

EDITORIAL

Sur proposition de Bernard Roy, les participants à la 65e réunion ont approuvé à l’unanimité que le fonctionnement du groupe soit désormais coordonné par un board de trois personnes : José Figueira, Bernard Roy, Roman Slowinski; ceci répond à une disposition concernant tous les groupes de travail européens que le comité exécutif de EURO a prise lors de sa dernière réunion.

Participants of the 65th Meeting approved unanimously the proposal made by Bernard Roy to create a Board of Co-ordinators of the Working Group, with the following board members: José Rui Figueira, Bernard Roy, and Roman Slowinski. This proposal has been made on demand of the EURO Executive Committee, which recently sent such a directive to all the EWGs



Opinion Makers Section

Intuition and Rationality in MCDM

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In the Newsletter issue of spring 2006, Paul Slovic published a paper on affect, reason, risk and rationality. While agreeing with most of his arguments and conclusions, I differ concerning some fundamental assessments or tacit assumptions of this paper: that the *experiential side* of our mental life “appears every bit as important as the analytic/deliberative side” - we shall see below that it is, in some aspects, *at least ten thousand times more important*; and that the binary classification *affect* versus *reasoning* is complete – we shall see below that the trinary classification *emotion (affect)* versus *intuition* versus *rational reasoning* is much more adequate. The fundamental importance of intuition is usually overlooked today, for some historical reasons we shall explain below; but *intuition is the source of our meta-theoretical assumptions about truth and of our most innovative ideas* and, as such, cannot be neglected. The paper reviews recent theories and results concerning intuition and knowledge creation, together with conclusions implied by them for multiple criteria decision making (MCDM).

Short Review of the History of Reflection on Intuition

The debates of meaning and importance of the concept of intuition have a very long history, in a sense from the beginnings of Occidental philosophy – from Plato to Descartes, Kant, Husserl, Heidegger; Oriental philosophy has possibly even longer tradition in this respect, see, e.g., Wang (2003), but Occidental thinking started earlier critical reflection and debates about the nature of intuition. Since Plato (380 BC) reported the dialog between Sokrates and Menon, there is a tendency, at least in the Occidental tradition, to understand intuition as a source of inner certainty about the essence of basic concepts. This source was usually interpreted as infallible – after an appropriate critique, such as Kantian critique of pure reason or Husserlian phenomenological reduction. For Kant (1781), intuition was the source of *a priori synthetic judgments*, our fundamental convictions about nature – e.g., about space and time – that were for him obviously true. Thus, from Plato through Descartes to Kant, philosophy believed in *infallible intuition*.

However, the discovery of non-Euclidean spaces in 19th Century, later generally the relativism of knowledge, recognized in the 20th Century, has led to considerable skepticism about such interpretations and thus generally about the value of intuition, see, e.g., (Bunge 1962). The role of intuition remained extremely important in mathematics, and even in the 20th Century was stressed by such thinkers as Poincare, Brouwer or Gödel. Nevertheless, philosophical reflection on intuition in 20th Century – as represented by Bergson (1903) or later by

Polanyi (1966) with his concept of tacit knowledge, practically equivalent to experiential knowledge thus including both emotions and intuition - attached great importance to intuitive reasoning but treated it as a mystic force and refused to analyze it in rational terms. Another part of philosophy refused to even speak about intuition, as stressed by Wittgenstein (1922), who said in his famous quotation "wovon man nicht sprechen kann, darüber muss man schweigen" (loosely translated, "if we cannot speak about it, we must remain silent") – meaning that we should not analyze metaphysical concepts, including such concepts as intuition. This conviction became popular among natural sciences in the 20th Century, where the term intuitive became almost equivalent to non-scientific. This is also probably the reason why Slovic (2006) uses the term *intuitive* in a similar sense, almost *close to erroneous*.

At the end of 20th and in the beginnings of 21st Century, however, new interpretations of the power and the role of (even if *fallible*) *intuition* emerged. This concerns two issues:

- 1) The power and the role of intuition in generating new ideas was explained in an evolutionary, naturalistic and rational theory, see Wierzbicki (1992; 1997; 2004); Wierzbicki and Nakamori (2006);
- 2) The role of intuition as the source of our meta-theoretical assumptions about truth of mathematical axioms was clarified, see Król (2005, 2007). Therefore:

We must stress that we understand *intuition* or *intuitive* here in a realistic and naturalistic but broader meaning of the concept: *as a source of cognitive and creative insights that often might be fallible, but is nevertheless very powerful*. We are interested in a rational explanation of the strength of this human faculty and of its functioning.

An Evolutionary, Naturalistic and Rational Theory of Intuition

This theory is based on a result that combines modern knowledge from two disciplines of contemporary informational sciences: of telecommunications and of computational complexity theory: since video signals transmit at least 100 times more data and computational complexity is strongly nonlinear, processing of vision is at least 10000 (10^4) times more complex than processing of language. The old proverb: *a picture is worth one thousand words* must be thus corrected: *a picture is worth at least ten thousand words*.

- Thus, we can safely adopt the first assumption of the theory of intuition: *our senses give us much more complex information than we can express by words*.
- The second assumption of this theory is simply that we follow the evolutionary theory of biological

species and accept that *humans developed speech at some level of their evolution*.

Then we can consider the question: *how did people process signals from their environment just before the evolutionary development of speech?* Many animals have ways of communication; what distinguishes humans is that *we developed speech much further and used it to start the evolution of civilization*. Therefore, even if the process took a long time, after the development of speech we were in a radically different situation. The development of speech was an excellent evolutionary shortcut. It turned out that we could process signals 10^4 times more simply. This enabled the intergenerational transfer of information and knowledge, and we started to build up the cultural and intellectual heritage of mankind. The biological evolution of people slowed down and eventually almost stopped – including the evolution of our brains – but we accelerated our intellectual and civilization evolution.

Now we can ask next question: *what happened to our original capabilities of holistic processing of signals* – let us call them *preverbal*, since we had them before the development of speech? Because the processing of words is 10^4 times simpler, our verbal, logical, analytical, conscious reasoning utilizes only a small part of the tremendous capacity of our brain that was developed before the use of speech. The capabilities of preverbal processing of memory and of information from our senses remained with us – *but lacking better words, we call them intuition*, and we do not always know how to rationally use them.

We can thus define intuition as the ability of preverbal, holistic, subconscious (unconscious, quasi-conscious) imagining and processing of sensory signals and memory content, left historically from the preverbal stage of human evolution.

The concept of quasi-conscious can be defined as an action we are aware of doing, but do not concentrate conscious on; every day we perform many quasi-conscious actions, such as walking, driving a car, etc. The above is naturalistic and *an evolutionarily rational definition of intuition*, because it is deeply related to the evolution of human civilization, it follows from a rational set of assumptions and we can draw from it diverse conclusions that can be variously tested – in comparison with other parts of knowledge or even empirically.

However, we must enhance this definition with a differentiation of the sense of the concept of *intuition* from other concepts of experiential ("irrational" or a-rational) abilities of our mind, in particular *instincts* and *emotions*. Intuition is related to imagining and to the holistic processing of information, visual and in other forms; intuitive behaviour is predominantly a result of learning, not of inheritance, while instincts and emotions are mostly inherited. We do admit, on the other hand, that there might be a rough border between intuition and instincts; thus

there might be some inherited aspects in intuition. And obviously, intuition can be also influenced by emotions.

These fundamentals of a evolutionarily rational theory of intuition can be subjected to diverse validation or falsification tests; see (Wierzbicki and Nakamori 2006). Here it is important to note that this *evolutionarily rational definition of intuition* can be used to clarify the concept of *tacit knowledge* (Polanyi 1966, Nonaka and Takeuchi 1995) and its intersubjective transfer.

Tacit knowledge consists of intuitive knowledge and emotive knowledge (the latter including inherited instincts). If any language is only an imperfect code to describe a much more complex world, simplifying the processing of information at least 10^4 times, than each word – out of necessity – must have many meanings, and to clarify our meaning we have to devise new words. But we would never transfer tacit knowledge by words only; we transfer it, e.g., by body language in personal meetings, thus tele-transfer of tacit knowledge requires multimedia communication.

However, if our knowledge must be expressed in language, if only for interpersonal verification, and language is only an imperfect code, *then an absolutely exact, objective truth and knowledge are not possible* – not because the human knowing subject is imperfect, but because she or he uses imperfect tools for creating knowledge, starting with language.

Naturally we can – and should – make statements that are true; but absolutely true statements are possible concerning only verbal relations or very simple facts. On the other hand, we must strive to be truthful, otherwise human cooperation is endangered – and the development of human civilization has been based on language used as means of human cooperation. And we must strive to be objective, for all our technology is based on applications of reasonably objective knowledge. Thus, *objectivity is a goal, an ideal or a concept of a higher level*; but this concept is needed in hard science and especially in technology creation.

The attempts of postmodern social sciences to reduce objectivity to power and money – see, e.g., Bruno Latour (1987) – are based on an incorrect use of more advanced forms of logic. We know today what is feedback – a dependence of evolving time-streams of effects and causes in the dynamic sense – thus the argument of (Latour 1987, p. 99) against objectivity, "since the settlement of a controversy is the cause of Nature's representation not the consequence, we can never use the outcome – Nature – to explain how and why a controversy has been settled" indicates a clear lack of understanding of the dynamic character of the causal loop in this case and of the circular, positive feedback-supported evolutionary development of knowledge and science.

On this example, we can analyze the relation of intuitive – or even possibly instinctive – judgments and rationality. It is difficult to experimentally verify

knowledge in social sciences, hence they instinctively (or rather intuitively, in their hermeneutical horizon, see next section) prefer subjectivity or intersubjectivity to objectivity. Later they try to *rationalize* related conclusions – such as the reduction of objectivity to power and money. But the role and *power of rationality* is precisely to check such judgments for all logical consequences and for consistency (or, in this case, for the lack of consistency) with other parts of human knowledge – with the rational heritage of humanity.

Thus, intuition is very powerful, is the source of most original ideas – but is fallible, hence we must check such ideas using the power of rationality.

