre avoidance projects. A very recent one details one of these projects and deals with the choice between various road location possibilities (C. Geneva).

Organisation

Such projects deal more with the legal status, internal procedures and power issues among actors.
At an early stage, we helped design a regional utility aimed at co-ordinating communities needs for larger waste treatment plants (C. Vaud). Later on, we designed a procedure for the federal environmental agency to define priorities among the various projects it could undertake (OFEFP). More recently, we supported the change process for the national body in charge of agricultural counselling, with two linguistic-based agencies (SRVA).

Public procurement

This field was quickly identified as an interesting one, as it provided a rather clear legal basis for MCDA, stemming from the Marrakech agreement (1994).
One of our first contracts dealt with the selection of a tenderer for a distant heating system (C. Geneva). Then we supported two incineration plants, one for a succession of calls for tenders, from the leading engineering consultant to the construction companies (C. Vaud, C. Valais), the other for the sewer sludge transportation to the plant (Neuchâtel). More recently, we helped several communities of a region in the choice of a solid wastes transportation company for each of them (C. Vaud).
An Austrian bank asked us to help them with a kind of public procurement procedure aiming at selecting pollution reduction projects abroad (Kommunalkredit Austria AG).

Our experience led us to write a book based on an analysis of the Swiss jurisprudence. We proposed a methodology that remains as near as possible from the actual practice but improves it when necessary [Pictet, Bollinger, 2003; NL 3/8]. To help the authorities implement our proposals, a spreadsheet is available to download (www.marches-publics.ch).

Miscellanies

Not all projects have a clear MCDA dimension. Interestingly, an on-going line of projects in databases stems from a preliminary study about the possible use of these databases to support decision-making. We found that there was a need to improve first the databases themselves, in connection with their online consultation. This explains why we worked on noise, rivers water quality and fishes populations over the years (C. Geneva)!

Teaching

While at the EPFL, we were both teaching MCDA at undergraduate and postgraduate levels. After "getting private", the latter continued (environmental engineering and management). More recently, we have been asked to contribute to another postgraduate program (energy engineering and management).

We also train public officers for some years (C. Geneva) and, more surprisingly, nurses from the whole French-speaking area of Switzerland.

In 2003, we were responsible for the practical exercise of the International summer school on MCDA, held in Montreal.

Research

Research is not at the top of our agenda, as it does not "fill the fridge". Moreover, attending conferences and buying journals is taxing for a small company. Nevertheless, we try to keep in touch, attending meetings when they are not too far (Hawaii is out of reach!) and writing papers when possible.

Jacques Pictet continues his fruitful collaboration with Val Belton initiated when he was in Glasgow. After their first paper about group MCDA [Belton, Pictet, 1997], they wrote two contributions together:

- one about compensation and incomparability within MAVT in French [Pictet, Belton, 2000] (an English version is underway),
- one about the non-mathematical dimensions of MCDA [Belton, Pictet, 2002].

An invited conference in Madrid about e-democracy led to an article in which we emphasise the distance between what researchers are able to propose and what we face in practice [Bollinger, Pictet, 2003]. More generally, Academia might be appalled by the basic level of MCDA on a day-to-day basis, mathematically speaking!

An interesting research topic deals with extensions of the cards procedure initially proposed by Jean Simos:

- use as a basis for the evaluation of criteria with interval scale, within outranking methods,
- use for evaluation and weighting within MAVT, under certain conditions [Pictet, Bollinger, 2004a],
- use as a group elicitation procedure [Pictet, Bollinger, 2004c].

A possible application to landscape evaluation has also been investigated [Tangerini et al., 2004].

We also try to inform the general public, or a more specific one, about the aim and potential of MCDA [Pictet, Bollinger, 2004b].

Introspection

Public / private clients

Our clients are public authorities or public utilities, but for a few exceptions. More precisely, they are mostly the French-speaking (or bilingual) Cantons. The community level might not require the formalism MCDA implies, except for public procurement. The federal level implies language difficulties that are not easy to overcome.

Private companies seem to be out of reach. The contacts we had over the years indicate that they rely on ad hoc methods and do not need the transparency public authorities have to accept.

Possibly, it is our own limitations that prevent us from accessing a larger circle of clients.

Collaboration / specific knowledge

Even if the projects are often connected with our background as rural engineers, we collaborate regularly with engineering companies or researchers. They provide the content skills that we lack. Having the basic understanding of the issues definitively helps us in our activity.

