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Opinion Makers Section

On Argumentation theory – a very brief overview

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Introduction

The study of argumentation in philosophy, since Aristotle and the Greek philosophers, has focused on how conclusions may be reached from premises through logical reasoning. Today, the theoretical study of argumentation theory is interdisciplinary and is found in philosophy, linguistics, psychology, communication theory, and more recently, computer science and artificial intelligence. Loosely speaking, argumentation can be seen as the process of making claims and providing elements to support these claims, in order to persuade or convince (oneself or others), often in the presence of uncertain or incomplete knowledge. Within philosophy, argumentation focuses on how to propose, discuss and resolve claims in a context where several diverging opinions exist. It has a strong dialogical element with an emphasis on the context within which it is situated (Gilbert, 1997).

There is no single definition of argumentation. Van Eemeren (2003, 2009) defines argumentation as *"a verbal, social and rational activity aimed at convincing a reasonable critic of the acceptability of a standpoint by advancing a constellation of propositions justifying or refuting the proposition expressed in the standpoint."* One essential characteristic is that argumentation pertains to a specific point of view that the arguer advances in a specific context with regard to a specific issue. This definition takes into account both the process and the product nature of arguments. Argumentation theorists are concerned with establishing criteria for sound arguments. Some of the scholars follow a normative approach inspired by logic while others, mainly from the linguistic field, follow a descriptive approach to convey how discourse is used to convince interlocutors more or less successfully. Most scholars often take a middle position between a normative and a descriptive approach.

According to O'keefe (1992), there are two concepts of argument: an argument can be seen as a product when one *makes* an argument, or understood as a process where one *is having* an argument. There is a common long standing view that there are three perspectives to studying argumentation as part of a conceptual system governed by distinct purposes (Wenzel, 1992, Habermas 1984): Logic studies the *product* of argumentation where the interest is in the form, the validity, and the soundness of arguments (*judging arguments*). Dialectic studies its *procedure*, namely the structure of exchanges and the norms for conducting them (*engaging in arguments*). The rhetorical perspective investigates the effectiveness of argumentation in persuading an audience (*presenting arguments*). Argumentation is thus seen as an ordered activity that produces objects (Tindale, 2004). Recently, an alternative to this view was proposed by Blair (2012a) who asserts that rhetoric, dialectic and logic are not different perspectives, but rather apply to a different objective of argument and argumentation. He also introduces the notion that rhetoric and dialectic reflect different paradigmatic contexts, where rhetoric involves a context of speech with no interaction, and dialectic involves conversational exchanges where arguments are traded back and forth. He adds, for example, that when rhetoric is used to influence conduct, its arguments are subject to dialectical and logical norms.

There are many types of argumentative tasks: identification, analysis, evaluation, production, and presentation (Walton, 2009). Identification consists of extracting the premises and conclusions of an argument in a discourse. *Analysis* consists of finding implicit premises or conclusions necessary for the proper evaluation of an argument. *Evaluation* is a task to determine the strengths or weaknesses of an argument within a logical framework. *Production* is the construction of new arguments, and *presentation* consists of communicating arguments.

The monological approach of deductive logic concentrates on a single inference, using a formal model, to link premises with conclusions. If all the premises are true, following the rules of deductive logic leads to a conclusion that is necessarily true (sound or valid argument). In

contrast to formal deductive logic, argumentation theory adopts a dialogical approach and looks at both the "for" and the "against" side of a proposition (van Eemeren *et al.*, 2002). There exists a widely shared view that formal deductive logic is not adequate for the everyday reasoning and decision making, known as practical reasoning or reasoning toward action (Woods *et al.* 2002). This has led to the development of an important subfield within argumentation theory called informal logic, mostly concerned with the norms for interpreting, evaluating and constructing arguments in natural language. The label "informal logic" covers a "*collection of normative approaches to the study of reasoning in ordinary language that remain closer to the practice of argumentation than formal logic*." (van Eemeren, 2009).

Informal Logic

Although there is no agreement on a single definition of informal logic, one accepted definition provided by informal logicians Blair and Johnson (1987) is: "*informal logic is best understood as the normative study of argument. It is the area of logic which seeks to develop standards, criteria and procedures for the interpretation, evaluation and construction of arguments and argumentation used in natural language*". Informal logic differs from formal logic in the distinction it makes between the social and communicative practice of argumentation, and the inference and implication (Johnson and Blair, 2002).

According to Johnson and Blair (2002), informal logic developed following three streams of criticisms of formal deductive logic. First, the pedagogical critique, originating mainly in the United States and Canada, put forward that the students' ability to analyse and evaluate arguments, reason, and argue in everyday social political and practical issues was not improved by studying formal deductive logic. Deductive logic was therefore seen as inadequate for teaching argument evaluation. This is exemplified by the critical thinking movement's position that a fundamental goal of education should be the critical analysis of beliefs and assumptions (Siegel, 1980). In a 1980 California State University executive order, the teaching of abilities for the analysis, criticism, promotion of ideas, and reasoning inductively and deductively, was mandated in post-secondary curricula (Ennis, 2011). Critical thinking is understood as the evaluation of an intellectual product whether an argument, an explanation, or a theory, in terms of its strengths and weaknesses (Johnson, 1992).

The second critique came from philosophers who concluded to the inadequacy of formal deductive logic for evaluating everyday arguments. Both the ideas of formalism and deductiveness were challenged: since the definition of a good argument in formal deductive logic is one that is valid and which premises are true, this would mean that there cannot be good arguments *for* and *against* a proposition. Yet, situations where good arguments can be made *for* and *against* a proposition are common in everyday life, namely in law, environmental, social, and public policies, and history, to name a few. The challenge to formalism came from the difficulties encountered in expressing natural language arguments in canonical notation. According to Blair and Johnson (1987), this theoretical breakaway is attributed to the works of Perelman and Olbrechts-Tyteca (1958), and Toulmin (1958) who, independently, put forward that formal deductive logic was not the logic of argumentation and that arguments, as a communication product in natural language, are *not* chains of deductive inferences.

The third critique came from an empirical context challenging the idea that the ability of reasoning was improved as a consequence of formal deductive logic training. This was suggested by psychological findings where those who had formal deductive training tended to fail at some conditional reasoning tasks (Perkins, 2002).

In order to evaluate the validity of arguments in informal logic, an alternative to the formal criterion of deductive validity was proposed by Johnson and Blair (1987). A good argument in informal logic has premises that meet three criteria: relevance, acceptability and sufficiency. Premises should be acceptable by the arguer and the audience, be relevant as support for the claim in question albeit in varying degrees, and suffice to support the claim on behalf of which they were offered. Twenty-five years later, Blair (2012b) revisits these criteria and concludes that they are still pertinent, and that the introduction of the dialectical and rhetorical perspectives enriches the ways that these criteria can be interpreted and applied.

In classical logic, a deductive inference is monotonic, whereby a conclusion that is reached based on a set of premises will still hold if more premises are added. In non-monotonic logic, arguments are defeasible: a reasoning that formed a solid argument in favor of a conclusion can be undone if the point of view is changed, or if new information is brought to light. In everyday contexts, human reasoning is non-monotonic and defeasible. Defeasible arguments are the subject matter of informal logic and a prominent informal logician, Douglas Walton, has defined many argument schemes for defeasible arguments. These are forms that represent stereotypical patterns of defeasible reasoning (inferences) found in everyday discourse, in legal reasoning, in medical reasoning, etc. (Walton, 1996). Argument schemes are one of many ways to represent arguments; other possible representations include, for example, simple premise-conclusion pairs, or inference trees.

