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Latest developments on diviz

Tutorial: how to create and submit a web service proposal and integration into into diviz

The challenge of getting useful MCDA methods being used through usable software: a case-study of Decision Deck, JSMAA, and their integration

Robust ordinal regression methods on Decision Deck platform

Object oriented analysis and decomposition into elementary components via XMCDA

Inverse analysis of an outranking relation and presentation of a new web service

Use of the XMCDA format to describe a multicriteria evaluation process to localize a wind park in Corsica: feedback.

Some decision support systems and methods with applications in production and logistics

Address Book
Welcome by the organising committee

It is our great pleasure to welcome you at the 5th Decision Deck Workshop held for the first time in Brest. We hope that it will be a productive and stimulating meeting for everyone and that you will enjoy the conference venue in the Campus of Telecom Bretagne. We would like to thank the following sponsors. Their support was fundamental in the organisation of this event.

- The COST Action IC0602: Algorithmic Decision Theory
- Institut Telecom
- Brest Métropole Océane

The organising committee:
Sébastien Bigaret
Yannick Le Bras
Patrick Meyer
Workshop Organization
Scientific Committee

- Raymond Bisdorff, Université du Luxembourg;
- Gilles Coppin, Telecom Bretagne;
- Luis Dias, INESC Coimbra / University of Coimbra;
- Philippe Lenca, Telecom Bretagne;
- Patrick Meyer, Telecom Bretagne;
- Vincent Mousseau, Ecole Centrale de Paris;
- Philippe Picouet, Telecom Bretagne;
- Marc Pirlot, Faculté Polytechnique de Mons.

Organising Committee

- Sébastien Bigaret, LUSSI dept., Telecom Bretagne;
- Yannick Le Bras, LUSSI dept., Telecom Bretagne;
- Patrick Meyer, LUSSI dept., Telecom Bretagne.
Information and Contact

- Project: [http://www.decision-deck.org](http://www.decision-deck.org)
- Workshop: [http://conferences.telecom-bretagne.eu/ddws5](http://conferences.telecom-bretagne.eu/ddws5)

Sponsors

During the Workshop

- Patrick Meyer: +33676912399
- Conference Room: B1/114
- WIFI connection:
  - SSID: ddws5
  - WEP: .................................................................
General Information
How to get to Telecom Bretagne From the Center of Brest

Bus number 28 leaves close to the 'Place de la Liberté' (main square in the centre of town), in front of the University (UBO) building, on Georges Clémenceau Avenue. The journey lasts 15 to 20 minutes and you get off at 'La Pérouse' (ask the driver, or watch out for the 4th bus stop after the Ifremer roundabout. This roundabout is at the top of a sharp hill just after a small port).
**Bus Schedules**

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Lunches

Lunches will take place at the Restaurant of Telecom Bretagne (see CAMPUS map).

Thursday
- Salade de gésiers confits
- Filet mignon de porc
- Assiette de fromages
- Crème brûlée

Friday
- Feuilleté de fruits de mer
- Carré d’agneau
- Assiette de fromages
- Pâtisserie du jour
Thursday’s Conference Dinner

1bis, rue Yves Collet
29200 BREST
Thursday, from 7:30 pm

Menu:

- Fondant de Saint-Jacques aux crevettes, sauce vin blanc aux herbes
- Dos de cabillaud rôti, pommes maquaire, émulsion d’huile de noisette à la graine de vanille
- Kouign amann tiède aux pommes et sa glace vanille crème Anglaise à la vanille Bourbon
- Café et mignardises
Saturday’s Boat Trip

Saturday 12.30 am - 3.30 pm
Meeting at 11:30 am on the parking in the front of the hotel Abalys, on the opposite side of the road (on the map).

From the marina of the Moulin Blanc, we will discover the commercial harbour, the naval base, the Pointe des Espagnols, the bay of Roscanvel, the island of Trébéron and the Death island, the Long Island (base of the nuclear submarines) and the Round Island while having lunch on the boat. Then, by following the coast of the peninsula of Plougastel-Daoulas, we will go towards the Élorn river by passing under the ancient bridge Albert Louppe and the new bridge of Iroise. Finally, we will return in the marina.