The field of public procurement, mainly in the hands of lawyers, needed a major effort in the first place to get into it (over the years, we collected on the Internet more than 3 000 A4 pages, size 10, of Swiss jurisprudence, not to mention the other countries).

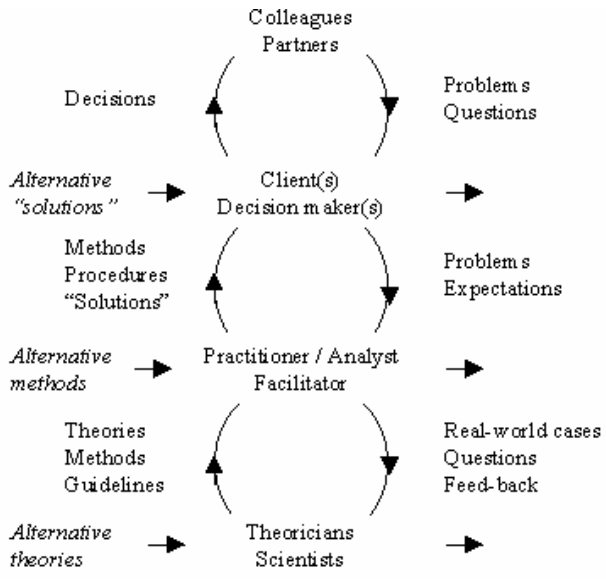
Can the MCDA practitioner survive?

This was a subtitle of a contribution made by Val Belton and Jacques Pictet in the Opinion-makers section in 1997 (NL 2/11). The question is not whether MCDA is lethal, but whether MCDA is enough to ensure enough work. The answer, in our case, is a mitigate one: it might be enough for the toast, but not (yet) for the caviar on it!

The way ahead

Nobody knows what the future will be, but we intend to go on and contribute to the dissemination of MCDA in practice. Possibly, we will have to reconsider the way we conceive our activity, our relationship with our clients and partners.

In the contribution mentioned above, Val Belton and Jacques Pictet presented the figure below, arguing that the "weakest link" was between the practitioners and their clients.



Looking back to it, one might wonder whether the gap between theory and practice is not getting larger by the day. Theory developments are far too quick to be followed by practice application and mentalities.

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Software

El-Ghazali Talbi
Université des Sciences et Techniques de Lille
E-mail : El-Ghazali.Talbi@lifl.fr

PARADISEO (PARAllel and DIStributed Evolving Objects). ParadisEO is a free C++ white-box object-oriented framework dedicated to the reusable design of parallel metaheuristics for (multi-objective) optimization. It is basically an extension of the EO evolutionary computation framework (http://eodev.sourceforge.net). It provides a broad range of new features including local searches (Hill Climbing, Simulated Annealing and Tabu Search), the most common parallel models (based on the walk, the solution and the objective function) and some hybridization mechanisms. ParadisEO is based on a clear conceptual separation of the solution methods from the problems they are intended to

solve. This separation confers to the user a maximum code and design reuse. A first implementation relies on a multi-programmation layer (Posix threads) and some communication libraries (LAM-MPI or PVM) for execution on dedicated parallel and/or distributed computational resources. Another implementation relies on Athapascan and Inuktitut for the dynamic scheduling on a dedicated grid environment. A last release will be available soon. It is based on Condor and the Master/Worker API for High Throughput Computing and Grid Computing on volatile non dedicated resources.

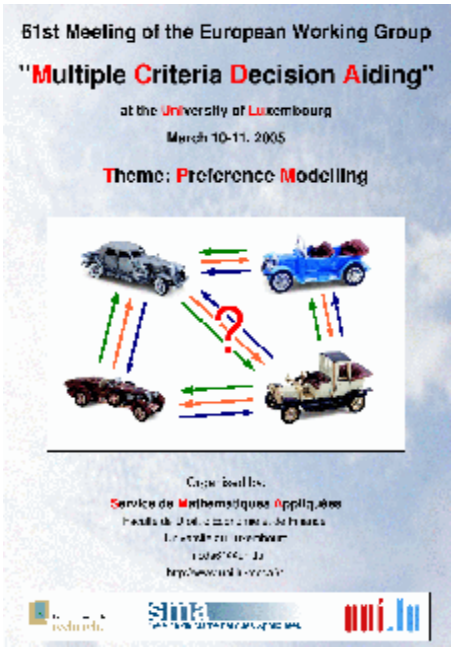
GUIMOO (a Graphical User Interface for Multi Objective Optimization). Guimoo is a free software dedicated to the analysis of results in multi-objective optimization. Its main features enable - The on-line visualization of approximative Pareto frontiers. Such information could be used by the expert to build more efficient metaheuristics. A Pareto frontier may be characterized by its (dis)continuity, (dis)convexity, modality, - some metrics for quantitative and qualitative performance evaluation (contribution, entropy, generational distance, spacing, size of the dominated space, coverage of two sets and coverage difference) GUIMOO aims to be generic. Yet, its architecture permits to easily customize it in order to provide the user more functionalities, as a specific problem is tackled (it was done for radio network optimization). Some 'problems' with related files are supplied for demonstration. They deal with the 'Vehicle Routing Problem' and the 'Flow Shop Scheduling'. The latest release of Guimoo is available either as an executable file on Windows or a tarball of sources on Linux. http://www.lifl.fr/~cahon/logiciels.html.