Argumentation systems

The interest in the study of defeasible reasoning has grown over the last 40 years mainly because of its application in artificial intelligence. Bench Capon and Dunne (2007) present an account of argumentation as a core study within

artificial intelligence. Many non-monotonic logics were developed for reasoning and explanation when knowledge is incomplete and uncertain. Formal logics of argument, a way of formalizing non-monotonic commonsense reasoning in artificial intelligence, are presented in Chesñevar *et al.* (2000). An overview of some defeasible logics for argumentation, where reasoning patterns consist of producing arguments *for* and *against* a claim, and evaluating these arguments to determine their acceptability, can be found in Prakken and Vreeswijk (2002). All these argumentation systems allow to construct arguments, to compare conflicting arguments, and to evaluate the acceptance of arguments, in order to arrive to a conclusion on whether to accept or reject arguments; they pertain mainly to the logical and dialectical perspectives.

An abstract argumentation framework was introduced by Dung (1995) in his seminal paper to model criteria of argument acceptability. An argumentation framework consists of a set A whose elements are called arguments and a binary relation R on $A \times A$, called the attack relation. *Semantics* describe the way in which to derive a set of *extensions* (a subset of arguments) that are "collectively acceptable". There are a number of semantics proposed in the literature (Baroni & Giacomin, 2009). Dung (1995) initially proposed four of them as shown in Table 1. A *credulous* reasoner can be defined as one who accepts an argument if it is *at least in one* preferred extension, and a *sceptical* reasoner as one who accepts an argument only if it is in *all* preferred extensions. When the preferred extension is unique, a dispute is said to be *resoluble*, since there is only one set of arguments capable of rational acceptance (Bench-Capon, 2003).

Table 1 Interpretation of the semantics of Dung (1995)

Semantic	Extension
Complete	A subset of arguments capable of defending themselves that includes all the arguments it defends.
Grounded	A subset of arguments containing only arguments which defense is based on initial arguments, i.e. those that are not attacked.
Stable	A subset of arguments attacking all arguments not contained in the subset.
Preferred	A maximal subset of arguments that can defend itself against all attacks.

Dung's framework is very widely used[1] and due to its abstract nature, it encompasses a large variety of several non-monotonic reasoning formalisms. Argumentation frameworks "provide an elegant way of subsuming much previous work on defeasible reasoning" (Walton 2011). Many extensions to Dung's framework were developed to take into account: the values of an audience (Bench-Capon & Atkinson, 2009); arguments supporting multiple values (Kaci & van der Torre, 2008); bipolar argumentation with a support and an attack relation (Cayrol & Lagasquie-Schiex, 2009; Amgoud *et al.*, 2008); defeasible preferences (Modgil, 2009); weighted arguments reflecting the strength of the attacks (Dunne *et al.*, 2009); and arguing about multi-criteria preferences (Visser *et al.*, 2012). Today, many of the argumentation systems use a Dung style argumentation framework for multi-agent decision making.

Argumentation and decision making

Practical reasoning, or reasoning for action, is a type of defeasible reasoning where one reasons to decide what to do, in order to solve a problem, or to attain objectives based on an agent's values. It is different from epistemic reasoning where one reasons about beliefs regarding the state of the world. Practical reasoning is defined as leading "to a conclusion representing an action that is the most practical or prudent thing for an agent to do, in a particular set of circumstances, as far as they are known or surmised by the agent."(Walton, 2007).

Decision making can be viewed as a type of practical reasoning. Argument schemes for practical reasoning were proposed by Walton (1996). They were extended and applied to the domain of eDemocracy by Atkinson *et al.* (2006), and further extended by Cerutti (2011) and van der Weide (2011). Ouerdane (2009) proposed arguments schemes for multicriteria decision analysis organised within a hierarchy, supporting argumentation at the single criterion level, the aggregation level and the global evaluation level of multicriteria procedure.

The use of practical reasoning and argumentation-based decision making is fairly recent in the development of decision support systems, and an overview is provided in Girle *et al.* (2003). Applications are found in the legal domain (Prakken & Sartor, 2002), autonomous decision making (Kakas & Moraïtis, 2003), negotiation in multi-agent systems (Rahwan *et al.*, 2003), the medical domain (Longo *et al.*, 2012; Fox *et al.* 2007), collaborative learning (Scheuer *et al.*, 2010), public health policy (Bourguet *et al.*, 2013), etc. For an list of argumentation systems applied to decision support, the reader is referred to Ouerdane *et al.* (2010). In the context of applying multicriteria decision methods, argumentation is also used to explain the results of applying the method (Labreuche, 2011).

To give the reader a concrete idea of how argumentation frameworks can be used to support decisions, we briefly summarize Amgood (2009) who modeled a ranking decision problem as a two-step argumentation process. In the first step, the inference step, arguments *for* or *against* alternatives are constructed, their strength evaluated, and their acceptability is assessed in a Dung style framework.

[1] Cited 1884 times as of March 2nd, 2013.

In the second step, pairs of alternatives are compared based on the accepted arguments. Three different principles were used to order options.

- The unipolar principle, based on the number of *for* arguments, or the number of *against* arguments;
- The bipolar principle where an option is preferred to another if it has more arguments *for* it and less *against* it. This principle no longer ensures a complete preorder;
- The non-polar principle where arguments aggregated into a meta-argument by assigning a score to an alternative based on the difference between the number of pro and the number of contra arguments.

The notion of the strength of an argument was introduced. Strength takes into account the certainty level of an argument (certainty in the alternatives evaluations with respect to the criteria), the importance of a criterion, and the degree to which a goal on a criterion is satisfied based on a qualitative unipolar scale. In addition to providing a ranking, this approach provides reasons for justifying the final result.

Most of the papers combining multicriteria decision analysis and argumentation are related to automated decision support, or to providing explanations for decisions. However, recently, a methodology based on content analysis and a value based argumentation framework was applied in a descriptive study of a public decision process involving public hearings. The objective was to extract knowledge about a decision process concerning the development of a hydroelectric project in Quebec, Canada. The knowledge of interest pertains to the preferences of the decision-makers, their reasoning methods and their attitudes towards the presence of inconsistencies in the arguments presented during public hearings (Tremblay and Abi-Zeid, 2013).

Conclusion

My objective in writing this short article was to introduce readers of the EWG MCDA newsletter very briefly and superficially to argumentation theory. The account made here is by no means exhaustive nor is it complete. My hope is to raise the interest in argumentation within the MCDA community in order to increase the fairly recent interactions between the two fields. In the paper by Dix *et al.* (2009) on research challenges in argumentation, some of the questions raised are: "What does an argumentation-theoretic approach add over and above decision theory? How can one integrate argumentation tools with classical decision theory and other existing models of decision making?" Some similar questions are also posed by Simari (2011). Perhaps some of the answers will be constructed through collaboration and cross-fertilisation between argumentation theory and MCDA.