The Role of Intuition as the Source of Meta-Theoretical Assumptions about Truth

The rational checking of intuitive assumptions is not always easy. Let us recall here some elements of the theory of truth in formal languages. According to Kurt Gödel, the question of truth cannot be answered inside a given formal system; Alfred Tarski (1933) formalized this issue further, postulating the use of a formal meta-language in order to meaningfully address the issue of truth in a given language. However, Zbigniew Król (2005, 2007) stresses that it is impossible to create and study mathematics as a purely formal, meaningless game: there is no mathematical theory which is absolutely (i.e., actually) formalised, there is no mathematical theory given as a formal system with a formal meta-language. To have a strictly formal language one needs a formal meta-language, to have a formal meta-language one needs a formal meta-meta-language, and so on – an infinite recursion. Thus, the only possible way is to stop and study fundamental assumptions in a non-formal, *intuitive* meta-environment. This intuitive environment is called *hermeneutical horizon*; Król shows that hermeneutical horizon has been changing historically, that "Euclidean geometry" has been understood differently (in the deepest interpretations of its axioms) by ancient Greeks, differently in times of Descartes, Newton, Kant, differently today. If this can be observed in mathematics, it applies as well in other parts of science: different paradigms use not only different, incommensurable languages, but – more fundamentally - are also related to different hermeneutical horizons, intuitive environments for interpreting axiomatic truths. This phenomenon is called *horizontal change*.

According to Król (2007), the emergence of a new concept takes place in the established hermeneutical horizon if the concept is non-revolutionary. The emergence of a revolutionary new concept is preceded by a basic change in the hermeneutical horizon. Thus, intuitive hermeneutical horizon is the most important element of any scientific paradigm: it defines what is assumed tacitly as obvious, need not be explicitly stated.

The above, Platonian theory of intuition as the source of meta-theoretical assumptions about truth is different, but not contradictory to the naturalistic, evolutionarily

rational theory of intuition described earlier. Intuitive hermeneutical horizon is formed historically, thus it is a part of tradition of a given discipline, preserved and perpetuated by teaching, a part of the civilization heritage of humanity.

The Civilization Heritage of Humanity and Implications for Micro-Theories of Knowledge Creation

The civilization heritage of humanity, the *giant upon whose shoulders we stand*, is composed not only of linguistic records. At least in the arts; paintings and music also belong to this heritage. But is intuition, or are instincts, also a part of this heritage?

Karl Popper – see (Popper 1972) defined his concept of *the third world* – the world of ideas, knowledge, arts existing independently of individual perception and of actual reality – as actually equivalent to social knowledge in the broad sense. However, we should differentiate in this concept its significant parts, such as emotive and mythical heritage, or the ideas called *a priori synthetic judgments* by Immanuel Kant, or *hermeneutical horizon* by Zbigniew Król.

In this sense, we can distinguish three basic constituent parts of our civilization heritage:

- 1) The *rational heritage*,
- 2) The *intuitive heritage*,
- 3) The *emotive heritage*.

This distinction can be used to generalize the concept of *SECI* (Socialization-Externalization-Combination-Internalization) *Spiral* of organizational knowledge creation (Nonaka and Takeuchi 1995) to the idea of *Creative Space* (Wierzbicki and Nakamori 2006), extending the *SECI Spiral* using three-valued instead of binary logic. *Creative Space* is a multidimensional space whose dimensions represent the essential aspects of creativity, usually ordered according to a three-valued logic into three *nodes* on each dimension: *rational, intuitive, emotive; individual, group, humanity; disciplinary, transdisciplinary, interdisciplinary*; etc. In *Creative Space*, two types of normal knowledge creation processes are distinguished:

- *Organizational* processes in market or purpose-oriented knowledge creation, such as the *SECI Spiral* of Nonaka and Takeuchi. Such processes are motivated mostly by the interests of a group and two other spirals of this type can be also represented in *Creative Space*; these are the *Brainstorming DCCV* (*Divergence-Convergence-Crystallisation-Verification*) *Spiral* (Kunifujii 2004) and the Occidental counterpart of *SECI Spiral*, the *OPEC* (*Objectives-Process-Expansion-Closure*) *Spiral* of (Gasson 2004).
- *Academic* processes of normal knowledge creation, in universities and research institutes. Such processes are motivated mostly by the interests of an individual researcher. Three typical spirals of this type are

distinguished as parts of *Creative Space* in (Wierzbicki and Nakamori 2006): the *Hermeneutic* (*Enlightenment-Analysis-Hermeneutic Immersion-Reflection*) *EAIR Spiral* of reading and interpreting scientific literature, the *Debating EDIS* (*Enlightenment-Debate-Immersion-Selection*) *Spiral* of scientific discussions and the *Experimental EEIS* (*Enlightenment-Experiment-Interpretation-Selection*) *Spiral* of performing experiments and interpreting their results. These three spirals can be performed together in a *Triple Helix* of normal academic knowledge creation.

These theories are together called *micro-theories of knowledge creation*, describing how knowledge is or should be created for the today and tomorrow needs of knowledge economy and civilization, as opposed to *macro-theories of knowledge change*, describing the development of knowledge on a long historical scale, such as in (Kuhn 1962) or (Popper 1972).

Implications for Multiple Criteria Decision Making (MCDM) and Conclusions

The concept of intuitive decisions is often used, particularly in the formal utilitarian theory of decision making, usually assuming – without proof – that a formally justified analytical decision must be better than intuitive one. It might sometimes be true, but already the results of (Dreyfus and Dreyfus 1986) indicate, conversely, that an intuitive decision might be much better, if made by an expert.

If we accept the definition of intuition as a preverbal, quasi-conscious mental activity, then we should note that today each person makes very many intuitive decisions of an operational, repetitive character. These are learned decisions because of their repetitive character: when walking, a mature man does not have to articulate (even mentally) the will to make next step. Intuitively we pass around a stone blocking our way, turn off the alarm-clock after waking, etc. These quasi-conscious *intuitive operational decisions* are so simple and universal that we do not attach any importance to them. But we should study them in order to better understand intuition. Note that their quality depends on the level of experience and, as shown by the Dreyfuses, is best at master-level experience. This might be the result of the formation of *intuitive paths in the brain* resulting from the automation of repeated activities. Such automation occurring in our brain is one of the basic components of intuition resulting from *learning by doing*. The other basic component, as we stressed before, is *imagination*.

From this reflection, we can continue to define ways of stimulating our creative intuitive abilities, or propose models of intuitive decision processes, see (Wierzbicki and Nakamori 2006). There might be also diverse practical advices resulting from the rational theory of intuition. One of them might be called *Limit TV*:

If you want to be creative, do not spend too much time in front of the TV set – because you should let your imagination play its own games, not only the games presented by others.

An important aspect to teaching creativity might be teaching what intuition is and how to stimulate it. However, even more important is to teach how to use imagination, how to imagine various perspectives of looking at a problem, to empathize with the object of your study, etc. *If you want to be a race driver, it is important to be able to imagine that you are your car and see the racetrack from its perspective.*

Another group of practical conclusions is related to the conditions that help to achieve the enlightenment effect. We already stressed that *emptying your mind, concentrating on void or on beauty, forgetting the prejudices of an expert* are useful in concentration before performing in a well-trained field like athletics. They might be equally useful in suppressing your conscious perception when trying to achieve enlightenment.

Thus, having a difficult problem you want to solve creatively, study it hard, but then forget about it and go to a tea ceremony or Zen meditation.

The same principle can be applied to group activities such as difficult negotiations or solving difficult problems through brainstorming. *Organize group discussions for at least two days, with relaxation and good sleep in between.* This *Principle of Double Debate* can be experimentally tested by simulated exercises in brainstorming or negotiations.

When it comes to personal intuition and creativity, the same theory implies that our best ideas for intuitive decisions might come after a long sleep, but before we fill our mind with the troubles of everyday life. Hence a simple *Alarm Clock Method*:

Set your alarm clock ten to twenty minutes before your normal waking time and immediately after waking try to find the solutions to your most difficult problems.

This *Alarm Clock Method* is most easy to test, and we advise all readers to test it personally. You will be astonished how clearly and fast you are thinking just after waking, and how easy it is to achieve if not a great enlightenment, than at least a small illumination.

Finally, there are also some conclusions related to the development of multiple criteria decision making (MCDM) theory and practice. We see that deliberation requires holistic information; thus, in a multiple criteria decision situation, the best computerized support stimulating intuition must concentrate first on providing an estimate of the *ranges of criteria change*. These ranges might result from considering all decision options, or only Pareto-optimal options, while in the latter case evolutionary multiple objective (EMO) algorithms might

be helpful for estimating the ranges. It should be only stressed that finding so-called nadir point – the lower bound for criteria values in Pareto-optimal set – might be difficult (in the case of more than two criteria) even for EMO algorithms, thus they should be stopped first when a good estimate of the nadir point is obtained, see (Wierzbicki and Szczepański 2003). See also (Wierzbicki et al. 2000).

To conclude: a thorough understanding of the nature and essence of intuitive decisions might essentially change many paradigmatic preconceptions of multiple criteria decision making.

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MCDA Research Groups

Applied Mathematics Unit

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On December 7th, 2004, the Faculty of Law, Economics, and Finance of the newly founded University of Luxembourg (<http://www.uni.lu>), approved the creation of the Service de Mathématiques Appliquées (SMA, <http://sma.uni.lu/home>). This recent applied mathematics unit takes a closer look at the intervention of mathematics in the world of economics, finance, management and business information systems. Particular attention is given to recent mathematical theories of decision-making support, as well as to stochastic analysis and statistics used by economists and finance specialists in the resolution of statistical problems arising in the business world. The

members of the SMA are at present : Raymond Bisdorff (professor, head of the SMA), Jean-Luc Marichal (assistant-professor), Jang Schiltz (assistant-professor), Patrick Meyer (assistant and doctoral student), and Claude Lamboray (doctoral student). The SMA hosted the 61st meeting of the EURO-MCDA Working Group, March 10-11, 2005, and recently ORBEL21, the 21st national conference of the Belgian OR society, January 17-19, 2007.

This presentation is focused on the SMA work that is relevant for the MCDA community:

Decision aiding methodology (méthodologie de l'aide à la décision)

MSC(2000): 05C20/69/85, 62C12, 62P20, 68R10, 90B50, 90C09/27, 91A30/35, 91B06/08/10/12/14716, 94C15

Our original contribution to the European school of Operational Research concerns the logical foundation of decision aiding methodology (Bisdorff 2000). We have shown the necessity to choose a non standard bipolar valued logical evaluation domain in order to avoid well known inconsistencies of classical multi-valued or fuzzy logics (Bisdorff 2002a). In directing our investigations early on to what the exceptional new algorithmic approaches of artificial intelligence brought to operational research (Bisdorff and Laurent 1995), we have been able to extend the application field of the graph kernel concept (independent and dominating set) to bipolar valued digraphs. This allows us to apply it to multicriteria ranking problems (Bisdorff, 1999), to multicriteria clustering problems (Bisdorff 2002b) and to choice decision problems (Bisdorff and Roubens, 2004). We have also investigated the notion of ordinal concordance of preferential assertions in the context of multicriteria preference modelling. This allowed us to introduce a specific robustness analysis of multicriteria decision aid recommendations (Bisdorff, 2004).