Persons and Facts

MCDM International Society. President-Elect (for 2008-2012): Jyrki Wallenius has been elected Four executive committee members for the 2004-2008 cycle: Carlos A. Bana e Costa, Hirotaka Nakayama, Jose Figueira, Mark Ridgley.

On 27 April 2004 the Senate of Ukraine State Aviation University (in Kiev) awared the title of Doctor Honoris Causa to the Principal Vice-rector of Vilnius Gediminas Technical University Prof. Dr Habil. Edmundas Kazimieras Zavadskas.

About the 61st Meeting



Purpose

The spring meeting – actually the 61st in a 30 years tradition – of the EURO Working Group on "*Multiple Criteria Decision Aiding"* (EWG-MCDA) was hosted from March 10 – 12, 2005 by the Faculty of Law, Economics, and Finance at the University of Luxembourg.

Multiple Criteria Decision Aiding may be considered as a branch of Operational Research which appeared in the late sixties. Important conceptual and methodological work, as well as practical applications, have been accomplished in the meantime. This bilingual French/English working group was founded by Pr. Bernard Roy from University Paris-Dauphine at the occasion of the first EURO Conference in Brussels in 1975. It has always been one of the most active European working groups, gathering constantly

Pr. Bernard ROY

more or less 300 research workers from many countries inside and even outside Europe. Without any exception, the group has met in spring and autumn since then.

The EWG-MCDA group contributes to develop, on the European level, an original approach to multiple criteria decision aiding. The regular meetings allow each group member to share his/her most recent work in methodology, theory or application areas with an expert audience where critical discussions are specially welcome and actively supported.

Institutional support

The meeting was supported by EURO, the Association of European Operational Research Societies, the National Research Fund (Fonds National de la Recherche, FNR) Luxembourg as well as the University of Luxembourg. Jean-Paul Lehners, vice-rector of the newly founded University of Luxembourg, welcomed the participants in the name of the University authorities at the academic reception on Thursday evening, March 10.

The conference participation

The conference gathered 56 participants from 18 countries: Algeria (1), Belgium (8), Canada (1), Czech Republic (2), Estonia (1), France (16), Germany (2), Greece (5), Hungary (1), Ireland (1), Italy (2), Luxembourg (3), Morocco (1), Portugal (4), Spain (4), Sweden (1), Tunisia (1), UK (1).

The Programme Committee

B. Roy (Université Paris-Dauphine), J.-P. Barthélemy (Telecom Bretagne), R. Bisdorff (Université du Luxembourg), D. Bouyssou (CNRS, France), J.-L. Marichal (Université du Luxembourg), P. Meyer (Université du Luxembourg), M. Pirlot (Faculté Polytechnique de Mons), M. Roubens (Faculté Polytechnique de Mons), A. Tsoukias (CNRS, France), Ph. Vincke (Université Libre de Bruxelles).

Local organizers

Raymond Bisdorff, Jean-Luc Marichal, and Patrick Meyer from the Applied Mathematics Unit (SMA) of the Faculty of Law, Economics, and Finance.

Venue

The meeting was held at the Campus Limpertsberg of the University of Luxembourg.

The MCDA61 web site

A specific web site was set up. The participants could consult all necessary information concerning the scientific as well as the social program of the conference. A picture album reminds of the main events. (see http://www.uni.lu/mcda61).