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MCDA Research Groups

RED-M: The Ibero-American Network of Multicriteria Evaluation and Decision Making

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According to Wikipedia (see http://en.wikipedia.org/wiki/Ibero-America)

Ibero-America is a term used since the second half of the 19th century to refer collectively to the countries in the Americas that were formerly colonies of Spain or Portugal. Spain and Portugal are themselves included in some definitions, such as that of the Ibero-American Summit and the Organization of Ibero-American States. The Organization of Ibero-American States also

includes Equatorial Guinea, in Central Africa, but not the other Portuguese-speaking African countries.

Following the same source in Ibero-American countries there are over 400 million people speaking Spanish and about 209 million people speaking Portuguese - 198,742,592 in Brazil and 10,695,000 in Portugal.

In July 1997 the first meeting of the Ibero-American Network of Multicriteria Evaluation and Decision Making (RED-M) took place in Santiago, the capital city of Chile. That first meeting comprised four invited speakers delivering plenary talks and the presentation of twenty one papers. The four plenary talks covered the following subjects: (1) the Analytic Hierarchy Process (Luiz F. Autran M. Gomes, from Brazil); (2) a concise overview of Multicriteria Evaluation Theory (Giuseppe Munda, from Italy and Spain); (3) Group Multicriteria Decision Making (Antonio M. Moreira, from Brazil and Portugal); and (4) Environmental Ranking and Decision Making (José M. Moreno Jimenez, from Spain). That first meeting had a total of about eigthy participants. As an important outcome from that first meeting the following decisions were made: (i) a network of Ibero-American professionals, researchers and graduate students working with Multicriteria Decision Analysis (or MCDA) should definitely be created; and (ii) a second, follow-up meeting should take place in Mexico. The chosen acronym for that network was RED-M, literally meaning "Multicriteria Network". That first meeting of the network from now on would be denoted as "RED-M 1997". This meeting was by far the seed of that network.

From that pioneering meeting on three other meetings were organized in Mexico: RED-M 1999, in Mexico City, with fourty participants; RED-M 2007, in Culiacán, Sinaloa, with fifty papers presented and a total of eighty participants; and RED-M 2009, in Zapopan, Jalisco, with fourty-six papers presented and sixty participants. Besides the presentation of scientific papers those three meetings included invited lectures as well as workshops. Invited speakers came from Brazil, Chile, Cuba, United States, France, Mexico, Portugal and Spain. Besides cooperation between researchers from different countries books and journal articles published in Mexico emerged from these three Mexican meetings. It is important to emphasize that holding these three meetings in Mexico was crucial to maintaining the existence of the network. A very important outcome from these three meetings in Mexico was the production of RED-M Bylaws. Those Bylaws were written in Spanish and are presented as an annex to this text.

In August 2011 the 5th meeting of RED-M took place jointly with the 43rd Brazilian Annual Symposium of Operations Research (XLIII SBPO) in the city of Ubatuba, at the coast of the Brazilian state of São Paulo, in Brazil. RED-M 2011 had Roman Słowinski, from Poland, as keynote speaker. Fifty papers were presented in the 5th RED-M and there were around four hundred and fifty participants in both RED-M 2011 and XLIII SBPO. It was then decided that Chile should be considered for holding the coming RED-M 2013. After consulting with Chilean colleagues the idea was approved. RED-M 2013 will indeed take place in Concepción, in Chile, jointly with OPTIMA 2013 (or X OPTIMA), the Chilean Congress of Operations Research. The dates will be 27-30 October and Javier Pereira, professor at the Universidad Diego Portales, will head RED-M 2013.

Following the spirit of previous RED-M meetings the 6th RED-M (also denoted by VI RED-M or simply RED-M 2013) is designed to promote scientific and academic collaboration among professionals and researchers working with MCDA in Ibero-American countries. Like previous meetings the 6th RED-M aims at disseminating knowledge in all approaches and methodologies pertaining to the broad field of MCDA. It is also expected that this sixth meeting will allow for the promotion of a process of cross-fertilization of disciplines such as Decision Theory, Computer Science, Discrete Mathematics and Artificial Intelligence.

About 300 attendants are expected for the joint meetings of X OPTIMA and VI RED-M. Among the activities there will be a plenary session by Dr. José Figueira, from the Higher Technical Institute (or IST) of Lisbon. In his plenary session Dr. Figueira will present a current overview of the field of MCDA. Technical sessions of the 6th RED-M are expected to cover sub-fields such as theoretical developments, applications, evolutionary algorithms, robustness analysis, etc. As part of its outreaching efforts, organizers of the 6th RED-M are planning to offer a tutorial focusing on application initiatives of MCDA in Latin America. Also similar to previous meetings, it is expected that a policy of expansion and development of MCDA in Ibero-American countries will emerge that will lead to cooperative projects involving professional, researchers, students, and industry in Latin America.

Estatutos de la Red Ibero-Americana de Evaluación y Decisión Multicriterio

PROLOGO

1. OBJETIVOS

2. MIEMBROS DE LA RED-M

3. COORDINACIÓN Y SECRETARÍA EJECUTIVA

4. ASAMBLEA GENERAL DE LA RED-M

5. FINANCIAMIENTO DE LOS PROGRAMAS DE LA RED-M

PROLOGO

Los métodos de evaluación y decisión multicriterio han sido objeto de una extraordinaria atención y desarrollo en medios académicos y profesionales de los países industrializados en los últimos años, tanto en el nivel teórico como en aplicaciones en los más diversos campos.

La Red Ibero-Americana de Evaluación y Decisión Multicriterio (RED-M) persigue movilizar los potenciales nacionales y regionales, a través de diferentes mecanismos de cooperación, con el propósito de promover el desarrollo y aplicación de los métodos de evaluación y decisión multicriterio en la solución de problemas de desarrollo económico y social en Iberoamérica.

La RED-M presupone la articulación y la coordinación de actividades cooperativas, basadas en las diferentes experiencias que poseen los distintos programas y especialistas que la constituyen.

La RED-M es interactiva, es decir, que los programas y especialistas participantes funcionan como nodos que contribuyen entre sí, aportando y recibiendo, a través de ella, información y tareas.

Considerando lo anterior, se ha decidido establecer la *Red Ibero-Americana de Evaluación y Decisión Multicriterio - RED-M*

1. OBJETIVOS

1.1 Objetivo general

Promover el desarrollo y aplicación de los métodos de evaluación y decisión multicriterio en la solución de problemas de desarrollo económico y social en Iberoamérica.

1.2 Objetivos específicos

i. Elevar la excelencia técnica y la calidad de los programas de evaluación y decisión multicriterio en Iberoamérica.

ii. Identificar y proponer áreas, programas, proyectos y actividades de cooperación regional

iii. Contribuir a la formación y capacitación del personal técnico de los programas de evaluación y decisión multicriterio

iv. Contribuir a la investigación y difusión de los métodos de evaluación y decisión multicriterio

v. Difundir los métodos y programas de evaluación y decisión multicriterio en las esferas de toma de decisiones, y participar en las instancias nacionales y regionales de toma de decisiones

vi. Contribuir a la elaboración, edición, publicación y difusión de documentos sobre evaluación y decisión multicriterio

vii. Apoyar el funcionamiento de bases de datos de programas y especialistas en evaluación y decisión multicriterio.