The acquisition in December 2004 of a new high performance application server gave us interesting perspectives of algorithmic development and new outstanding computing performances have been achieved. Indeed, we discovered recently a set of fundamental formal results, relating the valued choice approach with the corresponding valued characteristic vector approach (Bisdorff, Pirlot, Roubens 2006). These results give us by the way some clues for the development of new well performing valued kernel extraction algorithms.

Actually we are able to extract valued kernels



from a 75% filled random outranking graph of order 2500 in less than 30 seconds (Bisdorff, 2006, 2007).

A constant research effort concerns the *choice* problematic in multiple criteria decision aiding. Its genuine purpose is to help a decision maker determining a single best decision alternative. Methodologically we focus on pairwise comparisons of these alternatives which lead to the concept of *bipolar-valued* outranking digraph. This work is situated in the context of *progressive* decision aiding methods consisting normally in several stages providing the decision maker with more and more precise choice recommendations. The choice method developed in the Applied Mathematics Unit is called *Rubis* (Bisdorff et al. 2007). Its backbone is a bipolar-valued credibility scale, modelling the credibility of the validation of preferential statements. Its development leads us to define the concept of *hyperkernel* of a digraph as a choice recommendation. Lately we have extended this methodology to the *k-choice* problematic (Meyer and Bisdorff, 2007).

Claude Lamboray, for his part, is investigating the use of prudent ranking rules in ordinal aggregation problems. A prudent order is a ranking solution initially proposed by Arrow and Raynaud. It is based on minimizing the pairwise strongest opposition, which makes especially sense in a decision aid context. In order to gain a better understanding of the prudent approach, we have built an axiomatic framework which can be used to characterize prudent ranking rules (Lamboray 2006). We have also compared the prudent order solution to the solutions found by other common ranking rules encountered in the Social Choice literature. We are currently working on an extension of the prudence principle to exploit bipolar valued outranking relations in the ranking problematic.

In the framework of multiple attribute value theory (MAVT), Patrick Meyer furthermore contributes to the development of the Kappalab toolbox for the manipulation of non-additive integrals (<http://www.polytech.univ-nantes.fr/kappalab>, Grabisch et al. 2005, 2007). Kappalab, which stands for "laboratory for capacities", is a package for the GNU R statistical system. It is a toolbox for capacity (or non-additive measure, fuzzy measure) and integral manipulation on a finite setting which can be used in the framework of decision making or cooperative game theory. Kappalab contains routines for handling various types of set functions such as games or capacities. It can be used to compute several non-additive integrals: the Choquet integral, the Sugeno integral, and the symmetric and asymmetric Choquet integrals. An analysis of capacities in terms of decision behavior can be performed through the computation of various indices such as the Shapley value, the interaction index, the orness degree, etc. The well-known Möbius transform, as well as other equivalent representations of set functions can also be computed. Kappalab further contains seven capacity identification routines: three least squares based

approaches, a method based on linear programming, a maximum entropy like method based on variance minimization, a minimum distance approach and an unsupervised approach grounded on parametric entropies.

Data Aggregation

MSC (2000): 26B35, 26E60, 28E10, 39A12, 39B12/22/72, 90B50, 90C29, 91A12, 91B06/08/12/14/16, 91C05, 91E45, 94A17.

The research topic stems from the area of data aggregation, domain more and more present in various disciplines of applied mathematics, with applications in decision making, cooperative game theory, theory of means and averages, and theory of functional equations, to name a few. Here, we are interested in real functions that aggregate numerical readings into one representative value. Various aggregation functions and processes have already been proposed in the literature and many others are still to be designed to fulfill newer and newer requirements. Studies on the aggregation problem have shown that the choice of the aggregation function is far from being arbitrary and should be based upon properties dictated by the framework in which the aggregation is performed. One of the main concerns when choosing an appropriate function is to take into account the scale types of the variables being aggregated. On this issue, it is now well known that the general form of the functional relationship between variables is greatly restricted if we know the scale types of the dependent and independent variables. For instance, if all the variables define a common ordinal scale, it is clear that any relevant aggregation function cannot be constructed from usual arithmetic operations, unless these operations involve only order. Thus, computing the arithmetic mean is forbidden whereas the median or any order statistic is permitted.

The research we have led thus far have been focused on the following themes:

Means and typical values. The most often encountered aggregation functions are similar to means or medians. Some extensions, like nonstrict or nonsymmetric means have been proposed and axiomatized. Some of them, like the ordered weighted averages, belong to more general families, called nonadditive or fuzzy integrals (Fodor and Marichal, 1997, Marichal, 2000a).

Nonadditive measures and integrals. The study of aggregation functions quickly led to the investigation of families of particular functions, namely nonadditive integrals such as the Choquet integral and the Sugeno integral. Those integrals represent a kind of average or median whose weights depend on the aggregated values. Their interest is the taking into account of the possible interaction between aggregated variables or attributes, what the classical means cannot model. We have contributed to the representation and the axiomatization of those particular functions (Marichal, 2000a, 2001).

Set functions, importance and interaction indices. Nonadditive integrals are constructed from nonadditive measures. In turn, these measures have been deeply investigated and have given rise to some indices, inspired from game theory, allowing us to measure the overall importance of any combination of attributes or the average degree of interaction among those attributes (Grabisch, Marichal, and Roubens, 2000). In this framework, we have introduced and axiomatized a dispersion index, called generalized entropy (Kojadinovic, Marichal, and Roubens, 2005), as well as tolerance indices measuring the tolerant or intolerant character of an aggregation function (Marichal, 2007).

Conjoint measurement. Conjoint measurement concerns the taking into account of the scales of measurement of aggregated variables. In this framework, we have particularly studied the case of ordinal scales, thus axiomatizing the sole functions allowed to aggregate purely ordinal information (Marichal and Mesiar, 2004).

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Forum (Robustness Analysis)

Robustness analysis in practice

Jacques Pictet
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Introduction

When we try, in our practice, to explain the robustness analysis (RA) to the actors, we often use the analogy of the parachutist in a survival test. Ignoring the situation she is supposed to face when landing, the parachutist will try to map the area during her descent. It allows her to observe her environment beyond what she will experiment at the impact point. If she falls in water, it is vital to know if she is in a small lake or river, near a shore or in the middle of an ocean. To achieve this, she can only use the limited resources she has: a limited capacity to observe distant objects and a limited time before concentrating on the landing.

We are usually required to perform Multiple criteria decision analysis (MCDA) for problems with a discrete number of alternatives to be ranked, using either one of the Electre methods or some form of weighted sum. Very often, we face multiple experts and multiple decision-makers. So, we will consider here these specific cases only, focusing on the practical problems that arise in such situations.

Basic patterns

The vast majority of the projects we deal with follows on of the two following patterns:

- Planning: There is a planning issue to handle, with many actors – experts and decision-makers – following an ad hoc procedure. Usually, we propose to achieve a

consensus about the evaluations to consider, but to allow the decision-makers to provide their own weights. We often use Electre III for the aggregation. For an example, see (Bollinger, Pictet, 2003).

- Public procurement: A public authority prepares a call for tenders and contracts us to help them with the mathematical aspects. The existing practice relies on the weighted sum and we have to deal with specific constraints: (1) the criteria and their importance have to be published with the call for tenders, thus (2) the definition of the weights require the use of reference tenders and (3) the representatives of the authority have to agree on a given set of weights, or at least on intervals, for legal reasons¹. For details, see (Pictet, Bollinger, 2003).

These patterns correspond to different ways to work with groups, according to (Belton, Pictet, 1997):

- The first one usually uses shared evaluations and individual weights. Usually, the evaluations are provided by individual experts – and validated by the other actors - and weights by individual decision-makers. Sometimes, a clear segregation is maintained between these two groups. The robustness analysis can be designed freely according to the specific situation at hand.
- The second one uses shared evaluations and weights. Usually, experts and decision-makers work in close contact, or are even the same persons. To obtain shared information, the silent negotiation is sometimes used (Pictet, Bollinger, 2005). Robustness analysis is rather strictly limited by the legal constraints.

Group decision and robustness analysis

There is a need to clarify the relationship between group decision and robustness analysis. Both generate multiple results, if individual evaluations or, more frequently, individual weights, are used. This implies a need to synthesize these results, as we will discuss below. But they stem from different origins. In a group decision, different weights represent the diversity of the values systems present in the group, and different evaluations represent the diversity of understanding of the performances. In the robustness analysis, different weights and / or evaluations express some of the uncertainties and inaccuracies that are inherent to any modeling activity (Roy, 1989)².

So, these two notions should not be confused. The very fact that they can – and possibly have to – be handled with the same tools does not mean that they can be put

¹ For instance, the European union legislation requires that the weights, or, at least, "reasonable" weight intervals are published.

² We will not discuss here how some of these aspects can be integrated directly in the "basic" evaluations.

together in a big bag and treated indistinctly. They belong to two different facets of decision aid: validation and legitimization (Landry et al., 1996). Robustness analysis is an important part of a MCDA model validation, as it tries to identify the extent of the results validity, following the experimental principle that "One measure is no measure". Group decision plays a central role in the legitimization of a MCDA model, as it tries to integrate into the model some aspects that are in direct connection with the ongoing social process (Pictet, 1996).

To respect these two facets, we tend to follow these lines: (1) provide decision-makers with individual results, including RA about their weights, evaluations (individual or shared) and other parameters, (2) provide them with some support to compare or aggregate individual results, as part of the final negotiation.

Practicalities of RA

A robustness analysis is made of two distinct phases. The first one is an "opening" phase during which a tests are performed, generating a certain number of results. The second one is a "closing" phase during which some form of synthesis tries to capture the essence of the information obtained during the first phase.