Lunch on the boat :

- Millefeuille de dorade et de rascasse au piment d’Espelette

- Pavé de saumon rôti et ses tagliatelles de légumes du moment, riz pilaf, sauce citron

- Trilogie du fromager sur son mesclun de salades

- Entremet dacquoise aux fruits rouges et son coulis
Important Places
Map of Brest
Campus
Scientific Program
Thursday

- 10.00: Welcome
  *Patrick Meyer*

- 10.15: Current state of the Decision Deck project
  *Vincent Mousseau*

- 11.00: D4 - rationale, concept and architecture of a distributed MCDA application designer
  *Raymond Bisdorff, Michel Zam*

- 12.00: Free discussions

- 12.30: Lunch

- 13.30: Latest developments on diviz
  *Sébastien Bigaret, Patrick Meyer*

- 14.30: Free Discussions

- 15.00: Tutorial: how to create and submit a web service proposal and integration into diviz
  *Sébastien Bigaret, Patrick Meyer*

- 16.00: Coffee break

- 16.30: The challenge of getting useful MCDA methods being used through usable software: a case-study of Decision Deck, JSMAA, and their integration
  *Tommi Tervonen*

- 17.00: Robust ordinal regression methods on Decision Deck platform
  *Miłosz Kadziński*
Friday

- 09.30: Object oriented analysis and decomposition into elementary components via XMCDA
  *Olivier Cailloux, Quantin Hayez, Cédric Walck*

- 10.00: Inverse analysis of an outranking relation and presentation of a new web service
  *Thomas Veneziano*

- 10.30: Use of a multicriteria evaluation process for participative localization of windy parks in Corsica: use of the XMCDA format and feedback
  *Marie-Laure Nivet, Christophe Paoli, Pascal Oberti*

- 11.00: Coffee break

- 11.30: Analytic Center for UTA: presentation, implementation in R and taking into account of XMCDA
  *Boris Leistadt*

- 12.00: Some decision support systems and methods with applications in production and logistics
  *Martin Geiger*

- 12.30: Lunch

- 13.30: General Assembly of the Decision Deck Consortium
  Reports from the responsible persons of the different initiatives! Announcements of future events (developers’ days, workshop, . . .)

- 16.00: End of the workshop
Abstracts
D4 - rationale, concept and architecture of a distributed MCDA application designer

R. Bisdorff, G. Dodinet et M. Zam
Presentation of the rationale, the concepts and the architecture of D4 with first snapshots from the prototype followed by a live demo.

Latest developments on diviz

S. Bigaret, P. Meyer
We present the latest developments on diviz, the current public beta version of the software, as well as the current deployment schema of the diviz-related tools.

Tutorial: how to create and submit a web service proposal and integration into diviz

S. Bigaret, P. Meyer
We detail the conditions for a program to be publishable as an XMCDA web service, the various steps for its proper integration into Decision Deck’s web services architecture and the diviz software, as well as the submission procedure.
The challenge of getting useful MCDA methods being used through usable software: a case-study of Decision Deck, JSMAA, and their integration

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Decision Deck (DD) project is the first attempt at developing a generic decision analysis platform composed of modular software components implementing common functionalities of a large range of Multiple Criteria Decision Analysis (MCDA) methods. DD’s goal is to provide effective tools for three groups of users: practitioners, teachers, and researchers. DD has various software development efforts to achieve this goal: a client implementing a few MCDA methods (D2), a XML schema for representing MCDA models (XMCDA), web services communicating through XMCDA, a web services management client, and a client/server for XMCDA web services composition, management, and deployment.

The three target user groups of DD have quite different requirements. Practitioners need easy-to-use software with advanced visualization techniques, strict parameter checking, and hiding of unnecessary technical parameters. Teachers need all model parameters to be visible and the possibility to disable checking of feasible parameter ranges for educational purposes. Researchers don’t usually need an advanced user interface, but rather a possibility to easily extends the methods. Satisfying requirements of the three user groups simultaneously is not easy, and heterogeneity of the DD software development efforts makes it even harder. Furtheron, complexity of the DD platform and its dependency on web services makes deployment infeasible on various situations (e.g. military bases with no internet access).

During the past 20 years, the amount of MCDA applications hasn’t increased substantially [Keen and Sol, 2008]. Although the MCDA community has produced a vast amount of useful methods, they aren’t
supported by *usable* software. Their *use* in practice has been limited by various factors, including difficulty of integrating existing MCDA software with rest of the decision support technology (e.g. simulation models, GIS). I believe, that the open source software developed within DD can help to overcome the problem, but to achieve this, its architecture needs to be harmonized.

I will present the recently developed JSMAA software ([www.smaa.fi](http://www.smaa.fi)) that currently implements two SMAA methods: SMAA-2 and SMAA-TRI. JSMAA has been developed for two applications: drug benefit-risk assessment with SMAA-2 ([Tervonen et al., 2009a](#)) and nanomaterial risk assessment with SMAA-TRI ([Tervonen et al., 2009b](#)). The current version of the software hides some of the model parameters from the user and doesn’t allow preference information (weights) to be input in a form more exact than criteria ranking. This partially fulfills the requirements of practitioners. In order to fulfill requirements of teachers and researchers through DD integration, I provide an adaptor enabling input and output in XMCDA format.