Scientific Contents

The main topic of the meeting addressed the general issue "*Preference Modelling"*, the major research topic of this EURO Working Group. Three invited guests delivered specific talks related to this subject: Bernard de Baets (University of Ghent, B) *on cycle transitivity of preference relations*, János Fodor (Szent Istvan University, Budapest, HU) on *the construction and representation of fuzzy weak orders* and, Marc Roubens (Faculté Polytechnique de Mons, B) on *choice procedures in pairwise comparison multiple-attribute decision making methods*. Five sessions were respectively devoted to preference modelling, methodological applications, theoretical aspects, fuzzy approaches, bipolar structures, and ranking ans sorting. As it is tradition, a special session was devoted to the preparation of the next meetings. The upcoming fall meeting of the group, organized by Sven Larsson, will be held in Borlänge (Sweden). Finally, Alexis Tsoukias, President of EURO with a talk entitled: *OR and EURO: achievements and future challenges*, presented news from the 30th anniversary festivities of EURO and new initiatives from the EURO Executive Committee.

Diffusion of the results

Short abstracts of all communications were compiled in a Proceedings booklet. A copy of all submitted discussion papers was made available to the participants. A CD with the last ten newsletters from 2000 to 2004 of the EWG MCDA was also distributed.

Specific acknowledgments

The organizers would like to thank EURO, the FNR, as well as the University of Luxembourg for their financial support. We also thank our local professional sponsors: BGL (Fortis) Luxembourg, HP Luxembourg, ING Luxembourg.

Luxembourg, March 2005

Prof. Raymond Bisdorff
University of Luxembourg

Programme des Journées / *Programme outline of the meeting*

JEUDI 10 MARS / THUSRDAY, MARCH 10

11h00-12h00 Accueil et enregistrement / *Welcome and Registration*

12h00-13h20 Déjeuner (buffet) / *Lunch (buffet)*

13h20-13h40 Message de bienvenue (R. Bisdorff) / *Welcome Message (R. Bisdorff)*

13h40-15h30 Session 1 / **Modélisation des préférences / *Preference Modelling***
Chairman : M. Roubens

- B. De Baets, H. De Meyer, Cycle-transitivity (50 minutes)
- Ph. Fortemps, M. Pirlot, Elicitation d'une relation de préférence (30 minutes)
- J. Geldermann, V. Bertsch, O. Rentz, Multi-criteria Decision Support for Emergency and Remediation Management - Preference Elicitation and Evaluation of Strategies (30 minutes)

Papiers soumis à discussion / *Papers submitted for discussion*

- B. Aouni, A. Hassaine, J-M. Martel, La modélisation des préférences du décideur dans le modèle du Goal Programming
- S. Hoppe, E. Levrat, C. Fonteix, J. Renaud, C. Schrauwen, F. Pla, Comparaison de résultats d'aide à la décision par Ensembles Approximatifs (Rough Sets) et Moyennes Pondérées Ordonnées (OWA) dans le cas de l'extrusion réactive de polyuréthannes à usage médical
- C. Zopounidis, M. Doumpos, Eliciting Preferential Information Using Disaggregation Methods: An Experimental Evaluation

15h30-16h00 Pause café / *Coffee break*

16h00-18h00 Session 2 / **Applications méthodologiques / *Methodological Applications***
Chairman : J.-P. Barthélemy

- John Croston, Modelling Disaster Management such as rehabilitation after the Tsunami (30 minutes)
- F.Fournier, S.Hoppe, C. Fonteix, C.Schrauwen, F.Pla, Définitions de Plans d'Expérience: Comparaison de résultats d'aide à la décision par PROMETHEE et pour la méthode empirique usuelle (30 minutes)
- K. Kosmidou, C. Zopounidis, Managing Interest Rate Risk in Commercial Banks via Multicriteria Analysis (30 minutes)
- I. Sahnoun, J.-M. Martel, H. Chabchoub, Prévision de faillite à l'aide de la programmation mathématique (30 minutes)

Papiers soumis à discussion / *Papers submitted for discussion*

E. Grigoroudis, P. Kyriazopoulos, Y. Siskos, D. Yannacopoulos, Evaluating the quality of e-services: the case of an ISP

J. Halova, K. Zimmermann, M. Nemec, P. Stopka, M. Aust, L. Austova, Supercurrency - A new index of instability of world financial market

N. Matsatsinis, P. Delias, I. Gryspolakis, A multicriteria evaluation of a Technical University

Yodaira Borroto Pentón, Estrella María de la Paz Martínez, Fernando Delgado Merrera, Juan Sánchez Castillo, The multiple criteria analysis in the accomplishment of the maintenance audit in hospital facilities