Opening phase

In practice, there are two main procedures to perform the opening phase of RA. The first one is "manual" and tends to use a given set of information as "central" and then to move away from it by mixing more and more different sets of information, selected in a decreasing level of relevance; it can be labeled as a "star" (Maystre et al., 1994) or a "concentric circles" procedure. The second one is more "automatic" and intends to systematically test all combinations of information sets, in a Monte Carlo way.

So far, we only practiced the "manual" procedure in planning cases, due to the lack of an "automatic" one for Electre methods³. But we are confident that, in the future, this feature will be integrated in any MCDA software. In public procurement cases, we implemented some form of an "automatic" procedure, at least to test the impact of a weight variation for the most important criterion. This is easy, due to the linearity of the weighted sum, but other aspects need further consideration.

Closing phase

Providing the decision-maker(s) with a wealth of results is usually seen in the literature as positive, but little is said about the way to handle it in order to make sense of it. So far, we have seen three procedures to perform this closing phase. The "ad hoc" one tries to present, in a more or less systematic way, what is robust – or less so – in the results.

³ We have heard recently of such a procedure for Electre III, but it seems to use its median preorder, and we tend not to use it.

The "comparing" one put them side-by-side – usually for the weighted sum – or overlays them – usually for outranking methods (Pictet et al., 1996) – to allow an overall visual analysis. The "aggregating" one intend to present one single result that summarize all results.

This last procedure seems more convenient when using the weighted sum, but we are going to propose in the near future a solution for the outranking methods (Pictet, Bollinger, 2007). In our mind, the various results shall be weighted according to the credibility of the information underlying them (e.g. scenarios, parameters), but not according to the assumed importance of the decision-makers.

Conclusion

Robustness analysis is an important issue, both for theory and practice. Further research is necessary to precise how to perform it in a sound way. One has to keep in mind that the gain it provides – in terms of a better understanding of the model outcomes – is counterbalanced by the complexity to handle it in a way that helps the decision-maker(s).

In the past, RA was problematic, due to the amount of work necessary to perform it. Nowadays, computers can handle it easily. The challenge is thus more in the direction of its relevance for both the validation and legitimization of the decision model.

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Consultancy Companies



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ESTECO

ESTECO was created in 1999 to transfer the knowledge acquired by its founders while working on an European Union sponsored project on Design Optimization (FRONTIER) into a successful commercial product. It took ESTECO almost two years to deliver on its promises, turning a research-stage product into a world-class, industrial-strength, multiobjective optimization platform: modeFRONTIER. Along the way, our initial staff of experts in optimization techniques, numerical analysis and information technology has been expanded to acquire new skills and to position ourselves as ideal partners for engineering companies interested in taking full advantage of their human and computational resources.

Product Information



modeFRONTIER is a multiobjective optimization and design environment, written to allow easy coupling to almost any computer aided engineering (CAE) tool whether commercial or in-house. As the name suggests, modeFRONTIER provides an environment which allows product engineers and designers to integrate their various CAE tools, such as CAD, Finite Element Structural Analysis and Computational Fluid Dynamics (CFD) software. Using a variety of state-of-the-art optimization techniques, ranging from gradient-based methods to genetic algorithms, the process or design of interest can be optimized by specifying objectives and defining variables which affect factors such as geometric shape and operating conditions. modeFRONTIER in effect becomes a wrapper around the CAE tool, performing the optimization by modifying the value assigned to the input variables, and monitoring the outputs.

Process Integration

Running an analysis tool within the modeFRONTIER framework is extremely straightforward. There are no extra interfaces to license; rather just one generic interface which can be used for virtually any CAE tool. There are also direct interfaces for Excel, Matlab and Simulink; these programs can be used in their own right to perform an analysis, or to control another tool. The same process integration techniques can be used to link different CAE applications; for example, modeFRONTIER has been used to perform a fluid-structure interaction analysis, where a CFD program and a non-linear FEM program were coupled. modeFRONTIER has been successfully run with a large number of commercial CAE and in-house tools, ranging from CAD software to FEM and CFD programs.

Design Optimization

modeFRONTIER features the most recent optimization techniques available today in literature. Ranging from Design of Experiments to Direct Optimizers.

Modules:

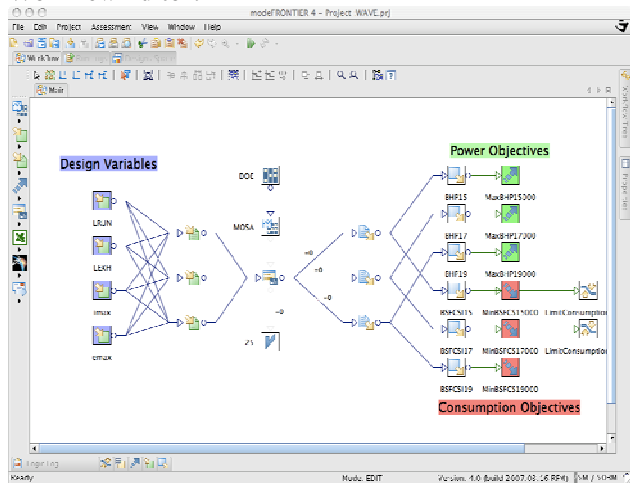
Preliminary Exploration Methods (DOE);

1. Schedulers (ranging from Multi-objective Genetic Algorithms to Simplex methods)
2. Metamodeling (Response Surface Methods, like Neural Networks to Gaussian Processes)
3. Decision Support Tools
4. Robust Design Optimization

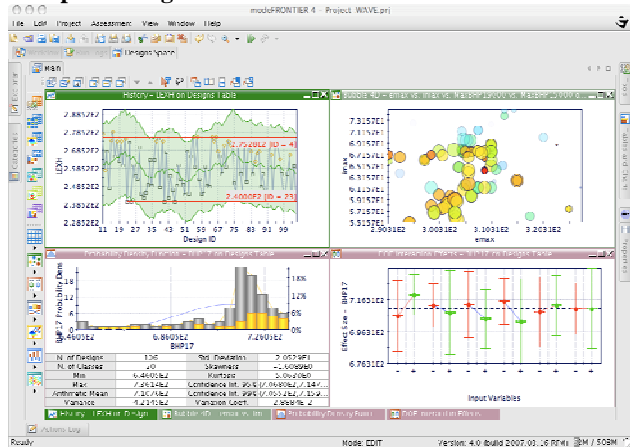
5. Charting and Assessment tools (from standard plots to very sophisticated multi dimensional scaling)

Screenshots

Workflow Editor:



Post processing:



For more information contact:
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Software



<http://paradiseo.gforge.inria.fr>

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Introduction

ParadisEO is a C++ white-box object-oriented framework dedicated to the reusable design of metaheuristics. ParadisEO provides a broad range of features including evolutionary algorithms (EA), local searches (LS), the most common parallel and distributed models and hybridization mechanisms, etc. This high content and utility encourages its use at international level. 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. Furthermore, the fine-grained nature of the classes provided by the framework allow a higher flexibility compared to other frameworks. ParadisEO is one of the rare frameworks that provides the most common parallel and distributed models. Their implementation is portable on distributed-memory machines as well as on shared-memory multiprocessors, as it uses standard libraries such as MPI, PVM and Pthreads.

What does ParadisEO provide ?

- Population based metaheuristics
 - Evolutionary algorithms
 - Scatter search
 - Particle swarm optimization ...
- Single solution based metaheuristics
 - Local search
 - Simulated annealing
 - Tabu search ...

- Hybridization
 - Balancing between diversification and intensification
 - Delivering better and robust solutions
- Parallelism: speedups the search to solve large problems based on three hierarchical models
- Multi-objective features
 - Enabling the Pareto approach at resolution
 - Most common fitness assignment strategies (i.e the ones used in MOGA, NSGA, NSGA-II, SPEA, SPEA-II, IBEA ...)
 - Diversification techniques (niching...)
 - Elitism (archive management)
 - Metrics for performance evaluation (contribution, entropy...)

Design architecture

ParadisEO is composed of four complementary modules :

- ParadisEO-EO (Evolving Objects) for population based metaheuristics
- ParadisEO-MO (Moving Objects) for single solution based metaheuristics
- ParadisEO-MOEO (Multi-Objective Evolving Objects) for multi-objective optimization
- ParadisEO-PEO (Parallel and distributed Evolving Objects) for models of parallelization and hybridization.



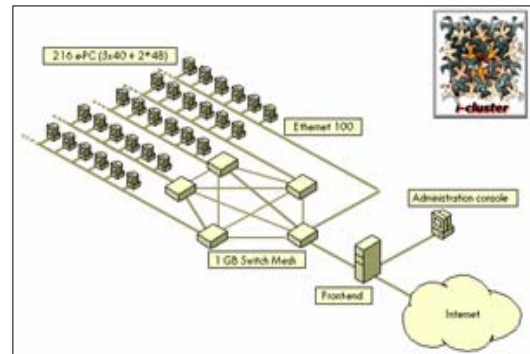
Execution architecture

- Many advanced characteristics of ParadisEO allow different transparent and efficient execution policies:
- On sequential platforms (Unix platforms: Linux, MacOS, etc)
 - On top of underlying middlewares for high performance / high throughput computing
 - Parallel computing (SMPs) using PThreads

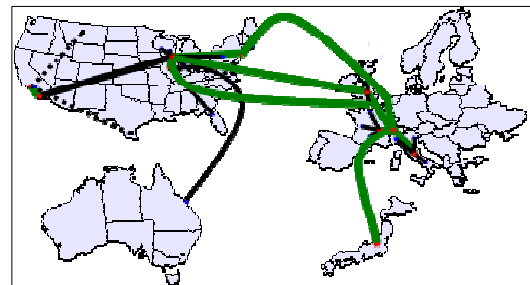
Distributed platforms (clusters) using MPI
Grids (Globus, Condor-G / MW)



Parallel Computing



Culster Computing



Parallell Computing High-Throughput
Grid computing





Persons and Facts

I have to give you the sad news that Peter Hammer died last December after a car crash.



About the 65th Meeting

The European Working Group «Multiple Criteria Decision Aiding» has held its 65th meeting in Poznań, Poland, April 12-14, 2007. The meeting was organized by the Laboratory of Intelligent Decision Support Systems, within the Institute of Computing Science of the Poznań University of Technology, and by the Poznań Branch of the Polish Academy of Sciences. The main theme of this meeting was: "Decision with Multiple Decision Makers".

The working group met in Poznań for the third time. The 18th and 39th meetings were hosted in Poznań, already in 1983 and 1994.

There were 75 registered participants from 20 countries attending the 65th meeting. Distribution of participants over countries is given below.