I argue, that DD shouldn’t aim at providing architecture for a general MCDA client, but rather XMCDA for modeling the problems, the algorithmic workflow management with diviz for researchers to explore recommendations of different methods for the same problem, and a visualization component library for composing easily customizable applications for practitioners. Such architecture could eventually bridge the gap from *useful* to *used* through *usable* software.

**References**


Robust ordinal regression methods on Decision Deck platform

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We present an implementation of two MCDA methods on Decision Deck platform. They are based on robust ordinal regression approach which has been recently proposed with the aim of taking into account all sets of parameters compatible with the preference information and, consequently, supplying the decision maker with two kinds of results, necessary and possible. The necessary results specify the most certain recommendations worked out on the basis of all consistent instances of a preference model considered simultaneously, while the possible results identify all possible recommendation which are compatible with the provided exemplary decisions and at least one set of parameters. Such results answer to robustness concerns, since they are in general “more robust” than a recommendation made by an arbitrarily chosen compatible instance of a preference model.

The first robust ordinal regression method proposed and subsequently implemented on D2 platform was UTA<sup>GMS</sup>, further generalized in another approach called GRIP. Both those methods are designed to support multiple criteria ranking problems. The aim of the presentation is to discuss implementation of two further methods which are based on the same approach as UTA<sup>GMS</sup>, but deal either with different kind of problems or use other preference model.

First of the presented methods - UTADIS<sup>GMS</sup> - was developed by analogy to UTA<sup>GMS</sup> to deal with multiple criteria sorting of alternatives. This methodology can be seen as an extension of UTADIS, which builds a set of additive value functions compatible with the preference information that is composed of desired assignments of corresponding reference alternatives to one or several contiguous classes. Using this preference model, two kinds of final assignments are computed: necessary and possible. The necessary assignment specifies the range of classes to which an alternative can be assigned considering all compatible value functions simultaneously, and the possible assignment, refers, in turn, to results which can be obtained considering at least
one compatible value function individually. Furthermore, we proposed a way of selecting *the most representative value function* among the set of compatible ones. This function represents all other compatible value functions, which also do contribute to its definition. It can be used in order to help the DM to understand the robust sorting or, autonomously, in order to supply the DM with the most representative sorting obtained by an example-based procedure driven by the chosen function.

The other presented method is ELECTRE\textsuperscript{GMS}. It permits to assess the set of *outranking relations* compatible with some exemplary pairwise comparisons of few real or fictitious reference alternatives. It is assumed that pairwise comparisons state the truth or falsity of the outranking relation. Further, the method defines the set of concordance indices, cutting levels and veto thresholds compatible with the preference information provided by the DM. On the basis of all compatible outranking models two outranking relations are defined. Whether one alternative necessarily or possibly outranks the other depends on the truth of outranking relation for this pair for all or at least one compatible model, respectively. Finally, the necessary and the possible outranking relations are exploited as usual outranking relations in the context of choice, ranking or sorting problems.

Both methods are implemented with Java plugins and compliant with a set of predefined conventions and formats of second version of Decision Deck platform (1.1). More precisely, discussed plugins are OSGI bundles, i.e., a tightly-coupled, dynamically loadable collection of classes, resources, and configuration files that explicitly declare its properties and external dependencies. They use GLPK (GNU Linear Programming Kit) solver to analyze the consistency of preference information, compute compatible sets of parameters, and necessary and possible results, and the JGraph (Java Graph visualization library) to visualize results and representative functions. Special attention has been paid to the process of eliciting preference information from the decision maker (DM), which, according to the assumptions of the methods, should be intuitive, interactive and iterative.
Object oriented analysis and decomposition into elementary components via XMCDA