M. Rogers, Strategic Environnmental Assessment: Its uses as a decision making tool in the planning off major development strategies

18h00-19h00 Réception académique / *Academic Reception*

20h00-23h00 Banquet / *Conference Dinner*

VENDREDI 11 MARS / FRIDAY, MARCH 11

08h30-10h00 Session 3 / **Aspects théoriques / *Theoretical Aspects***
Chairman : J.-L. Marichal

- L. Galand, Recherche interactive de solutions de compromis dans les problèmes d'arbres couvrants et de chemins multicritères (30 minutes)
- D. Bouyssou, M. Pirlot, ELECTRE et TACTIC sont-elles si semblables? (30 minutes)
- J.-P. Barthélémy, A. Legrain, Ph. Lenca, B. Vaillant, Mesures de qualité de règles d'association et agrégation de relations valuées (30 minutes)

Papiers soumis à discussion / *Papers submitted for discussion*

- T. Tervonen, J. Figueira, R. Lahdelma, P. Salminen, An Inverse Approach for Electre III
- I. Kaldo, On approximate Gauss-Newton Methods for nonlinear least squares problem
- M. Matos, Value Machines for Decision-Aid in Multicriteria Power System Problems
- B. Rousval, Impact des transports sur l'environnement: Aide à l'Evaluation ou Aide à la Décision
- A. Tauts, L. Krumm, O. Vaarmann, Search for the Pareto Point with Max-Min Approach

10h00-10h30 Pause café / *Coffee break*

10h30-12h20 Session 4 / **Approches floues / *Fuzzy Approaches***

Chairman : B. De Baets

- J. Fodor, B. De Baets, and U. Bodenhofer, Fuzzy Weak Orders - Construction and Representation (50 minutes)
- A. Denguir-Rekik, A. Akharraz, J. Montmain, G. Mauris, Decision Explanation and Risk Evaluation in a MCDM Process (30 minutes)
- A. Denguir-Rekik, J. Montmain, G. Mauris, Handling Uncertainty in a MCDM Process for an E-Business Website Choice Support (30 minutes)

Papiers soumis à discussion / *Papers submitted for discussion*

- Vladimir Isaak Kalika, Modelling stock buying-selling on stock exchange using a new MCDM methodology accounting for uncertainty
- Vasile Postolică, Fish wars studied by splines and efficiency
- G. Samaras, N. Matsatsinis, C. Zopounidis, P. Ypsilantis, A multicriteria DSS for Stock Evaluation using fundamental analysis

12h20-13h40 Déjeuner (buffet) / *Lunch (buffet)*

13h40-14h10 Session 5: **Vie du groupe et prochaines réunions / *Working group matters and next meetings,*** Chairman : B. Roy

14h10-16h00 Session 5 / **Structures bipolaires / *Bipolar Structures***

Chairman : R. Bisdorff

- M. Roubens, Choice procedures in Pairwise Comparison Multiple-Attribute Decision Making Methods (50 minutes)
- C. Labreuche, M. Grabisch, Taking into account bipolar decision behaviors in MCDA (30 minutes)
- Silvia Angilella, Josè Figueira, Salvatore Greco, Benedetto Matarazzo, The bi-polar extension of the Simos' procedure (30 minutes)

Papiers soumis à discussion / *Papers submitted for discussion*

J. Figueira, S. Greco, R. Slowinski, Building Additive Utility Functions Representing Intensities of Preferences

16h00-16h30 Pause café / *Coffee break*

16h30-18h00 Session 6 / **Rangement et classification / *Ranking and Sorting,***

Chairman : Y. Siskos

- S. Damart, L. Dias, V. Mousseau, Supporting groups in sorting decisions: methodology and use of a multi-criteria aggregation-disaggregation DSS (30 minutes)
- J. Renaud, E. Levrat, C. Fonteix, Classification de produids à partir de la méthode des opérateurs OWA - Application industrielle (30 minutes)
- Ute Simon, Rainer Brüggemann, Stefan Prudenz, Horst Behrendt, Meteor – an Approach to Unmask the Weighting Camouflage in Decision Support – Application in Water Management in Berlin, Germany (30 minutes)