2. MIEMBROS DE LA RED-M

2.1 Miembros Titulares

Los miembros titulares son programas y especialistas en evaluación y decisión multicriterio

Los programas y especialistas deben comunicar por escrito a la Secretaría Ejecutiva de la RED-M, el interés en formar parte de la RED-M, comprometiéndose a asumir, respaldar y promover el ideario y las actividades de la misma.

2.2 Miembros Honorarios

Los miembros honorarios son programas o profesionales con una trayectoria reconocida en evaluación y decisión multicriterio.

3. COORDINACION Y SECRETARIA EJECUTIVA

La coordinación de la RED-M estará a cargo de una Secretaría Ejecutiva. El Secretario Ejecutivo será electo entre los Miembros Titulares de la RED-M. El Secretario Ejecutivo será electo por un período de dos años, prorrogable una vez por igual plazo.

Las *funciones del Secretario Ejecutivo* son:

a. Representar a la RED-M ante instituciones públicas y privadas, nacionales e internacionales;

b. Coordinar y promover las actividades de la RED-M, a fin de cumplir con los objetivos de la misma;

c. Proponer a la Asamblea General a nuevos miembros de la RED-M ("Informe de candidaturas para incorporarse a la RED-M y de membresías a cancelarse por inactividad");

d. Presentar un Informe Bienal a la Asamblea General;

e. Transferir los archivos y la documentación relevante a su sucesor.

En caso de ausencia del Secretario Ejecutivo de la RED-M, el cargo será ocupado por el director del programa co-organizador de la próxima Asamblea General, en forma interina hasta dicha Asamblea.

El Especialista del Programa de Gestión Tecnológica e Ingeniería, del Sector de Ciencias de la UNESCO, colaborará con la Secretaría Ejecutiva de la RED-M brindando asesoría técnica.

4. ASAMBLEA GENERAL DE LA RED-M

La Asamblea General de la RED-M, constituída por los Miembros Titulares de la misma, se reunirá por lo menos una vez cada dos años en sedes rotativas.

La convocatoria a la Asamblea General la realizará la Secretaría Ejecutiva, en coordinación con el programa co-organizador. Este programa deberá asegurar la participación en la organización de la Asamblea General del mayor número posible de programas y especialistas del país sede.

La Asamblea General deberá:

a. Evaluar las actividades de la RED-M realizadas en el período precedente;
b. Definir el Programa de Cooperación Regional para el período subsiguiente;
c. Evaluar, y aceptar, en su caso, las solicitudes de incorporación de nuevos miembros; y cancelar la membresía de miembros inactivos;
d. Elegir al Secretario Ejecutivo;
e. Determinar la sede de la próxima Asamblea General (ver "Principales Compromisos de la Institución Local Organizadora de una Reunión de la RED-M").

Las decisiones de la RED-M serán adoptadas, siempre que sea posible, por consenso; alternativamente serán adoptadas por los Miembros Titulares, por mayoría.

Los estatutos pueden ser modificados con la aprobación de las 2/3 partes de los Miembros Titulares presentes, debiéndose incluir con anticipación en la Convocatoria a la Asamblea General y en el Orden del Día las propuestas de modificación.

5. FINANCIAMIENTO DE LOS PROGRAMAS DE LA RED-M

La RED-M financiará sus actividades con contribuciones de los centros y programas miembros, de organismos nacionales, regionales e internacionales, y de otras entidades públicas y privadas. Asimismo, los Miembros Titulares deberán pagar una pequeña Cuota Anual

Forum

Multi-objective Combinatorial Optimization

Andrea Raith[2] and Michael Stiglmayr[3]

Multi-objective combinatorial optimization (MOCO) deals with multi-objective integer optimization problems where the constraint set describes a combinatorial structure like a matroid or graph, such as the shortest path, the assignment or the travelling salesperson problem. MOCO problems can be formulated by means of multi-objective linear binary (or integer) optimization problem

$$\begin{aligned} \min \quad & Cx \\ \text{s.t.} \quad & x \in X, \end{aligned}$$

where $C \in \mathbb{R}^{p\times n}$ is the objective matrix, $X = \{Ax = b, x \in \{0,1\}^n\}$ the feasible set and $A \in \mathbb{R}^{m\times n}$ the constraint matrix. Here, we focus on approaches guaranteed to find at least a complete set X_E of Pareto efficient solutions to the problem, that is at least one efficient solution $\bar{x} \in X$ for each nondominated point $C\bar{x}$ in objective space.
MOCO problems like multi-objective shortest path, multi-objective knapsack or multi-objective assignment have many practical applications in logistics, economics and engineering.

Challenges associated with MOCO
MOCO problems are challenging to solve even though many combinatorial optimization problems are relatively easy to solve in their single-objective form (those include shortest path, assignment, spanning tree, to name just a few). MOCO problems are generally NP hard and intractable, the latter meaning that they may have an exponential number of efficient solutions. While it is not surprising that problems that are already difficult with a single objective are still difficult with multiple objectives (such as the travelling salesperson problem), other problems only become difficult once multiple objectives are considered such as the assignment or network flow problem. References for difficulty of different MOCO problems can be found in [1]. However, in practice MOCO problems can have few efficient solutions and effective solution methods exist despite bad worst-case complexity.

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We illustrate in the following that two different types of efficient solutions of MOCO problems are distinguished namely *supported* and *nonsupported* ones. Supported efficient solution are those efficient solutions that can be obtained as optimal solution of the problem obtained by applying a weighted sum scalarisation, denoted by λ-MOCO:

$$\begin{aligned} \min \quad & \lambda^T C x \\ \text{s.t.} \quad & x \in X, \end{aligned}$$

with $\lambda \in \mathbb{R}^p$, $\lambda \geq 0$. Nonsupported solutions cannot be obtained as optimal solutions to the weighted sum problem above. This is illustrated for two objectives ($p = 2$) in Fig

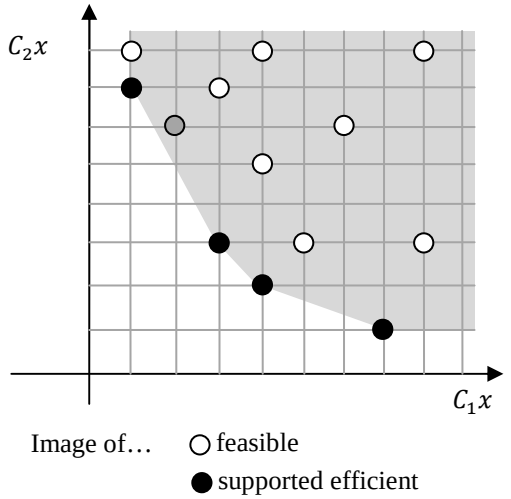

Figure 1: images of supported and nonsupported solutions for biobjective problem

1.
The figure shows the objective space of a MOCO problem and distinguishes images of supported and nonsupported solutions, and clearly shows that nonsupported ones lie in the interior of the convex hull of $CX_E + \mathbb{R}^p_{\geq}$ indicated in grey.
Supported solutions can be obtained quite efficiently using weighted sum scalarisation. If one denotes $\tilde{C} := \lambda^T C$, then λ-MOCO has the form of its corresponding single-objective combinatorial problem and can therefore solved with well-studied combinatorial algorithms (e.g. the Hungarian method for assignment problems), which may be very efficient.
Recent surveys of MOCO problems are [1,2,3]. Here, we present methods to solve a few important MOCO problems of different levels of difficulty without trying to be exhaustive. We focus on methods to obtain a complete set of efficient solutions.