Cédric Walck
Olivier Cailloux
Quantin Hayez

We are pleased to present the result of an analytical and software contribution to Decision Deck which has been worked on during the last few months at SMG, CoDE, ULB. The contribution can be presented in three related parts, with each one constituting a goal by itself. The first part aims at creating a tool to programmatically convert between an XMCDA file and a series of objects organized into an object-oriented design called XMCDA-OO. The second one consists in a decomposition of several MCDA methods into elementary components. These two parts combine to provide the last one: implement some well-known MCDA procedures as web-services for use by the Decision Deck community. In technical terms, the first part provides a library permitting to transform the data contained into a file into an equivalent representation in memory, a process technically known as deserialization, and doing the reverse operation, namely storing objects into a file (conforming to the XMCDA standard), i.e., serialize the data. An object oriented analysis has been done in order to convert a part of the XMCDA structure, which is appropriate for flat-file format storing, to an object-oriented design appropriate for direct programmatic data manipulation in an object-oriented language. Once this design was done, the technical aspect about (de)serialization was realized using the Java programming language. Although our library currently focuses on selected key MCDA concepts that we use for the other parts of the work, our goal is to present and possibly validate the approach itself, opening the path to a more complete library implementation and hopefully implementations in other languages. We think that such a tool could reveal highly valuable to help programmers in the Decision Deck community implement web services of their choice. The second part emerges from the observation that some well-known MCDA procedures share several computation routines. For example, the concordance matrix computation can be found in several Electre procedures, and is easily generalized
to form only one general (and parametrized) concordance computation block. We thus decomposed four MCDA procedures into elementary components, thereafter called “bricks”: Promethee, Electre-I, II, and III. The purpose is to create an elementary components base (with a limited number of components) in order to build any MCDA procedure with an appropriate bricks assembly. An object-oriented analysis was made to know how to implement and to concatenate them (for this the results of a previous work have been reused [Simsek (2006)]. Each brick processes data it receives and gives a result, which can be used by the next brick in turn... The implementation was realized using the Java programming language. Once again, although our work deals with the Promethee and Electre procedures, we wish to present the conceptual approach and encourage discussion about its validity and the appropriateness to extend it to other MCDA procedures. These two parts are used to achieve our final goal: to develop new web services implementing the Promethee and Electre procedures. Thanks to the use of the two previously developed tools, this step is very easy to realize, thereby illustrating in our opinion how useful such general tools, fully implemented, would be to the Decision Deck community. The deserialization, i.e., the extraction of the data from the input XMCDA file takes place through the library, this data being then fed to the different bricks in order to realize, e.g., the Promethee procedure, or the part of it that interests the user. It is then only a matter of configuration to provide a full web service implementing an MCDA procedure by using the Diviz software aggregation functionality.

References

Inverse analysis of an outranking relation and presentation of a new web service

T. Veneziano, R. Bisdorff, P. Meyer
We developed a new web service for assessing robust criteria significance weights of a multiple criteria decision problem. We show that, knowing the pairwise outranking statements (given by the decision maker), we can compute numerical significance weights taking into account some robustness properties. We present the web service in action within the diviz software.

Use of the XMCDA format to describe a multicriteria evaluation process to localize a wind park in Corsica: feedback.

Marie-Laure NIVET*, Christophe PAOLI*, Pascal OBERTI**
University of Corsica
* CNRS UMR 6134 SPE
** CNRS UMR 6240 LISA
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The proposed presentation will be organized as follow. First, we will describe a multicriteria evaluation process to localize a wind park in Corsica. Then, we will present its translation into the XMCDA format. Finally we will present the encountered difficulties and we will discuss some perspectives.
Some decision support systems and methods with applications in production and logistics

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abstract

Based on our previous research in past years, we present different decision support systems for the solution of combinatorial optimization problems with applications in production and logistics. Important problem areas are machine scheduling and vehicle routing. Both problems involve multiple objectives, and must be solved on a recurring basis combining optimization and decision making. In each case, solutions are presented to the decision maker both in outcome and alternative space. Then, preference information may be articulated and gathered, leading to the choice of a most-preferred solution or the adaptation of the computed alternative.

Introduction

Multi-objective optimization with applications in combinatorial optimization presents a challenging field of research. Practical applications can be found in logistics, where scheduling, routing, and similar (planning) problems must be solved on a recurring basis. Such problems are twofold. One one hand, efficient solutions must be found by some optimization approach. On the other hand, a most-preferred alternative among the elements of the Pareto-set must be chosen. We present and study different approaches for different applications, each implemented in a running decision support system.
Contributions

MOOPPS: A Multi Objective Production and Project Planning System

MOOPPS is a decision support system for the solution of multi-objective machine and project scheduling problems. It implements a set of different local search approaches, including hillclimbing and evolutionary algorithms, and allows for the configuration (parametrization) of user-defined heuristics.

Figure 1: Screenshot of MOOPPS

Solutions are computed off-line, and presented to the decision maker involving plots in outcome space. An interactive decision making procedure based on the Aspiration Interactive Method allows for an identification of a most-preferred solution. Figure 1 shows the user interface of the system.
Interactive multi-objective vehicle routing

An interactive decision support system is presented for the case of multi objective vehicle routing problems. Figure 2 presents two screen-shots, each showing a different (extreme) solution of a particular problem.

Figure 2: Screenshots of the vehicle routing decision support system

Interaction with the system is permitted by changing weight settings for the objectives, forcing the heuristic search algorithm to adopt the solution to the changed preference information in real-time. While search terminates with the identification of a most-preferred solution, this enables the decision maker to actively influence the construction of the solutions in a chosen direction.
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Notes
Notes
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Le dossier est un document réalisé sur word et imprimé en couleurs. Les coordonnées (service émetteur, date, contributeur) sont en Arial regular corps 10, les titres sont en Arial bold corps 14, le texte courant est en Arial regular corps 12 (recommandé).

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