Papiers soumis à discussion / *Papers submitted for discussion*

1. Jaime Manera Bassa, María A. de Vicente y Oliva, Mónica Martín del Peso, Construction d'un cadre théorique pour le rangement de projets de développement à l'aide de la décision multicritère
2. A. B. Petrovsky, Ordering and Sorting Objects with Contradictory Attributes: Multiset Approach

SAMEDI 12 MARS / SATURDAY, MARCH 12

10h00-12h00 Visite guidée du centre historique de la ville de Luxembourg /

Guided tour of the historical center of Luxembourg city

Rendez-vous devant l'office du tourisme, place d'Armes, centre de Luxembourg / *Rendez-vous in front of the Luxembourg city tourist office, place d'Armes.*

Forthcoming Meetings

(This section is prepared by Carlos Henggeler Antunes)

Forthcoming EWG Meettings/Prochaines réunions du Groupe

Note:

- It should be remarked again that this is a bilingual group; all the papers should be presented in both official languages of the group (i.e. French with English slides, and *vice-versa*).
- Ceci en un groupe bilingue ; tous les papiers doivent être présentés dans les deux langues officielles du groupe (i.e. en français avec les transparents en anglais et *vice-versa*).

September 22-23, 2005. 62nd Meeting of the European Working Group on MCDA. Organisers: S-O Larsson, J-E Nilsson, A Grummas. Topic: Infrastructure, transport and Multicriteria Decision Aiding. Place: The Swedish National Road and Transport Research Institute (Borlänge, Sweden). The host organisation of the reunion MCDA 62 is: Institute (http://www.vti.se). Web site of the Meeting: http://www.vti.se/mcda62. E-mail: larsson.018129984@telia.com and agneta.grummas@vti.se.

March 23-24 or 30-31, 2003. 63rd Meeting of the European Working Group on MCDA. Organisers: Manuel Matos and Jorge Pinho de Sousa. Topic: Performance Evaluations (Individuals, Institutions, Services, etc). Place: Faculty of Enginnering, The University of Oporto or INESC-Porto. E-mail: mmatos@inescporto.pt.

Other Meetings

May 15 - May 18, 2005. Eighth SIAM Conference on Optimization Stockholm, Sweden. [http://www.siam.org/meetings/op05/]

May 23 - May 25, 2005. OPTI 2005 Ninth International Conference on Computer Aided Optimum Design in Engineering Skiathos, Greece. [http://www.wessex.ac.uk/conferences/2005/op2005/2.html]

May 23 – May 26, 2005. CIRO'05: 4ème Conférence Internationale en Recherche Opérationnelle Marrakech, Morocco. [http://www.ucam.ac.ma/fssm/ciro05/]

May 26 – May 28, 2005. EWG ECCOXVIII, 18th annual meeting of the EWG European Chapter on Combinatorial Optimization. Meeting theme: Combinatorics for Modern Manufacturing, Logistics and Supply Chains. Belarusian State University, Minsk, Belarus. [http://www.prism.uvsq.fr/~vdc/ECCO/]

June 5 – June 7, 2005. EWG Graz-2005 - Joint-Workshop on Decision Support Systems, Experimental Economics & e-Participation. Graz, Austria. [http://www.uni-graz.at/soowww/eCube]

June 6 - June 10, 2005. Seventh Workshop on Models and Algorithms for Planning and Scheduling Problems (MAPSP2005) Siena, Italy. [http://mapsp2005.dii.unisi.it/]

June 8 - June 10, 2005. Eleventh Conference on Integer Programming and Combinatorial Optimization (IPCO XI) Berlin, Germany. [http://www.math.tu-berlin.de/ipco05]

July 3 - July 8, 2005. The 16th IFAC World Congress Prague, Czech Republic. [http://ifacplaza.certicon.cz/index.php]

July 10 - July 12, 2005. The First Euro Conference on Mobile Government (The EURO, mGOV 2005) Sussex University, Brighton, The United Kingdom. [http://www.icmg.mgovernment.org/europeanmg.htm]

July 10-13, 2005. 9th World Multi-Conference on Systemics, Cybernetics and Informatics (http://www.iiisci.org/sci2005), which will take place in Orlando, Florida, USA. You can get the conferences Call for papers in [http://www.iiisci.org/sci2005/website/callforpapers.asp]

July 11 - July 15, 2005. SIAM Annual Meeting New Orleans, LA, USA. [http://www.siam.org/meetings/an05/index.htm]