Solving MOCO Problems in General
We illustrated the main difficulty of solving MOCO problems in Fig 1. We now discuss how a general MOCO problem could be solved. Firstly, supported solutions can be obtained using a sum scalarisation, which means they can – in the case of totally unimodual problems – be obtained by using a strategy such as the parametric (bi- or multi-objective) (network) simplex which iteratively moves from one supported (extreme) efficient solution to the next hereby identifying a complete set of them. Alternatively, supported efficient solutions can also be obtained by solving a sequence of weighted sum problems for example using a dichotomic approach to effectively choose weights in case of bi-objective combinatorial optimization.
However, nonsupported efficient solutions are not so easy to obtain. They are situated in triangle-shaped regions in case of a bi-objective MOCO as illustrated in Fig 2. Nonsupported points could be obtained by adding constraints to the MOCO problem thus forcing the exploration of the regions of objective space of interest in order to guarantee all nonsupported solutions are found. This is also known as ε-constraint approach [4].

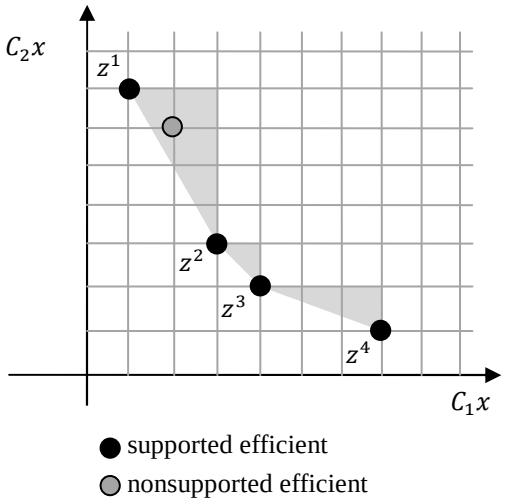

Figure 2: triangular regions in which nonsupported efficient points are located

For the example in Fig 2 the nonsupported solution would be found by solving

$$\begin{aligned} min \quad & C_1 x \\ s.t. \quad & C_2 x \leq z_2^1 - \delta \\ & x \in X, \end{aligned}$$

where $\delta > 0$ is sufficiently small to ensure no efficient solution is skipped.
However, this approach likely destroys the combinatorial structure of the problem by adding the extra ε-constraints and hence makes the optimization problem much harder to solve than it originally was. In contrast to the MOCO problem the ε-constraint subproblem is a standard integer programming problem, and solving it may be very time consuming. For example a shortest path problem with an additional constraint becomes a resource constrained shortest path problem, which is NP hard. To find all nonsupported efficient solutions many ε-constraint problems may have to be solved.
Ehrgott [5] discusses scalarisations for multi-objective integer problems most of which have limitations in either

not being able to identify all efficient solutions or in making the arising problems to be solved very difficult as explained above for the ε-constraint approach.

If an effective method to rank solutions of the single-objective version of a MOCO problem exists, this can be used to identify nonsupported efficient solutions. A ranking method identifies solutions with non-decreasing objective value. This can be applied to the scalarisation λ-MOCO and solutions are ranked. Objective vectors that are within the triangular areas of interest in Fig.2 above are candidates for being efficient. The process continues until all nonsupported efficient solutions are found. Ranking methods are readily available for example for the shortest path [6] or network flow problem [7]. If a ranking method is not available, variable fixing (essentially enumeration) is an option but it is not likely to be computationally effective.

What is described above can be summarised as the Two Phase Method (TPM) [8], where supported efficient solutions (or at least the extreme ones) are found in Phase 1 and the remaining (nonsupported) efficient solutions are obtained in Phase 2. An example here is a solution method for the bi-objective integer network flow problem that is solved by a parametric network simplex in Phase 1, and ranking in Phase 2 [9]. TPM is also used to solve an assignment problem with three objectives [10].

It is known that the set of efficient solutions of most MOCO problems is not connected [11]. Thus, algorithms based on neighbourhood search are likely to miss some of the efficient solutions. Since every efficient solution can be obtained as solution of an ε-constraint subproblem, the ε-constraint approach can be used directly to solve MOCO problems.

Research efforts are also dedicated to multi-objective branch and bound techniques, which are particularly applied to MOCO problems, whose single-objective analoga are NP hard and are solved with branch and bound/cut. Problematic in the formulation and implementation of multi-objective branch and bound algorithms is the fact that a subtree can only be pruned if all its feasible solutions are shown to be dominated, which may be rarely the case [12].

Solving "Easy" MOCO Problems

There are some MOCO problems for which specialized effective algorithms are available, often derived from algorithms for the corresponding single-objective optimization problems. One of the problems that received quite a bit of attention in the literature is the multi-objective shortest path problem (MSPP). Polynomial time algorithms for the shortest path problem are well-known. Those algorithms are extended to the multi-objective case in the form of multi-objective labelling algorithms, e.g. [13]. Ranking approaches were also applied to MSPP outside the TPM e.g. [14]. TPM is applied to the bi-objective problem with a parametric first phase followed by a label correcting algorithm in the second phase [15]. Computational comparisons find TPM and bi-objective labelling to be the most effective approaches for bi-objective problems [16] depending on network type.

Recently, research into MSPP algorithms has been dedicated to improving existing methods by identifying the most appropriate data structures to use in implementations [17] and adapting techniques that can improve computational efficiency of single-objective shortest path problems such as A* search [18].

Conclusions

Even though MOCO problems are theoretically challenging, many methods have been developed that are capable of identifying a complete set of efficient solutions within reasonable computation time. We introduce some standard methods and outline approaches specifically designed for some "easier" problems such as the MSPP problem.

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Consultancy Companies

Exdwarf
CONSULTING

Exdwarf is a start-up business intelligence consulting company based in Bratislava, Slovakia. Our vision is to become the leading consulting partner for business intelligence (BI), statistics and customer relationship management (CRM) services in the European market. Our mission is to help companies achieve their business goals through application of econometric models and business intelligence processes. We are committed to bringing the highest quality BI training and analytics for established companies as well as for organizations in transformation or startup phases. Although we do not focus on multi-criteria decision models, their application is one of our core competencies.

Our service portfolio is divided into four main ways of bringing value to the customer (see Figure 3). BI seminars are often the best way for our customers to get in terms with BI and to map their needs for further staff hiring or education (e.g. in data mining or decision aiding techniques) that is necessary for in-house BI analyses. We offer low cost BI seminars that serve as a basis for discussing the organizational information needs which can be met by, for example, setting up an in-house BI unit, training existing staff in BI techniques, or contracting external experts for performing further analyses. After the needs have been mapped, we perform a limited scope feasibility study to quantify the expected profits/savings. If they are found sufficient, the staff BI training and/or analyses are implemented in the execution phase. Throughout the process our role is mainly in advisory and education, i.e. we help our customers to build up knowledge and contract other external partners, with the goal of making better business decisions based on actual data from their core operations.