Country	# participants
Belgium	2
Canada	1
Czech Republic	1
Finland	1
France	13
Germany	1
Greece	2
Italy	6
Lithuania	2
Luxembourg	1
Morocco	2
Poland	25
Portugal	2
Romania	1
Serbia	1
Spain	7
Switzerland	3
Taiwan	1
Tunisia	1
UK	2

The number of submitted proposals of presentations was 58. Only 20 of them were accepted for presentation, and all of them have been effectively presented and discussed at the meeting (see the program below).

In opinion of participants, presentations and discussions were interesting and enriching from the first to the last presentation.

A good atmosphere of the group meeting was strengthened by several social events offered to participants thanks to the sponsors: Philips Lighting Poland, ALMA IT Company, Poznań University of Technology, and Polish Academy of Sciences.

On Thursday, April 12, the group attended a pipe organ concert given by prof. Elżbieta Karolak in one of Poznań's most beautiful churches, the huge Baroque Parish Church of St. Stanislaus (<http://www.fara.archpoznan.org.pl>), commonly referred to as the Fara Church. Fara's construction began in 1649 and it took over 50 years to finish it (consecration in 1705). The sound of the historic organ in the rich interiors has been a great experience. After the concert there was a short visit around the church.

Symposium Dinner took place on Friday, April 13, in the "Nalewka" Restaurant, which is located in the heart of the old market, near city hall (<http://www.nalewka.pl/>). During breaks between successive courses of the dinner, the participants enjoyed a dancing performance by a student ensemble of the Poznań University of Technology called "Poligrodzianie".

On Saturday, April 14, the participants visited Poznań and its neighborhood. The guided tour went around the most important places in the city, both historical and modern. The lunch was served in the Wąsowo Palace, which is a beautiful 18th century late-baroque mansion 50 km far from Poznań (<http://www.wasowo.pl/>). On the way back to Poznań, there was a stop in Nowy Tomyśl which is famous for its willow cultivation, wicker growing and basketry. In Nowy Tomyśl there stands the world's biggest wicker basket (recognized by Guinness Book of World Records), having the form of a flower bed. A visit at a local wicker craftsman finished the excursion.

For more detailed information about the MCDA'65 meeting, as well as for its photo gallery, please visit the website (<http://www.mcda65.org/>). Almost all presentations from the meeting are available for download at the website.

Full papers submitted after the meeting will be considered for publication in a special issue of the journal "Foundations of Computing and Decision Sciences" (<http://www.cs.put.poznan.pl/fcds/>).

Roman Słowiński



PROGRAMME

65^e Journées du Groupe de Travail Européen «Aide Multicritère à la Décision»
65th Meeting of the European Working Group «Multiple Criteria Decision Aiding»
(Poznań, Poland, 12-14 avril/April, 2007)

jeudi le 12 avril / Thursday, April 12

9:00 - 10:00 Inscription / Registration
10:00 - 10:30 **Session d'ouverture / Opening session**

Session 1

Président/Chairman : B. Matarazzo

- 10:30 - 11:30 C. Gonzales, P. Perny S. Queiroz: Collective decision making in combinatorial domains using GAI-Networks (40 minutes)
- 11:30 - 12:00 S. Damart, M. A. Aloulou, D. Bouyssou, V. Mousseau, F. Montignac: Pratique de la méthodologie MACBETH en situation d'experts multiples: le cas de l'évaluation des technologies de stockage d'hydrogène (20 minutes)
- 12:00 - 12:30 L. Monroy, F. R. Fernández: Weighted multicriteria simple games (20 minutes)
- 12:30 - 13:00 L. Kruś: On some procedures supporting multicriteria cooperative decisions (20 minutes)

Papiers soumis à discussion/Papers submitted for discussion

- S. Greco, B. Matarazzo, R. Słowiński: Dominance-based rough set approach to decisions involving multiple decision makers
- C. Sanchez, J. Montmain, M. Vinches, B. Mahieu: The Escota's "SINERGIE" project: a hierarchical multicriteria evaluation process over finite scales for maintenance activities
- V. Postolică: A recent survey on Pareto efficiency in infinite dimensional vector spaces
- W. K. Brauers: Decision makers or stakeholders?
- E. Łukasik: Musical Instruments Competition Jury Ranking as a Case of a Decision of Multiple Decision Makers

13:00 - 14:00 Déjeuner/Lunch

Session 2

Président/Chairman : J. Teghem

- 14:00 - 14:30 M. J. Geiger: Solving the biobjective knapsack problem - an interactive approach (20 minutes)
- 14:30 - 15:00 C. Bazgan, H. Hugot, D. Vanderpooten: Using complementary dominance relations in dynamic programming for 0-1 multi-objective knapsack problem (20 minutes)
- 15:00 - 15:30 N. Belacel: Data Mining-Based Clinical Decision Support System: Opportunities and Challenges (20 minutes)

Papiers soumis à discussion/Papers submitted for discussion

- T. Petkus, E. Filatovas: Parallel solution strategies to solve multiple criteria optimization problems
- M. A. Boujelben, Y. De Smet: The sorting problem based on disjunctive categories: application of belief functions
- I. Papadimitriou, D. Loukas: The method of ascending hierarchical classification as a tool to MCDA
- M. Moulai, S. Amrouche: Branch and bound method for multiple objective integer stochastic linear programming problem
- M. Daubie, N. Meskens, C. Zopounidis: Business failure prediction based on non financial variables: a multicriteria approach
- A. Mendas, M. A. Hamadouche, A. Saidi: Combinaison SIG - méthodes d'analyse multicritère pour une classification des tronçons de routes potentiellement dangereux
- E. Vardumyan, A. Arakelyan: On a dynamic model of foreign trade as an MCDM problem

15:30 - 16:00 Pause café/Coffee break

Session 3

Président/Chairman : C. Zopounidis

- 16:00 - 16:30 J. Pictet, D. Bollinger: Partial aggregation of group MCDA results obtained with an outranking method (20 minutes)
- 16:30 - 17:00 F. Cadier, G. Coppin, P. Lenca: Some results on a cognitive approach in collective decision making modeling (20 minutes)
- 17:00 - 17:30 M. Chabane: Aide a la décision pour la conception de structures participatives (20 minutes)

Papiers soumis à discussion/Papers submitted for discussion

- S. Greco, V. Mousseau, R. Słowiński: Decision support with a set of additive value functions for multiple decision makers: UTA^{GMS}-Group
- A. Benamar, M. Benbouziane: Exchange rate regimes and economic performance: a pooled mean group estimation to MENA countries
- N. Bojovic, N. Trubint: A multicriteria approach to design postal retail outlet networks
- R. Ciobanu: Management of the Romanian projects - a critical area with multiple decision makers
- H. Trabelsi: Gouvernance des ressources en eau en Tunisie et aide multicritère à la décision participative

19:00 - 20:00 Concert d'orgues dans l'Eglise Paroissiale / Organ concert at the Fara Church

vendredi le 13 avril / Friday, April 13

Session 4

Président/Chairman : S. Greco

- 9:00 - 10:00 A. Skulimowski, P. Rotter: Preference elicitation, reference sets and relevance feedback (40 minutes)
- 10:00 - 10:30 D. Bouyssou, V. Mousseau, A. Tsoukias: Ordinal measurement procedures (20 minutes)
- 10:30 - 11:00 T. Agouti, A. Tikniouine, Md. Eladnani, A. Aitouahman: Proposition d'une technique floue pour la modélisation des préférences des décideurs: « choix d'un site pour l'implantation d'une usine de traitement des déchets » (20 minutes)

Papiers soumis à discussion/Papers submitted for discussion

- B. Gładysz, D. Kuchta: Multicriteria programming in robust estimation for interval data
- G. Fernández Barberis, M. C. Escibano Ródenas: New generalized criteria in the Promethee methods: their application to a real case
- P. Klüber: A proposal of portfolio choice for infinitely divisible distributions of asset returns
- I. Bach, G. Bocewicz: CP-driven approach to multicriteria decision making based on imprecise data
- V. G. Sousa, A. M. Faustino: A fuzzy programming approach to MCDA decisions under stochastic environment
- M. Nowak: Interactive approach in project selection under risk
- F. Aleskerov, Y. Çinar: 'q-Pareto-scalar' two-stage extremization model and its reducibility to one-stage model

11:00 - 11:30 Pause café/Coffee break

Session 5

Président/Chairman : J. Pictet

11:30 - 12:30 L. D. Phillips, A. Morton: When values conflict: how citizens, stakeholders and experts contributed to formulating policy for managing the UK's radioactive waste (40 minutes)

12:30 - 13:00 R. D. Condor, A. Scarelli, R. Valentini: Decision support for global environmental agreements (20 minutes)

Papiers soumis à discussion/Papers submitted for discussion

- J. Halova, M. Aust, L. Austova: Multiple respondents preference system on radioecology
- D. Serre, M. Wallis, J. Simms: Towards a use of multicriteria decision aid for flood defence asset management in the UK: aim and scope
- C. A. Lastras Rodriguez, J. Manera Bassa, M. Martin del Peso: ERP systems selection: a multicriteria approach based on factors affecting the adoption and acquisition decision phase
- B. Plottu: Contribution de l'aide multicritère à la décision à l'évaluation du paysage
- T. Tervonen, J. R. Figueira, R. Lahdelma, P. Salminen: Towards robust ELECTRE III with simulation: theory and software of SMAA-III
- T. Agouti, A. Tikniouine, Md. Eladnani, A. Aitouahman: A hybrid approach of mathematical programming and MCDA for the GISMR: the industrial localization

13:00 - 14:00 Déjeuner/Lunch

Session 6

Président/Chairman : M.F. Norese

14:00 - 14:30 B. Roy: Vie du groupe et prochaines réunions/Working group matters and next meetings

14:30 - 15:00 R. Bisdorff, V. Mousseau, M. Pirlot: D2 – Decision Deck – une plateforme logicielle générique d'aide multicritère à la décision (20 minutes)

15:00 - 15:30 I. Kaliszewski: Commercial applications of MCDM decision support – any chance for them? (20 minutes)

15:30 - 16:00 Hsu-Shih Shih: A note on the incremental analysis for multiple criteria decision making (20 minutes)