July 11 - July 15, 2005. 17th Triennial Conference of the International Federation of Operational Research Societies 2005 Honolulu, Hawaii.. [http://www.informs.org/Conf/IFORS2005/]

July 11 - July 15, 2005. The 17th IMACS World Congress Paris, France. [http://imacs2005.ec-lille.fr/]

July 21 - July 26, 2005. CINC 2005 7th International Conference on Computational Intelligence and Natural Computing, 2005 Salt Lake City, UT, USA. [http://www.jcis.org/pages/subconference/cinc/cinc.aspx]

July 28 - July 31, 2005. INFORMS Annual Teaching of Management Science Workshop Lake Bluff, Illinois,

USA.
[http://www.informs.org/Edu/TMSWorkshop/TMS05/index.htm]

August 22 - August 26, 2005. 6th Metaheuristics International Conference (MIC2005) Vienna, Austria. [http://www.mic2005.org/]

September 1-3, 2005. The Tenth International Conference on Rough Sets, Fuzzy Sets, Data Mining and Granular Computing RSFDGrC2005. University of Regina, Canada Website: www.cs.uregina.ca/~rsfdgrc. Email: rsfdgrc@uregina.ca

September 7 - September 9, 2005. Operations Research 2005 (OR 2005) International Conference on Operations Research Bremen, Germany. [http://www.or2005.uni-bremen.de]

October 26 - October 28, 2005. 7th International Conference on Artificial Evolution (EA'05) Lille, France; [http://www.lifl.fr/~jourdan/ea2005/]

November 13 - November 16, 2005. INFORMS Annual Meeting, New Orleans 2005 New Orleans, Louisiana, USA. [http://www.informs.org/Conf/NO2005/]

July 2 - July 5, 2006. EURO XXI, 21st European Conference on Operational Research 2006 Reykjavik, Iceland. [http://www.euro2006.org]

November 5 - November 8, 2006. INFORMS Annual Meeting 2006 Pittsburgh, PA, USA.

Call for Paper

Web site for Call for Papers:
www.inescc.fe.uc.pt/~ewgmcda/CallforPapers.html

Books

*** *** ***

Aide Multicritére à la Décision / Multicriteria Decision Aiding
(56e Journées du Groupe de Travail Européen
AIDE MULTICRITÈRE À LA DÉCISION
56th Meeting of the European Working Group
MULTIPLE CRITERIA DECISION AIDING

Coimbra, Portugal, 3-5 / 10 / 2002)

Carlos Henggeler Antunes
José Figueira
João Clímaco
(Editors)

Contents: C. Henggeler Antunes, J. Figueira, J. Clímaco – "Preface" . Acknowledgment to the reviewers. **I Conceptual Issues**: J.-P. Brans - "La gestion du futur: le respect, le multicritère, le bonheur"; L. Dias, A. Tsoukiàs – "On the constructive and other approaches in decision aiding"; B. Roy - "Robustesse de quoi et vis-à.-vis de quoi mais aussi robustesse pourquoi en aide à la décision?". **II – Theory and Methodology** : R. Bisdorff, M. Roubens - "On clear choices with ordinal valued binary relations"; M. Doumpos, C. Zopounidis - "An outranking relation approach for classification problems based on pairwise comparisons" ; P. Kunsch, A. Chevalier - "The representation of dynamic trajectories with the Kolm's triangle for multiple-factor decision problems"; R. Lourenço, J. P. Costa - "The LinearTri software: sorting solutions in multiple objective mixed integer linear programming problems"; C. Mousset - "Répresentation numériques de familles de relations non complètes" ; G. Munda - "Social multi-criteria evaluation" ; A. Scarelli - "Electre III model and stochastic dominances" . **III – Modelling Uncertainty**: C. Bana e Costa, J. C. Lourenço, J. O. Soares - "An interval weighting assignment model applied to credit risk assessment"; R. Hites - "The aggregation of preferences method for solving the robust p-elements problem"; R. Lahdelma, S. Makkonen, P. Salminen - "Modelling dependent uncertainties in Stochastic Multicriteria Acceptability Analysis" ; M. Matos - "Eliciting and aggregating preferences with fuzzy inference systems". **IV – Applications:** D. Diakoulaki, V. Hontou, G. Mavrotas - "A multicriteria descriptive approach for classifying countries with respect to environmental indicators"; F. Freire, J. Malça, S. Rozakis - "Integrated economic and environmental life cycle optimization: an application to biofuel production in France"; E. Grigoroudis, Y.Politis, O. Spyridaki, Y. Siskos - "Modelling importance preferences in customer satisfaction surveys"; O. Larichev, D. Kochin, L. Ustinovicius - "A multicriteria method for choosing the best object for investments".