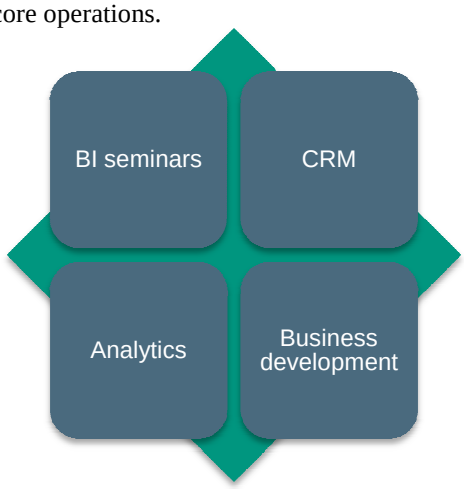

Figure 3: Exdwarf services framework.

The second service, customer relationship management (CRM) is offered either as an individual analysis or as a comprehensive multi-analysis package for customer organizations that do not have extra staff to train / dedicate for BI. For such customers we offer help in various CRM processes. These include campaign management, customer potential, acquisition, segmentation, and retention analyses, as well as market and competitive intelligence and pricing support.

Our third service, analytics, consists of custom business analytics. Whereas the CRM analyses are often of similar formats for most organizations, the analytics services are more customized towards the individual customer needs. Our competency in business analytics covers both predictive analyses e.g. with econometrical models, as well as prescriptive analyses where simulation and multi-criteria decision aiding methods are among the tools we apply. The fourth service, business development, consists of efficient data collection implementations (e.g. online surveys and web mining) and of follow-up analyses of the collected data in order to provide deeper understanding, for example, of the target market or of the internal state of the customer organization. We then also help our customers in applying this knowledge for achieving, in the most efficient manner possible, their business development or transformation goals.

In a conclusion, it could be said that our core competency is in **data** and **model driven business intelligence** and on their application in helping organizations to make more informed and better business decisions in a shorter time frame. We are constantly in look for experts willing to work on temporary contracts (mainly for the 'analytics' service), so if you are interested in being included in our expert database, please send an email including your CV to info@exdwarf.com.

DrTommi Tervonen
Co-founder, Exdwarf consulting
We would be delighted to provide further information on our services. Please address all enquiries to
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www.exdwarf.com

About the 77th Meeting

Les 11, 12 et 13 avril 2013 ont été organisées à l'IAE de Rouen (Université de Rouen, France), les 77èmes journées du groupe de travail européen sur l'aide multicritère à la décision. 61 personnes ont participé à ces journées au cours desquelles 18 travaux (sous forme de communications courtes) ont été présentés. Notons que le soleil s'était lui aussi inscrit mais n'a malheureusement fait que de courtes apparitions… au cours du dîner de gala notamment illuminant la cathédrale de Rouen, face à la salle magnifique de l'office du tourisme de Rouen, l'une des plus vielles bâtisses de la ville.
5 sessions ont été organisées. Les deux premières concernaient le thème principal des journées (« Aide multicritère à la décision et management public) quand les autres portaient respectivement sur les thèmes suivants : clustering and sorting, robustness and recommendations, business issues. Une session spéciale a été organisée dans l'après-midi du vendredi portant exclusivement sur les avancées du consortium Decision Deck ; une occasion de présenter la plateforme web Decision Deck et les très nombreuses et très riches opportunités qu'elle représente sur les plans académiques, pédagogiques et de la pratique de l'aide multicritère à la décision.
Au cours de ces journées ont également été évoquées les 78ème et 79ème journées qui se tiendront respectivement à Catania (Sicile, Italie) les 24, 25 et 26 octobre 2013 et à Athènes au printemps 2014.
Le samedi 13 avril 2013, une visite guidée de la ville de Rouen a été organisée permettant aux participants de découvrir Rouen, la ville aux cents clochers.

Programme des journées / Meeting program

Jeudi 11 avril 2013 / Thursday 11th April 2013 : ROOM N103 site Pasteur

12h30 – 13h30 / 12:30pm – 1:30pm : Accueil des participants et inscriptions / Welcome and registration of participants

13h30 – 14h00 / 1:30pm – 2:00pm : Bienvenue à Rouen / Welcome to Rouen (S. Damart)

14h00 – 15h30 / 2:00pm – 3:30pm : **1ère session / 1st session : Macro decision-making**

Camille Fertel, Jean-Philippe Waaub, La sécurité des corridors énergétiques : proposition d'une démarche d'évaluation d'un indice de risque politique et application au Canada

Willem Karel M. Brauers, Romualdas Ginevicius, Askoldas Podvezko, The Lithuanian banks during the recession years: a multi objective approach

Stella Androulaki, John Psarras, Dimitrios Aggelopoulos, Evaluating long term potential natural gas supply alternatives for Greece with multicriteria decision analysis

Travaux soumis à discussion / Paper submitted to discussion :
Laurent Botti, Nicolas Peypoch, Multi-criteria ELECTRE method and destination competitiveness

15h30 – 15h45 / 3:30pm – 3:45pm : Pause café / Coffee break

15h45 – 17h45 / 3:45pm – 5:45pm : **2ème session / 2nd session : Public decision-making**

Aurélie Prévost, Nathalie Molines, Jean Bandet, Electre Tri, un outil d'aide à la décision pour l'urbanisme réglementaire : application au Plan Local D'Urbanisme (PLU) de Toulouse

Marta Bottero, Valentina Ferretti, Giulio Mondini, Decision-making and cultural heritage: an application of the Multi Attribute Value Theory for the reuse of historical buildings

J. Renaud, D. Chafai, D. Casner, Proposition d'une approche de classement d'équipements territoriaux

Eleftherios Siskos, Dimitris Askounis, John Psarras, Robust e-government evaluation based on multiple criteria analysis techniques

Travaux soumis à discussion / Papers submitted to discussion :
Jasmin Tremblay, Irène Abi-Zeid, Décision multicritère et argumentation : le processus d'évaluation de projets par le Bureau d'Audiences Publiques sur l'Environnement (BAPE) du Québec

Christian Hurson, Panagiotis Manolitzas, Evangelos Grigoroudis, Nikolaos F. Matsatsinis, Evaluating patient satisfaction in hospital emergency department

18h00 / 6:00pm : Assemblée générale du consortium Decision Deck / Decision Deck consortium general meeting

19h30 / 7:30pm : Dîner de gala à Rouen / Dinner in Rouen

Vendredi 12 avril 2013 / Friday 12th April 2013 : ROOM C211 – Site Pasteur

9h00 – 10h30 / 9:00am – 10:30am : **3ème session / 3rd session : clustering and sorting**

Alexandru-Liviu Olteanu, Raymond Bisdorff, and Patrick Meyer, Self-organizing maps applied to clustering in MCDA

Olivier Sobrie, Vincent Mousseau, Marc Pirlot, Learning the parameters of a multiple criteria sorting method from large sets of assignment examples

Tairan Wang, Vincent Mousseau, Enrico Zio, Multicriteria Decision Making Framework for
Vulnerability Analysis

10h30 – 10h45 / 10:30am – 10:45am : Pause café / Coffee break

10h45 – 12h45 / 10:45am – 12:45am : **4ème session / 4th session : Robustness and recommendations**

Maria de L. Vazquez, Jean-Philippe Waaub, Adrian Ilinca, MCDA: Measuring robustness as a tool to address strategic wind farms issues

Antonio Boggia, Salvatore Corrente, Salvatore Greco, Gianluca Massei, Roman Słowiński, Robust Ordinal Regression in Geographical Information Systems