Papiers soumis à discussion/Papers submitted for discussion

- A. Pasanisi, J. Ojalvo: A multicriteria decision tool to improve the energy efficiency of residential houses
- J. Renaud, C. Fonteix: Apprentissage multicritère par recherche de zones de préférences et par identification
- D. Górecka: Multicriteria aiding of decision - makers in the process of selecting projects applying for co-financing from European Union
- M. F. Norese, F. Montagna, S. Riva: A multicriteria approach to support the design of complex systems
- M. A. De Vicente Y Oliva, J. Manera Bassa, R. Guede Cid: Using MCDA to improve DEA analysis results for the technological transfer offices in Spain
- T. Agouti, A. Tikniouine, Md. Eladnani, A. Elfazziki: Toward an integration of the fuzzy logic and MCDA to GIS: application to the project of the localization of a site for the implantation of chemical products factory
- T. Agouti, A. Tikniouine, Md. Eladnani: Proposition d'une méthode d'analyse multicritères « analyse hiérarchique des influences (AHI) » : application à un problème d'aménagement du territoire « cas d'électrification des zones rurales au Maroc »
- B. Latifa: L'apport de l'approche multicritère d'aide à la décision pour le diagnostic économique des organisations

16:00 - 16:30 Pause café/Coffee break

Session 7

Président/Chairman : A. Benallou

16:30 - 17:00 M. Trzaskalik-Wyrwa, M. Nowak, T. Trzaskalik: Application of multicriteria analysis to restoration of historical portable organ (20 minutes)

17:00 - 17:30 R. Botreau, J. Capdeville, P. Perny, I. Veissier: Multicriteria evaluation of animal welfare at farm level: an application of MCDA methodologies (20 minutes)

17:30 Fermeture/Closing

20:00 Banquet



Forthcoming Meetings

(This section is prepared by Juscelino

Almeida Dias)

Forthcoming EWG Meetings/ 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*).

The 66th Meeting of the EWG on MCDA will be organized by " Mohammed VI International Academy of Civil Aviation " and l'Office National Des Aéroports (National Airports Authority) will be held on October 18-20, 2007 in Marrakech – Morocco. Dr. Hassane YAMNAHAKKI: h.yamnahakki@onda.ma

The 67th Meeting of the EWG on MCDA will be organized by Risto Lahdelma (risto.lahdelma@cs.utu.fi), Kaisa Miettinen, Pekka Salminen and Ahti Salo and will be held in the Spring 2008 in Finland, more precisely in Lapland.

Other Meetings

May, 2007

JRS 07

International Symposium on the Foundations and Applications of Rough Sets

Date: May 14-16, 2007
Local: Toronto, Canada
Email: JRS07@infobright.com
Website: <http://www.infobright.com/jrs07>

GDN 2007

Group Decision and Negotiation Meeting

Date: May 14-17, 2007
Local: Mt. Tremblant (Montreal)
Website: <http://gdn2007.concordia.ca>

IESM'2007

International Conference on Industrial Engineering and Systems Management

Date: May 30 to June 2, 2007
Local: Beijing, China
Email: sondes.chaabane@univ-valenciennes.fr
Website: <http://www.i4e2.com/iesm>

June, 2007

EIASM'2007

14th International Product Development Management Conference

Date: June 10-12, 2007
Local: Porto, Portugal
Website: http://www.eiasm.org/frontoffice/event_announcement.asp?event_id=504

COSI'2007

Colloque sur l'Optimisation et les Systèmes d'Information

Date: June 11-13, 2007
Local: Oran, Algérie
Website: <http://www.isima.fr/cosi/cosi2007>

PEJ'2007

1st Meeting of the Portuguese Economic Journal

Date: June 22-23, 2007
Local: University of the Azores, S. Miguel island, Portugal
Email: meetings@iseg.utl.pt
Website: <http://www.deg.uac.pt/~pej>
<http://gemini.econ.umd.edu/conference/pej2007>

ESREL'2007

Safety and Reliability Conference. Theme "New Knowledge, Theories and Methodologies for the Analysis and Management of Risk, Reliability and Societal Safety"

Date: June 25-27, 2007
Local: Stavanger, Norway
Email: esrel2007.chairman@uis.no
Website: <http://www.esrel2007.com>

ITI 2007

29th International Conference Information Technology Interfaces

Date: June 25-28, 2007
Local: Cavtat, Dubrovnik, Croatia
Email: iti@srce.hr
Website: <http://iti.srce.hr>

July, 2007

MAPSP 2007

8th Workshop on Models and Algorithms for Planning and Scheduling Problems

Date: July 2-6, 2007
Local: Istanbul, Turkey
Website: <http://mapsp2007.ku.edu.tr>

CIGI'2007

7e Congrès International de Génie Industriel

Date: July 5-8, 2007
Local: Trois-Rivières, Québec (Canada)
Email: cigi2007@uqtr.ca
Website: <http://www.uqtr.ca/CIGI2007>

EURO XXII

The 22nd European Conference on Operational Research

Date: July 8-11, 2007
Local: Prague, Czech Republic
Email: euro2007@vse.cz
Website: <http://euro2007.vse.cz>

MEI'2007

3rd International Symposium on Management, Engineering and Informatics

Date: July 8-11, 2007
Local: Orlando, Florida, USA
Website: <http://www.iiis-cyber.org/mei2007>

Puerto Rico'07

INFORMS International Puerto Rico 2007

Date: July 8-11, 2007
Local: Western Rio Mar Beach Resort & Spa, Puerto Rico
Email: meetings@informs.org
Website: <http://meetings.informs.org/PuertoRico2007>

CITSA'2007

4th International Conference on Cybernetics and Information Technologies, Systems and Applications, jointly with The 5th International Conference on Computing, Communications and Control Technologies: CCCT 2007

Date: July 12-15, 2007
Local: Orlando, Florida, USA
Email: citsa2007@info-cyber.org
Website: <http://www.info-cyber.org/citsa2007>

ORAHS'2007

The 33rd conference on Operational Research Applied to Health Service

Date: July 15-20, 2007
Local: Saint Etienne, France
Email: orahs@emse.fr
Website: <http://www.emse.fr/orahs>

DSTIS'2007

International Conference on Decision Support for Telecommunications and Information Society

Date: July 18-20, 2007
Local: Warsaw, Poland
Website: <http://www.itl.waw.pl/konf/dstis/2007/>

OPTI'2007

6th International Conference on Optimization

Date: July 22-25, 2007
Local: Porto, Portugal
Email: opti2007@fep.up.pt
Website: <http://www.fep.up.pt/opti2007>

ICPR-19

19th International Conference on Production Research

Date: July 29 to August 2, 2007
Local: Valparaiso (Chile)
Email: icpr19@ucv.cl
Website: <http://www.icpr19.cl>

August, 2007

ISAHP 2007

International Symposium on the Analytic Hierarchy Process

Date: August 3-6, 2007
Local: Viña del Mar, Chile
Website: <http://www.isahp.org>

MDAI 2007

Modeling Decisions for Artificial Intelligence

Date: August 16-18, 2007
Local: Kitakyushu, Japan
Email: mdai2007@kitakyu-u.ac.jp
Website: <http://www.mdai.cat/mdai2007>

DMOCI 2007

Dynamic and Multi-objective Optimization with Computational Intelligence

Date: August 24-27, 2007
Local: Hainan University, China
Email: dmoci2007@gmail.com
Website: <http://www.hainu.edu.cn/hm/icnc-fskd2007>

MISTA 2007

The 3rd Multidisciplinary International Conference on Scheduling : Theory and Applications

Date: August 28-31, 2007
Local: Paris, France
Email: mista07@mistaconference.org
Website: <http://www.mistaconference.org/2007>

September, 2007

EUROSIM 2007

6th EUROSIM Congress on Modelling and Simulation

Date: September 9-13, 2007
Local: Ljubljana, Slovenia
Website: <http://www.eurosim2007.org>

ORSSA 2007

The Operations Research Society of South Africa Conference

Date: September 10-14, 2007
Local: University of Cape Town, South Africa

ICNAAM 2007

International Conference of Numerical Analysis And Applied Mathematics 2007

Date: 16-20 September 2007
Local: Hotel Marbella, Corfu, Greece
Email: tsimos@mail.ariadne-t.gr
Website: <http://www.icnaam.org/>

CEC 2007

IEEE Congress on Evolutionary Computation

Date: September 25-28, 2007
Local: Swissôtel The Stamford, Singapore
Email: -
Website: <http://www.cec2007.org>

ITELMS'2007

International Workshop on Intelligent Technologies in Logistics
and Mechatronics Systems

Date: September 28-29, 2007

Local: Jurmala-Rīga, Latvia

Email: info@ricadigital.lv

Website: <http://www.ricadigital.lv/index.php?mode=register&id=1>

October, 2007

DRCN 2007

6th International Workshop on Design and Reliable
Communication Networks

Date: October 7-10, 2007

Local: La Rochelle, France

Email: drcn2007@see.asso.fr

Website: <http://www.drcn2007.org>

EDUTE'07

The 3rd WSEAS/IASME International Conference on
Educational Technologies

Date: October 13-15, 2007

Local: Arcachon, France

Email: info@wseas.org

Website: <http://www.wseas.us/conferences/2007/france/edute>

November, 2007

INFORMS - Annual Meeting

Date: November 4-7, 2007

Local: Washington State Convention Center & Sheraton
Seattle, USA

R.E.D.-M. 2007

Tercer Encuentro de la Red Iberoamericana de Evaluación y
Decisión Multicriterio

Date: 5-8 de Noviembre de 2007

Local: Culiacán, México

Email: redm2007@culiacan.udo.mx

Website: <http://culiacan.udo.mx/~redm2007>

38th Annual Meeting - Decision Sciences Institute

Date: November 17-20, 2007

Local: Phoenix, Arizona, USA

December, 2007

ICOTA7

The 7th International Conference on Optimization: Techniques
and Applications

Date: December 12-15, 2007

Local: Kobe International Conference Center, Japan

Email: icota7@iict.konan-u.ac.jp

Website: <http://www.iict.konan-u.ac.jp/ICOTA7>

ACE'2007

The Second All China Economics International Conference

Date: December 12-14, 2007

Local: City University of Hong Kong

Email: aceinfo@cityu.edu.hk

Website: www.cityu.edu.hk/apec/ace

Announcements

Call for Nominations: MCDM Awards

The International Society on Multiple Criteria Decision Making (MCDM) has been presenting awards at each of its meetings since 1992. The next set of awards will be presented at the 19th International Conference on MCDM in Auckland, New Zealand, January 7-12, 2008 (<http://www.esc.auckland.ac.nz/mcdm2008/>). The Society welcomes nominations for the following awards: 1. MCDM Gold Medal, 2. Edgeworth-Pareto Award, and 3. Georg Cantor Award.