Coimbra, 2004.
Published by: CCDRC, INESC-Coimbra, FEUC.
ISBN : 972-569-140-7.

Ce livre sera envoyé à tous les membres du groupe qui ont participé aux Journées de Coimbra en Octobre 2002. Pour tous ceux qui souhaiteraient un exemplaire supplémentaire ou voudraient le faire commander, il vous sera envoyé moyennant des frais à fixer. Contact: Madame Sónia Nabais, INESC-Coimbra, Rua Antero de Quental 199, 3000-033 Coimbra, Portugal. E-mail: secretaria@inescc.pt

*** *** ***

Applications of Multi-Objective Evolutionary Algorithms

edited by

Carlos A. Coello Coello and Gary B. Lamont

World Scientific, Singapore. December 2004, ISBN 981-256-106-4, 792 pp. Price: $138 US dollars.

You can order it at:

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Important Dates

Full paper: *1 April 2005*

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Professor Edmundas K. Zavadskas
Department of Construction Technology and Management
Vilnius Gediminas Technical University
Vilnius
Lithuania
E-mail: edmundas.zavadskas@adm.vtu.lt

or
Professor Willem Brauers
Faculty of Applied Economics and Institute for Development Policy and Management
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Articles Harvest

(This section is prepared by Maria João Alves and Carlos Henggeler Antunes)

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Dissertations

BASSEUR: Matthieu : « Concéption d'Algorithmes Coopératifs pour l'Optimisation Multiobjectif : Applicaton aux Problèmes d'ordonnancement de Type Flow-Shop ». Thèse de Doctorat en Informatique (juin 2005). Université des Sciences et Techniques de Lille. Jury : Philippe MATTHIEU (USTL, Lille 1), Jin-Kao HAO (Univ. Angers), Patrick SIARRY (Univ. Paris XII), Arnaud FREVILLE (Univ. Valenciennes), Kenneth SORENSEN (Univ. Anvers), Jacques TEGHEM (Faculté Polytechnique de Mons), El-Ghazali TALBI (USTL Lille 1).

GOMES DA SILVA, Carlos : « Génération de l'Ensemble de Solutions Non-Dominées pour les Problèmes du Sac-à-Dos Bi-Critères : Méthodes Exactes, Approchées et Hybrides » [en portugais]. Thèse de Doctorat en Recherche Opérationnelle (juin 2005). Université de Coimbra. Jury : José PAIXÃO (FCUL), Pedro OLIVEIRA (Univ. Minho), Jorge PINHO DE SOUSA (FEUP), Pedro FERREIRA (FEUC), Carlos FORTUNA (FEUC), João CLÍMACO (FEUC), José FIGUEIRA (FEUC).

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(http://www.inescc.pt/~ewgmcda)

is being enlarged. Contributions of URL links to societies, research groups and other links of interest are welcome.

A membership directory of the European Working Group on "Multiple Criteria Decision Aiding" is available at the same site. If you would like to be listed in this directory please send us your data (see examples already in the directory).

Contact: José Figueira (figueira@fe.uc.pt) and Luís Dias (ldias@inescc.pt)

Web site for the EURO Working Group "Multicriteria Aid for Decisions"

A World Wide Web site for the EURO Working Group on "Multicriteria Aid for Decisions" is already available at the URL:

http://www.inescc.pt/~ewgmcda

This WWW site is aimed not just at making available the most relevant information contained in the Newsletter sections, but it also intends to become an online discussion forum, where other information and opinion articles could appear in order to create a more lively atmosphere within the group.

All information as well as links to other Web sites of interest can be sent to Luís Dias by the e-mail:

ldias@inescc.pt

Groupe de Travail Européen "Aide Multicritère à la Décision" /
European Working Group "Multiple Criteria Decision Aiding"

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Bernard Roy

Newsletter editor:
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Permanent Collaborators:
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Contributions should be sent to:
José Figueira (Room 317)
School of Economics, Univ. Coimbra, Av. Dias da Silva, 165
3004-512 Coimbra, PORTUGAL
E-mail: figueira@fe.uc.pt

or by fax to:
+351 239 403511

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ewg-mcda.newsletter@inescc.pt

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http://www.inescc.pt/~ewgmcda

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