Salvatore Greco, Yannis Siskos, Roman Slowinski, Entropy measures to control robustness in ordinal regression models

Véronique Delcroix, Karima Sedki, A system of recommendations based on Bayesian Network for recurrent multicriteria and multiattribute decision problems

Travaux soumis à discussion / Papers submitted to discussion :

Milosz Kadzinski, Roman Slowinski, Interactive robust cone contraction method for multiple objective optimization problems

12h45 – 14h15 / 12:45am – 2:15pm : Lunch

14h15 – 15h00 / 2 :15pm – 3:00pm : Vie du groupe de travail et prochaines réunions / Group next meetings

Salvatore Greco, Catania meeting, fall 2013
Roman Slowinski (on behalf of Zoe Nivolianitou), Athenia meeting, spring 2014

15h00 – 16h00 / 3:00pm – 4:00pm : **5ème session / 5th session : Business issues**

Christian Hurson, Bérangère Gosse, The satisfaction criteria of young employees: An assessment case study in a big French organisation

Manel Maamar, Vincent Mousseau, Wassila Ouerdane, Modélisation et optimisation multicritère d'une place de marché de Leads (Adéquation offre/demande)

Travaux soumis à discussion / Papers submitted to discussion :
Evangelos Grigoroudis, Constantin Zopounidis, An MCDA approach based on Balanced Scorecard for strategy evaluation in a business simulation game
Evangelos Grigoroudis, Nikolaos Matsatsinis, e-Marketing Online: An education web-based multicriteria decision Platform

16h00 – 16h15 / 4:00pm – 4:15pm : Pause café / Coffee break

16h15 – 18h15 / 4:15pm – 6:15pm : **6ème session / 6th session : Decision Deck session**

"The Decision Deck project and recent activities" by Vincent Mousseau (Ecole Centrale Paris) and Patrick Meyer (Telecom Bretagne) : what is Decision Deck, what are the tools which have been produced, latest updates, news on the MCDA applications book, ... (15-20 minutes)

"New web services for Preference Elicitation using Multi-Criteria Ranking with Multiple Reference Points" by Presentation by Jinyan Liu, Vincent Mousseau, Wassila Ouerdane (Ecole Centrale Paris) (20-30 minutes)

Round table on pedagogical issues in MCDA (how do we teach MCDA, how do we use diviz in those lectures, how do students react to the use of such tools, ...) (1 hour) (Vincent Mousseau (EcoleCentrale Paris), Patrick Meyer (Telecom Bretagne), Marc Pirlot (UMONS), Antoine Rolland (Univ. Lyon 2), Milosz Kadzinski (Poznan Technical University)

Autres travaux soumis à discussion / Other papers submitted to discussion :
Gabriela Fernández Barberis, Carmen Escribano Ródenas, Sensitivity analysis in multicriteria decision aid: weight Stability Intervals under semi order Preference Structure
Salvatore Corrente, Salvatore Greco, Roman Słowiński, Multiple Criteria Hierarchy Process for ELECTRE TRI methods
Silvia Angilella, Salvatore Corrente, Salvatore Greco, A Stochastic Choquet integral preference model: SMAA-Choquet
Lionel Valet, Maux de Vicente y Oliva, Jaime Manera Bassa, Vincent Cliville, Applying Multivariate Analysis to identify a preference model of image processing system
Sarah Ben Amor, Zaras Kazimierz, Ernesto A. Aguayo Garcia, The value of additional information in multicriteria decision analysis with information imperfections

Samedi 13 avril 2013 / Saturday 13th April 2013

Excursions / Social activities

Forthcoming meetings

INFORMS Revenue Management and Pricing Conference 2013
June 6-7, 2013
Georgia Institute of Technology, Atlanta. USA
http://www.informs.org/Community/revenue-mgt

22nd International Conference on Multiple Criteria DecisionMaking,
MCDM2013
June17-21, 2013
Málaga, Spain
http://www.mcdm2013.com

MIM '2013 - IFAC Symposium on Manufacturing Modelling, Management, and Control
June 19-21, 2013
Saint Petersburg State University, Russia
http://mim2013.org/

EURO - 26th European Conference on Operational Research
EURO-INFORMS Joint International Meeting
July 1-4, 2013
Rome - Università Sapienza, Italy
http://www.euro2013.org/

GECCO 20'13 - Genetic and Evolutionary Computation Conference
July 6-10, 2013
Amsterdam, The Netherlands
http://www.sigevo.org/gecco-2013/

INFORMS Marketing Science Society Conference 2013
July 11-13, 2013
Swissôtel The Bosphorus, Istanbul, Turkey
http://www.informs.org/Community/ISMS/

INFORMS Applied Probability Society Conference 2013
July 14-17, 2013
Marriott Costa Rica, San Jose, Costa Rica
http://www.informs.org/Community/APS

MIP2013 - Mixed Integer Programming Workshop
July 22-25, 2013
University of Wisconsin-Madison, USA
http://www.ams.org/meetings/calendar/2013_jul22-25_madison.html

11th MCDA/M Summer School 2013
July 22 – August 2, 2013
Helmut-Schmidt-Universität, Hamburg, Germany
http://logistik.hsu-hh.de/MCDAM-2013

INFORMS MSOM Conference 2013
July 28-30, 2013
INSEAD, France
http://www.insead.edu

5th International Conference on Applied Operational Research - ICAOR 2013
July 29-31, 2013
Lisbon, Portugal
http://www.tadbir.ca

10th Metaheuristics International Conference (MIC 2013)
August 5-8, 2013
Singapore
http://www2.sis.smu.edu.sg/mic2013/

LM13 - Logistics Management 2013
September 11-13, 2013
University of Bremen, Germany

78th Meeting of the EWG on MCDA - MCDA'78. October, 2013, Catania, Italy. Organizer: University of Catania Contact: Salvatore Greco

INFORMS Annual Meeting 2013 Minneapolis
October 6-9, 2013
Minneapolis Convention Center & Hilton Minneapolis, USA
http://www.informs.org

The 36th Annual Meeting of the Society for Medical Decision Making
October 19-24, 2014
Doral Golf Resort and Spa, USA
http://smdm.org/smdm_annual_meetings.shtml

INFORMS Annual Meeting 2014 San Francisco
November 16-19, 2014
Hilton San Francisco, USA
http://www.informs.org

Announcements and Call for Papers

THE 22nd INTERNATIONAL CONFERENCE ON MULTIPLE CRITERIA DECISION MAKING
MCDM for Tomorrow's World
Málaga (Spain), 17 – 21 June, 2013
www.uma.es/mcdm2013
The 22nd International Conference on Multiple Criteria Decision Making will take place in the Mediterranean city of Málaga (Spain), in June 2013. As in all our conferences, the aim is to bring together researchers and practitioners who address Multiple Criteria Decision Making.
We expect about 300 participants from all over the world. The Conference theme is MCDM for Tomorrow's World.
This is the 22nd Conference of the International Society on Multiple Criteria Decision Making, which is an international society with more than 1,700 members from more than 90 countries around the world. For further information about our Society, please visit our webpage at www.mcdmsociety.org.
There will be three plenary talks, delivered by Profs. Ralph L. Keeney (Duke University, Durham, NC, USA), Dylan F. Jones (University of Portsmouth, UK) and Carlos Bana e Costa (Technical University of Lisbon, Portugal). The rest of the conference is basically organized in parallel sessions. No proceedings volume will be published, but several special volumes will be edited in different journals, for those who wish to submit their full papers after the conference.