Submit nominations to: Professor Murat Köksalan, Industrial Engineering Department, Middle East Technical University, 06531 Ankara, Turkey or (preferably) by e-mail, koksalan@ie.metu.edu.tr. Contact him for further information.

To assure full consideration:

1. Make the nominations by September 10, 2007.
2. Indicate the name of the nominee, why he or she is worthy of the award, his/her contributions to the field, and anything else that is relevant to the award.
3. Provide a CV of the nominee.

Awardees are expected to attend the conference and give a talk. More information concerning the awards and past awardees may be found on the web site at <http://project.hkkk.fi/MCDM/intro.html>.

Cost IC0602 International Doctoral School

Algorithmic Decision Theory: MCDA and MOO
Session 2007 : September 17-21, 2007, Han sur Lesse,
Belgium

Organizing and scientific committee: R. Bisdorff (SMA-UL, Luxembourg), D. Bouyssou (CNRS-LAMSADE, Paris), M. Pirlot (FPMs, Mons, Belgium), A. Tsoukias (CNRS-LAMSADE, Paris).

This programme is an activity of the COST Action IC0602 "Algorithmic Decision Theory"

(<http://www.cost.esf.org/index.php?id=1089>). It is also supported by EU-DEAL (European Decision Aiding Laboratory).

Goals:

- Promote training and research in the field of multiple criteria decision analysis (MCDA) and multi-objective optimization (MOO)
- Develop contacts and collaboration among researchers in this field.

Target participants: doctoral students engaged in decision theory or analysis in a broad sense (i.e. MCDA, MOO, decision under risk and uncertainty, algorithmic decision theory, preference modelling and elicitation, etc.)

Organisation: during their stay, up to 25 selected doctoral students will receive intensive training in two selected topics dispensed by two prominent scholars; the participants will be given an opportunity to present their own work and receive a feedback. Additional senior researchers will stay for one or two days and give a talk. All presentations and discussions will be in English.

Practical issues: the participants will be accommodated in the Centre "Les Mesures" located in Han-sur-Lesse, a touristic resort in the Southern part of Belgium (the Belgian Ardennes).

The working sessions will take place in the Centre, as well as the meals. Accommodation is in bungalows for 2 persons and some rooms in the main building. The Centre is easy to reach from Brussels, either by road (2h) or by public means (train + bus : 2h as well; about one connection every 3 hours; busses stop in front of the Centre). Further information is available at <http://www.restode.cfwb.be/cdpa/pages/han/pub-han.htm>.

Sketch of the programme: a typical day will consist of two lectures of two hours on the following topics (provisional titles):

- Rank-dependent utility: key preference conditions and elicitations, by M. Abdellaoui (CNRS, Paris)
- Multi-objective optimization, by M. Ehrgott (Univ. Auckland and CNRS, Nantes).

About three hours will be devoted to presentation and discussion of their research by the participants. A couple of senior researchers will visit the School and deliver a lecture.

Fee: the School is supported by the COST Action IC0602 "Algorithmic Decision Theory". The fee for students is 150 € for the entire stay (full pension). Travel expenses are not covered by the organizers.

Application: doctoral students, especially those in early stages of their research, are invited to apply for participation to the School by sending a short CV that mentions their background and their research interests and/or achievements. Applications must be sent before

June 20, 2007

to Marc Pirlot (marc.pirlot@fpms.ac.be). The scientific committee will select the participants on the basis of their research interests; priority will be given to students from countries involved in the COST Action. Applicants will be informed of the decision of the committee by July 10, 2007.

For further information send an e-mail to:

marc.pirlot@fpms.ac.be



19th International Conference on Multiple Criteria Decision Making

MCDM for Sustainable Energy and Transportation Systems

The University of Auckland, Auckland, New Zealand

7-12 January 2008

Conference website www.esc.auckland.ac.nz/mcdm2008
Conference email address mcdm2008@esc.auckland.ac.nz

Call for Papers and Sessions

In the 21st century the world has entered an age of exponentially increasing demand for energy and transportation services in a globalised economy. Climate change and other environmental impacts of human economic activity necessitate the consideration of conflicting goals in decision making processes to develop sustainable systems. The science of multiple criteria decision making has a lot to offer in addressing this need. The International Society on Multiple Criteria Decision Making organises its 19th International Conference under the theme MCDM for Sustainable Energy and Transportation Systems.

Abstracts are now called for and should be submitted by email to mcdm2008@esc.auckland.ac.nz. All areas of MCDM are welcome and papers related to the theme of the conference are especially encouraged.

- Multiple Criteria Decision Aiding
- Multiple Criteria Classification, Ranking, and Sorting
- Multiple Objective Continuous and Combinatorial Optimisation
- Multiple Objective Metaheuristics
- Multiple Criteria Decision Making and Preference Modelling

- Fuzzy Multiple Criteria Decision Making

(Extended) abstracts should be up to two A4 pages in 12pt font or similar. Abstracts must contain the name and affiliation of all authors, plus the email address of the corresponding author for notification of acceptance. Abstracts can be submitted in plain text, Latex, or Word formats, but postscript and pdf files are not acceptable. In order to be included in the conference programme at least one author must have registered and paid the appropriate fee.

Abstract submission deadline: 15 September 2007

Notification of acceptance: 15 October 2007

Colleagues interested in organising invited sessions should contact the organising committee at mcdm2008@esc.auckland.ac.nz as soon as possible.

Track on Evolutionary Multiobjective Optimisation

As part of the conference a special track on Evolutionary Multiobjective Optimisation will be organised. Details will appear on the website soon.

Proceedings Volume

Discussions with Springer are underway concerning the publication of a proceedings volume in the "Lecture Notes in Economics and Mathematical Systems". A call for full papers will be published on the conference website.

Registration

Registration will be solely via the conference website and will be available before the end of April. The full registration fee will include a 2-year electronic subscription to the Journal of Multi-Criteria Decision Analysis published by Wiley (see <http://www.wiley.com/WileyCDA/WileyTitle/productCd-MCDA.html> for more information on the journal) and free membership in the MCDM society

Local Organising Committee

Matthias Ehrgott (Chair), Fernando Beltran, Ivan Kojadinovic, Richard Lusby, Michael O'Sullivan, Andrea Raith, Paul Rouse, Lizhen Shao, Bassy Tam, Cameron Walker, Judith Wang, Hamish Waterer, Oliver Weide, Golbon Zakeri.

International Executive Committee

Theodor J. Stewart, University of Cape Town (President). Valerie Belton, University of Strathclyde. Carlos A. Bana e Costa, Technical University of Lisbon. José Rui Figueira, Technical University of Lisbon. Martin Josef Geiger, University of Hohenheim. Salvatore Greco, Università di Catania. Birsan Karpak, Youngstown State University. Kathrin Klamroth, University of Erlangen

Nuremberg. Murat M. Köksalan, Middle East Technical University. Hirotaka Nakayama, Konan University. Mark Ridgley, University of Hawai'i at Manoa. Daniel Vanderpooten, Université Paris Dauphine. Luis Vargas, University of Pittsburgh. Jyrki Wallenius, Helsinki School of Economics. Constantin Zopounidis, Technical University of Crete. Kaisa Miettinen, Helsinki School of Economics

OR49 Edinburgh, 4-6 September 2007

Multi Criteria Decision Analysis - in the real world

Stream Definition

This stream is for MCDA Practitioners, Researchers or Commissioners of MCDA projects who will give presentations and offer their insights as to:

- How is MCDA deployed to solve real world decision problems?
- What are the real and tangible benefits that MCDA can bring to an organization?
- What is new on the theory front?
- How can MCDA break through into the mainstream processes?

Multi Criteria Decision Analysis (MCDA) is part of the OR toolset that has a huge range of applications in an equally wide range of sectors. In the academic field MCDA has advanced greatly with researchers and academics from leading universities around the world.

In the business world, though, MCDA has not yet really broken the boundaries; only a handful of niche consultancies mostly spawned from academia have managed to deploy it successfully. A potential reason is that the academic mandates make MCDA tedious and time consuming. This makes it appear difficult to implement and thus intimidates organisations with regard to the investment required, before any benefits are realised.

The great objective of this stream is to debate the aspects of MCDA that are crucial to realizing its potential. Especially as the benefits tend to be realised during the experience and hence difficult to cost justify before the event. Does the clue lie in?

- Relaxed constraints
- Use of Templates
- Better education
- Clearer feedback
- New insights for weighting
- Embedding in other processes
- Mixed methodologies
- Other

Tell us your stories or come to the stream and join the debate.

Stream Organizer: Colin Simmons, Krysalis Ltd., Colin@krysalis.co.uk

Call for Papers

Web site for Call for Papers:

www.inescc.fe.uc.pt/~ewgmcd/CallforPapers.html

Algorithmic Operations Research

Call for Papers

Special Issue on Biology, Medicine, and Health Care

Operations Research (OR) is playing an increasing role in Biology, Medicine and Health Care, and a special issue of Algorithmic Operations Research will target these burgeoning interactions. Contributions to the special issue may address numerical, theoretical or computational concerns of how OR is used to approach problems in:

- Computational Biology
- Medicine
- Health Care Management
- Medical Physics
- Drug Design and Testing
- Public Policy and Health Care
- Bioinformatics
- Mathematical Biology

The goal of the issue is to catalog the state of current research so that readers in Operations Research can quickly become aware of problems stemming from other disciplines. As such, the submissions should provide enough background to be useful to the general OR reader.

Due Date: All submissions are due by March 15, 2007.

Journal Web Page:

<http://journals.hil.unb.ca/index.php/AOR/index>.

Refereeing: Refereeing will begin immediately after a paper is submitted. All attempts will be made to complete initial reviews in 3 months. Thus, decisions on papers will be made in a timely fashion, and authors will not have to wait until all papers are submitted. The hope is to have the issue appear in late 2007.

Submission Process: Please send pdf versions of your paper(s) by email to either:

- Allen Holder, Trinity University, aholder@trinity.edu, www.trinity.edu/aholder.
- Matthias Ehrgott, The University of Auckland, m.ehrgott@auckland.ac.nz, www.esc.auckland.ac.nz/people/staff/mehr002/.



