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Ngoc Thanh Nguyen · Ryszard Kowalczyk
Jacek Mercik (Eds.)

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Transactions on Computational Collective Intelligence XXVII

Preface

It is my pleasure to present to you the XXVII volume of LNCS *Transactions on Computational Collective Intelligence*. In Autumn 2016 (November 25) at the WSB University in Wroclaw, Poland, there was the second seminar on "Quantitative Methods of Group Decision-Making." Thanks to WSB University in Wroclaw, we had an excellent opportunity to organize and financially support the seminar. This volume presents post-seminar papers of participants to this seminar. During the seminar, we listened to and discussed over 18 presentations from 15 universities. The XXVII issue of TCCI contains 13 high-quality, carefully reviewed papers.

The first paper "Kalai–Smorodinsky Balances for n-Tuples of Interfering Elements" by David Carfi, Alessia Donato, and Gianfranco Gambarelli is devoted[1] to studying a mathematical game model providing optimal Kalai–Smorodinsky compromise solution n-tuples, whose components indicate active principle quantities, in a specific non-linear interfering scenario, with n possible interacting elements. The problem was solved by using the Carfı's pay-off analysis method for differentiable pay-off functions and implementing the Matlab algorithms for the construction and representation of the pay-off spaces and for the finding of Kalai–Smorodinsky solutions. The core section of the paper studies the game in the n-dimensional case, by finding the critical zone of the game in its Cartesian form together with proof of a theorem and a lemma about the Jacobian determinant of the n-game. In a particular highly symmetrical case, the analytical solution of the Kalai–Smorodinsky compromise problem is presented too.

In the second paper entitled "Reason vs. Rationality: From Rankings to Tournaments in Individual Choice" by Janusz Kacprzyk, Hannu Nurmi, and Slawomir Zadrozny, one may find the standard assumption in decision theory, microeconomics, and social choice that individuals (consumers, voters) are endowed with preferences that can be expressed as complete and transitive binary relations over alternatives (bundles of goods, policies, candidates). While this may often be the case, the authors show by way of toy examples that incomplete and intransitive preference relations are not only conceivable, but make intuitive sense and they suggest that fuzzy preference relations and solution concepts based on them are plausible in accommodating those features that give rise to intransitive and incomplete preferences.

In the third paper, "A Note on Positions and Power of Players in Multicameral Voting Games," Marcin Malawski presents a study of a multicameral simple game as an intersection of a number of simple games played by the same set of players: A coalition is winning in the multicameral game if and only if it is winning in all the individual games played. Examples include decision rules in multicameral parliaments where a bill must be passed in all the houses of the parliament, and voting rules in the European

[1] Hereafter description of the papers are directly taken from summaries prepared by their authors.

Union Council where a winning coalition of countries must satisfy two or three independent criteria. The presented paper is a preliminary study of relations between the positions and power indices of players in the "chamber" games and in the multicameral game obtained as the intersection. The author demonstrates that for any power index satisfying a number of standard properties, the index of a player in the multicameral game can be smaller (or greater) than in all the chamber games; this can occur even when the players are ordered the same way by desirability relations in all the chamber games. He also observes some counterintuitive effects when comparing the positions and decisiveness of players. However, as expected, introducing an additional chamber with all the players equal (a one man–one vote majority game) to a complete simple game reduces all the differences between the Shapley–Shubik indices of players.

The fourth paper "On Ordering a Set of Degressively Proportional Apportionments" by Katarzyna Cegielka, Piotr Dniestrzanski, Janusz Lyko, Arkadiusz Maciuk, and Radoslaw Rudek proposes a solution to the most important problem in a practical implementation of degressive proportionality, namely, its ambiguity. They introduce an order relation on a set of degressively proportional allocations. Its main idea is to define greater allocations such that emerge from others after transferring a certain quantity of goods from smaller to greater entities contending in distribution. Thus, maximal elements in this ordering are indicated as the sought-after solution sanctioning boundary conditions as the only reason for moving away from the fundamental principle of proportionality. In case of several maximal elements, the choice of one allocation remains an open issue, but the cardinality of the set from which they make a choice can be reduced significantly. In the best-known example of application of degressive proportionality, which is the apportionment of seats in the European Parliament, the considered set contains a maximal element. Thereby, there exits an allocation that is nearest to the proportional distribution with respect to transfer relation.