The important dates for the MCDM2013 Conference are:

- Invited sessions proposals: now open, till October 31st 2012.
- Abstract submission: from November 1st 2012 to January 31st 2013.
- Registration: from February 2nd 2013 to May 3rd 2013.

The new European Journal of Decision Processes founded by EURO ispreparing a special issue on risk Management.

CALL FOR PAPERS
Special Issue on Risk Management
Guest Editors Simon French (University of Warwick) Alec Morton (London School of Economics) Ortwin Renn (University of Stuttgart)

Motivation
Most decision making involves dealing with uncertain consequences and managing these uncertainties. Thus decision process and risk management are intimately interconnected, although their literatures are based in distinct communities. The purpose of this special issue of the EURO Journal of Decision Processes (EDJP) is to explore that relationship and draw together different disciplinary perspectives on risk management and decision.
EJDP-which has been recently established by the Association of European Operational Research Societies (EURO)-publishes papers that contribute to the understanding and appropriate use of operational research in supporting different phases of decision making processes. More information on EJDP is at http://www.springer.com/40070 and at http://www.euro-online.org/web/pages/1497/euro-journal-on-decision-processes

Schedule
Prospective authors are invited to submit a full paper to the Manuscript Central editorial system (https://www.editorialmanager.com/ejdp, article type SI: Risk Management). Alternatively, they may send the Guest Editors a three-page extended abstract describing the proposed contribution (email:a.morton@lse.ac.uk) for feedback. The planned schedule is as follows: June 1st, 2012: Deadline for the submission of extended abstracts September 30th, 2012: Deadline for submission of full papers November 15th, 2013:Final decision notification 4th quarter of 2013: Publication of Special Issue

The upcoming **MCDA/M Summer School** which will take place next year in Hamburg, Germany (a first announcement is attached). The website (which is still under construction) can be found here:

http://logistik.hsu-hh.de/MCDAM-2013
Certainly something for PhD-students, also for the ones starting their studies in the coming 18 months.

A special issue on Resilient Societies in the EURO Journal on Decision Processes, focused on topics at the juncture of modelling and simulation approaches and decision theory.
Contact: Dr. Tina Comes (comes@kit.edu)
Karlsruhe Institute of Technology (KIT) -
Institute for Industrial Production (IIP)
French-German Institute for Environmental Research (DFIU)

Web site for Annoucements and Call for Papers:
www.cs.put.poznan.pl/ewgmcda

11th MCDA/M Summer School 2013
Helmut-Schmidt-Universität,
Hamburg, Germany
July 22nd – August 2nd , 2013
http://logistik.hsu-hh.de/MCDAM-2013

The Summer School on MCDA/M is a joint event of the International Society on Multiple Criteria Decision Making and the EURO Working Group on Multicriteria Decision Aiding.

Scientific program
The scientific program of the summer school is, each day, organized into two morning and two afternoon sessions (=40 sessions in total). It comprises three parts.
(i) The main part consists of invited lectures on the topics of MCDA/M, i.e. the classical version of the summer school as it always was in the past. Lectures on "Problem Structuring", "Preference Modeling", "Multi Attribute Value/Utility Theory", "Outranking Approaches", "Robust Ordinal Regression", "Multi Objective Optimization", "Interactive Methods", "Multi Objective Combinatorial Optimization", "Multi Objective Evolutionary Algorithms", "Fuzzy Approaches", among others, will be given.
(ii) Besides, computer lab sessions and working groups on case studies are included in the scientific program.
(iii) As a new element, a student stream will be organized, which will give the participating students the opportunity to present their research topics and results to the others and the invited lecturers.
Dates
The MCDA/M Summer School is a two-week event, taking place from July 22ndto August 2nd, 2013. While the official scientific program starts on Monday, 22nd of July, an informal get-together will be organized the evening before (i.e. 21 st of July, 2013).
Registration
Registration to the summer school will open in September 2012.
Please notice: The MCDA/M Summer School 2013 is a non-profit event. The aim of the organizers at the Helmut-Schmidt-Universität, Hamburg, is to provide an excellent scientific environment at low costs. This implies that all registration fees collected will go back to the participants in some form (teaching material, lecturers, lunches, social program, etc.).

Books

Multi-criteria Decision Analysis: Methods and Software
By Alessio Ishizaka, Philippe Nemery
Wiley, July 2013
ISBN: 978-1-1199-7407-9
http://eu.wiley.com/WileyCDA/WileyTitle/productCd-1119974070.html

This book presents an introduction to MCDA followed by more detailed chapters about each of the leading methods used in this field. Comparison of methods and software is also featured to enable readers to choose the most appropriate method needed in their research.Worked examples as well as the software featured in the book are available on an accompanying website.

Multi-Criteria Decision Analysis: Environmental Applications and Case Studies**,** published in 2012 by CRC Press.

P. Vasant, N. Barsoum and Jeffrey Webb , Innovation in Power, Control, and Optimization: Emerging Energy Technologies

http://www.igi-global.com/book/innovation-power-control-optimization/52721

Through a collection of case studies, **Multi-Criteria Decision Analysis: Environmental Applications and Case Studies** gives readers the tools to apply cutting-edge MCDA methods to their own environmental projects. It offers an overview of the types of MCDA available and a conceptual framework of how it is applied, with the focus on its applicability for environmental science.

Articles Harvest

(This section is prepared by Salvatore CORRENTE, salvatore.corrente@unict.it)

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Seminars

SEMINAIRE « MODELISATION DES PREFERENCES ET AIDE MULTICRITERE A LA DECISION »

Responsables : Bernard ROY, Daniel VANDERPOOTEN (le mardi à 14h00 – salles à préciser)

Prochaines réunions

19 mars 2013 Conférence d'**André Rossi** (Université de Bretagne-Sud)
Analyse de sensibilité et robustesse pour deux problèmes d'ordonnancement (Résumé voir pièce jointe)

9 avril 2013 Conférence de **Kathrin Klamroth** (University of Wuppertal, Allemagne)
Connectedness of efficient solutions in multiple objective combinatorial optimization (Résumé voir pièce jointe)

4 juin 2013 Conférence d'**Albert David** (Université Paris-Dauphine)
Structuration des préférences et critères de décision en situation d'innovation

Persons and Facts

Professor Constantin Zopounidis has been elected as a Academician in the Royal Academy of Economic and Finance Sciences (RACEF) of Spain.
http://www.springer.com/philosophy?SGWID=0-40385-6-1399543-0
https://racef.es/en/news/2013/zopounidis-urges-introduce-multi-criteria-decision-analysis-financial-management

Announcement:

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

(www.cs.put.poznan.pl/ewgmcda)

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

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

Contact: José Rui Figueira (figueira@ist.utl.pt)

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

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

http://www.cs.put.poznan.pl/ewgmcda/

Web site Editor: Milosz Kadzinski (Milosz.Kadzinski@cs.put.poznan.pl)

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.

EWG-MCDA
EURO Working Group on Multicriteria Decision Aiding
Groupe de Travail Européen Aide Multicritère à la Décision
NEWSLETTER
BULLETIN

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