Books

Parallel Combinatorial Optimization

Edited by El-Ghazali Talbi

Wiley & Sons

ISBN: 0-471-72101-8

330 pages

October 2006

<http://eu.wiley.com/WileyCDA/WileyTitle/productCd-0471721018.html>

Learn to solve complex problems with efficient parallel optimization algorithms. This text provides an excellent balance of theory and application that enables readers to deploy powerful algorithms, frameworks, and methodologies to solve complex optimization problems in a diverse range of industries. Each chapter is written by leading experts in the fields of parallel and distributed optimization. Collectively, the contributions serve as a complete reference to the field of combinatorial optimization, including details and findings of recent and ongoing investigations. Readers learn to solve large-scale problems quickly and efficiently with the text's clear coverage of several parallel optimization algorithms:

- Exact algorithms, including branch and bound, dynamic programming, branch and cut, semidefinite programming, and constraint programming
- Metaheuristics, including local search, tabu search, simulated annealing, scatter search, GRASP, variable neighborhood search, ant colonies, genetic programming, evolution strategies, and genetic algorithms
- Hybrid approaches, combining exact algorithms and metaheuristics
- Multi-objective optimization algorithms

The text not only presents parallel algorithms and applications, but also software frameworks and libraries that integrate parallel algorithms for combinatorial optimization. Among the well-known parallel and distributed frameworks covered are COIN, ParadisEO, BOB++, MW, and SDPARA. Numerous real-world examples of problems and solutions demonstrate how parallel combinatorial optimization is applied in such fields as telecommunications, logistics, genomics, networking, and transportation. Whether you are a practicing engineer, field researcher, or student, this text provides you with not only the theory of parallel

combinatorial optimization, but the guidance and practical tools to solve complex problems using powerful algorithms.

Table of Contents : Chapter 1. Parallel branch and bound (T. Crainic, B. Lecun, and C. Roucairol). Chapter 2. Parallel dynamic programming (F. Almeida, D. Gonzalez, and I. Pelaez). Chapter 3. Parallel branch and cut (T. Ralphs). Chapter 4. Parallel semidefinite programming and combinatorial optimization (S. J. Benson). Chapter 5. Parallel resolution of the satisfiability problem: a survey (D. Singer). Chapter 6. Parallel metaheuristics: Algorithms and frameworks (Melab, E-G. Talbi, S. Cahon, E. Alba, and G. Luque). Chapter 7. Towards parallel design of hybrids between metaheuristics and exact methods (M. Basseur, L. Jourdan, and E-G. Talbi). Chapter 8. Parallel exact methods for multi-objective combinatorial optimization (C. Dhaenens, J. Lemesre, N. Melab, M. Mezmaz, and E-G. Talbi). Chapter 9. Parallel primal-dual interior point methods for semi-definite programs (M. Yamashita, K. Fujisawa, M. Fukuda, M. Kojima, and K. Nakata). Chapter 10. MW: A software framework for combinatorial optimization on computational grids (W. Glankwamdee and T. Linderoth). Chapter 11. Constraint logic programming on multiple processors (I. Sakellariou and I. Vlahavas). Chapter 12. Application of parallel metaheuristics to optimization problems in telecommunications and bioinformatics (S. L. Martins, C. Ribeiro and I. Rosseti).

Creative Space Models of Creative Processes for the Knowledge Civilization Age

**Andrzej P. Wierzbicki
Yoshiteru Nakamori**

Springer Berlin / Heidelberg, 2005

Contents: Preliminaries. Rational theory of intuition and its epistemological consequences. Basic dimensions of creative space. Further dimensions of creative space. A vision of the new civilization era. A new role of systems sciences informed systems approach. Decision Support versus decision knowledge support. Conclusions.



Articles Harvest

(This section is prepared by Juscelino ALMEIDA DIAS)

- Abbas A.E. (2007). Moments of utility functions and their applications. *European Journal of Operational Research* 180 (1), 378-395.
- Aghezzaf E.H., M.A. Jamali and D. Ait-Kadi (2007). An integrated production and preventive maintenance planning model. *European Journal of Operational Research* 181 (2), 679-685.
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Seminars

SÉMINAIRE «MODÉLISATION DES PRÉFÉRENCES ET AIDE MULTICRITÈRE À LA DÉCISION»

Responsables : Bernard ROY,

Daniel VANDERPOOTEN

(le mardi, à 14.00, en salle P 510)

Prochaines réunions

27 mars 2007 : Conférence de **Jérôme Lang** (IRIT, CNRS & Université Paul Sabatier, Toulouse) :
Indépendance préférentielle et agrégation des préférences sur des domaines combinatoires.

10 mai 2007 Demi-journée spéciale, à partir de 13.30, organisée par Alexis Tsoukiàs avec la participation de Valérie Belton (Université de Strathclyde, Grande-Bretagne) et Sébastien Damart (ENS Cachan) : Présentation des travaux de thèse sur le thème « Démarches participatives d'aide à la décision dans des contextes d'aménagement du territoire » par Katherine Daniell, Chabane Mazri, Costanzo Procaccini, Clara Pusceddu, Hedia Trabelsi.

12 juin 2007 Conférence de **Antoine Rolland** (LIP6, Université Paris VI) :

Modèles à base de points de référence pour la décision multicritère et la décision dans l'incertain.

« L'introduction de points de référence dans une relation de préférence ordinale permet de décrire des relations de préférence multicritères non représentables par une approche reposant uniquement sur une comparaison directe des alternatives. En particulier, nous montrons ici comment l'introduction de plusieurs points de référence permet de dépasser le théorème d'Arrow et d'obtenir des relations de préférences transitives et non dictatoriales par agrégation lexicographique de préférences ordinales. Nous présenterons également des résultats similaires dans le cadre de la décision dans l'incertain ».

Dissertations

CHARKHAR, Salem. « Cartographie décisionnelle multicritère : formalisation et implémentation informatique ». Thèse de doctorat. Soutenue au mois de décembre 2006, Université Paris-Dauphine. Composition du jury : Vincent Mousseau (directeur de thèse), Bernard Roy (co-directeur de thèse), Claudia Bauzer-Medeiros, Laurent Lorini, Denis Bouyssou, Philippe Rigaux, Stefabo Spaccapietra.

RESUME : Les SIG, *systèmes d'information géographiques*, stockent des données géo-référencées dans des bases de données géographiques, ouvrant ainsi de grandes potentialités en terme d'exploitation. Une utilisation fréquente des SIG concerne la prise de décision à référence spatiale. Néanmoins, la technologie SIG actuelle souffre encore de plusieurs lacunes, dues en grande partie à un manque de capacités analytiques capables de supporter la nature multicritère des problèmes spatiaux. La solution la plus diffusée pour faire évoluer les SIG vers un vrai outil d'aide à la décision à référence spatiale est l'*analyse multicritère* (AMC). De nombreux travaux d'intégration SIG-AMC ont été publiés depuis le début des années 1990. Cependant, ces travaux présentent plusieurs limites qui les empêchent à être diffusés au delà du cadre académique : (i) utilisation du mode d'intégration indirecte ou encastrée, (ii) intégration d'une seule méthode ou d'un nombre limité de méthodes, (iii) absence d'une méthodologie pour le choix de la méthode à appliquer dans un problème donné, (iv) intégration des méthodes du critère unique de synthèse, et (v) nécessité d'une connaissance approfondie du SIG et de l'AMC. Dans ce travail de thèse, notre contribution a porté sur la proposition de solutions conceptuelles, méthodologiques et informatiques pour surpasser ces différentes lacunes. Plus précisément, nous proposons : (i) une stratégie d'intégration SIG-AMC, (ii) un module à base de règles

pour le choix de la procédure d'agrégation, (iii) une méthodologie pour la cartographie décisionnelle multicritère facilitant l'utilisation des méthodes de surclassement de synthèse, et (iv) une algèbre destinée à la modélisation spatiale multicritère. Pour valider les solutions proposées, nous avons développé un prototype et nous l'avons appliqué à un problème de génération des corridors en utilisant des données réelles, relatives à l'Ile-de-France. Les résultats obtenus sont satisfaisants.

PRZBYLSKI, Anthony. « Méthode en deux phases pour la résolution exacte de problèmes d'optimisation combinatoire comportant plusieurs objectifs: nouveaux développements et application au problème d'affectation linéaire ». Thèse de Doctorat. Soutenue le vendredi 8 décembre 2006, Université de Nantes. Composition du jury : Patrice Perny, Université Paris VI, rapporteur Jacques Teghem, Faculté Polytechnique de Mons, rapporteur Horst W. Hamacher, Technische Universität Kaiserslautern, rapporteur Arnaud Freville, Conseil Régional du Nord-Pas-de-Calais, examinateur Matthias Ehrgott, co-directeur Xavier Gandibleux, directeur.

RESUME : Dans ce travail, nous nous intéressons à la résolution exacte de problèmes d'optimisation combinatoire multi-objectif par la méthode en deux phases. Pour cela, nous utilisons le problème d'affectation comme support de nos investigations. La méthode en deux phases est un cadre de résolution général qui a été popularisé par Ulungu en 1993 avec comme idée centrale d'exploiter la structure spécifique des problèmes d'optimisation combinatoire pour leur résolution dans un contexte multi-objectif. Elle a depuis été appliquée sur un grand nombre de problèmes, en se limitant toutefois au contexte bi-objectif. Nous apportons des affinements à cette méthode et à son application au problème d'affectation bi-objectif. En particulier, nous proposons des bornes supérieures améliorées et l'utilisation d'un algorithme de ranking comme principale routine pour la seconde phase de la méthode. Nous proposons ensuite une généralisation de cette méthode au contexte multi-objectif, qui est réalisée en deux temps. Pour la première phase, une analyse de la décomposition de l'ensemble des poids en correspondance avec les points supportés extrêmes, nous permet de mettre en évidence une notion d'adjacence géométrique entre ces points, et une condition d'exhaustivité sur leur énumération. La seconde phase consiste en la définition et l'exploration de régions dans lesquelles des énumérations sont nécessaires afin d'achever la résolution du problème. Notre solution repose essentiellement sur une description appropriée de ces régions qui en permet une exploration par analogie avec le cas bi-objectif, et permet donc la réutilisation de stratégies d'exploration existantes pour ce contexte. Les résultats expérimentaux sur le problème d'affectation tri-objectif attestent de l'efficacité de la méthode.

Announcement:

The "Useful links" section of the group's homepage

(<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).

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**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.

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