In the fifth paper entitled "Preorders in Simple Games," Josep Freixas and Montserrat Pons consider a hierarchy among players in a simple game with total preorder given by any power index. The desirability relation, which is also a preorder, induces the same hierarchy as the Banzhaf and the Shapley indices on linear games, i.e., games in which the desirability relation is total. The desirability relation is a sub-preorder of another preorder, the weak desirability relation, and the class of weakly linear games, i.e., games for which the weak desirability relation is total, is larger than the class of linear games. The weak desirability relation induces the same hierarchy as the Banzhaf and the Shapley indices on weakly linear games. They define a chain of preorders between the desirability and the weak desirability preorders. From them they obtain new classes of totally preordered games between linear and weakly linear games.

In the sixth paper "Sub-coalitional Approach to Values," Izabella Stach analyzes the behavioral models of classic values (like the Shapley and Banzhaf values) by considering the contributions to coalition S as contributions delivered by the players individually joining such a coalition as it is being formed; i.e., $v(S) - v(S\backslash\{i\})$. In this paper, she proposes another approach to values where these contributions are considered as given by sets of players: $(v(S) - v(S\backslash R))$, where S, R are subsets of the set of all players involved in cooperative game v. Based on this new approach, several sub-coalitional values are proposed, and some properties of these values are shown.

In the seventh paper entitled "The Effect of Brexit on the Balance of Power in the European Union Council: An Approach Based on Precoalitions," Jacek Mercik and David M. Ramsey investigate the change in the balance of power in the European Union Council due to the United Kingdom leaving. This analysis is based on the concept of power indices in voting games where natural coalitions, called precoalitions, may occur between various players (or parties). The precoalitions in these games are assumed to be formed around the six largest member states (after Brexit, the five largest), where each of the remaining member states joins the precoalition based around the large member state which is the most similar according to the subject of the vote. They consider adaptations of three classic indices: the Shapley–Shubik, Banzhaf–Penrose, and Johnston indices based on the concept of a consistent share function (also called quotient index). This approach can be interpreted as a two-level process of distributing power. At the upper level, power is distributed among precoalitions. At the lower level, power is distributed amongst the members of each precoalition. One of the conclusions of the research is that removing the UK from the voting game means that the power indices of small countries actually decrease. This seems somewhat surprising as the voting procedure in the EU council was designed to be robust to changes in the number and size of member states. This conclusion does not correspond to a general result, but does indicate the difficulty of defining voting rules which are robust to changes in the set of players.

The eighth paper entitled "Comparison of Voting Methods Used in Some Classical Music Competitions" by Honorata Sosnowska is devoted to a comparison of the rules of voting in the last two main Polish classical music competitions: the XVIIth Chopin Piano Competition and the XVth Wieniawski Violin Competition. Weak and strong points of rules are analyzed. The rules are also compared with rules used in the previous editions of the competitions. The author concludes that the changes resulted in the simplification of rules.

In the ninth paper "Determinants of the Perception of Opportunity" by Aleksandra Sus, the determinants of the perception of opportunity are analyzed. Contemporary strategic management has accepted the category of opportunity, although it cannot be reflected in the organization's plans and strategies. Alertness, proactivity, social networks, and knowledge resources are the categories that come up most often when discussing opportunity perception as one of the determinants of entrepreneurial activity. In reality, they are the result of both behavioral and cognitive processes. The purpose of the article is to identify the primary factors that predetermine the idiosyncrasy of how opportunity is perceived by various persons, such as creativity, intuition, and divergent thinking. The article presents opportunity value chains. The article also discusses the process of group decision-making in terms of opportunity.

The tenth paper entitled "Free-Riding in Common Facility Sharing" is authored by Federica Briata and Vito Fragnelli. The paper deals with the free-riding situations that may arise from sharing maintenance costs of a facility among its potential users. The non-users may ask for a check to assess who the users are, but they have to pay the related cost; consequently, a non-user may not ask for the check, with the hope that the other non-users ask and pay for it. In this paper, they provide incentives for asking for the check, without suffering a higher cost.

The 11th paper is the joint work of Natalie van der Wal, Daniel Formolo, Mark A. Robinson, Michael Minkov, and Tibor Bosse. The paper is entitled "Simulating Crowd

Evacuation with Sociocultural, Cognitive, and Emotional Elements." In this research, the effects of culture, cognitions, and emotions on crisis management and prevention are analyzed. An agent-based crowd evacuation simulation model was created, named IMPACT, to study the evacuation process from a transport hub. To extend previous research, various sociocultural, cognitive, and emotional factors were modeled, including: language, gender, familiarity with the environment, emotional contagion, prosocial behavior, falls, group decision-making, and compliance. The IMPACT model was validated against data from an evacuation drill using the existing EXODUS evacuation model. Results show that on all measures, the IMPACT model is within or close to the prescribed boundaries, thereby establishing its validity. Structured simulations with the validated model revealed important findings, including: the effect of doors as bottlenecks, social contagion speeding up evacuation time, falling behavior not affecting evacuation time significantly, and traveling in groups being more beneficial for evacuation time than traveling alone.

The 12th paper "Group Approximation of Task Duration and Time Buffers in Scrum" is written by Barbara Gładysz and Andrzej Pawlicki. Expansion of modern IT technologies, which took place in the past few years, caused a significant increase in software projects. These projects are quite often complex ventures burdened with high risk. Nowadays, a large number of software projects is managed using the Scrum framework. In Scrum, where people form self-organizing team, group decisions became an essential element of the project, which plays an important role in creating time approximation or in managing potential risks. This paper focuses on group decisions, temporal aspects of estimation, and risk management in the Scrum project. In the article they present a conceptual model of the extension of the Scrum framework by risk management processes and project time estimation. The proposed model contains time buffers based on mixture probability distribution, which improve the Scrum framework in terms of group estimation.

Traditionally, the last paper is an invited paper, and in this volume it is entitled "Extending Estimation of Distribution Algorithms with Agent-based Computing Inspirations" authored by Aleksander Byrski, Marek Kisiel-Dorohinicki, and Norbert Tusinski. In their paper, several extensions of a successful EDA-type algorithm, namely, COMMAop, inspired by the paradigm of agent-based computing (EMAS) are presented. The proposed algorithms leveraging notions connected with EMAS, such as reproduction and death, or even the population decomposition, turn out to be better than the original algorithm. The evidence for this is presented at the end of the paper, utilizing QAP problems by Eric Taillard as benchmarks.

I would like to thank all the authors for their valuable contributions to this issue and all reviewers for their feedback, which helped to keep the papers of high quality. My very special thanks go to Prof. Ngoc-Thanh Nguyen, who encouraged us to prepare this volume, and to Dr. Bernadetta Maleszka, who helped us publish this issues in due time and in good order.

May 2017 Jacek Mercik

Transactions on Computational Collective Intelligence

This Springer journal focuses on research in applications of the computer-based methods of computational collective intelligence (CCI) and their applications in a wide range of fields such as the Semantic Web, social networks, and multi-agent systems. It aims to provide a forum for the presentation of scientific research and technological achievements accomplished by the international community.

The topics addressed by this journal include all solutions to real-life problems for which it is necessary to use computational collective intelligence technologies to achieve effective results. The emphasis of the papers published is on novel and original research and technological advancements. Special features on specific topics are welcome.

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