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Preface

This proceedings volume contains the accepted papers and invited talks presented at the 4th International Workshop of Efficient and Experimental Algorithms (WEA 2005), that was held May 10–13, on Santorini Island, Greece.

The WEA events are intended to be an international forum for research on the design, analysis and especially the experimental implementation, evaluation and engineering of algorithms, as well as on combinatorial optimization and its applications.

The first three workshops in this series were held in Riga (2001), Monte Verita (2003) and Rio de Janeiro (2004).

This volume contains 3 invited papers related to corresponding keynote talks: by Prof. Christos Papadimitriou (University of California at Berkeley, USA), Prof. David Bader (University of New Mexico, USA) and Prof. Celso Ribeiro (University of Rio de Janeiro, Brazil).

This proceedings includes 54 papers (47 regular and 7 short), selected out of a record number of 176 submissions. Each paper was reviewed by at least 2 Program Committee members, while many papers got 3 or 4 reviews. A total number of 419 reviews were solicited, with the help of trusted external referees.

In addition to the 54 papers included in this volume, 6 papers were accepted as poster presentations: these papers were published in a separate poster proceedings volume by CTI Press and a major publisher in Greece, “Ellinika Grammata.” The presentation of these posters at the event was expected to create a fruitful discussion on interesting ideas.

The 60 papers accepted to WEA 2005 demonstrate the international character of the event: 33 authors are based in Germany, 20 in the USA, 13 in Italy, 12 in Greece, 9 each in Switzerland, France and Brazil, 6 each in Canada, Poland and Belgium, 5 in the Netherlands, to list just the countries with the largest participations.

Selected papers of WEA 2005 will be considered for a Special Issue of the ACM Journal on Experimental Algorithmics (JEA, <http://www.jea.acm.org/>) dedicated to the event.

We would like to thank all authors who submitted papers to WEA 2005. We especially thank the distinguished invited speakers (whose participation honors the event a lot), and the members of the Program Committee, as well as the external referees and the Organizing Committee members.

We would like to thank the Ministry of National Education and Religious Affairs of Greece for its financial support of the event. Also, we gratefully acknowledge the support from the Research Academic Computer Technology Institute (RACTI, Greece, <http://www.cti.gr>), and the European Union (EU) IST/FET (Future and Emerging Technologies) R&D projects FLAGS (Foundational As-

pects of Global Computing Systems) and DELIS (Dynamically Evolving, Large-Scale Information Systems).

I wish to personally acknowledge the great job of the WEA 2005 Publicity Chair Dr. Ioannis Chatzigiannakis, and Athanasios Kinalis for maintaining the Web page and processing this volume with efficiency and professionalism.

I am grateful to the WEA Steering Committee Chairs Prof. Jose Rolim and Prof. Klaus Jansen for their trust and support.

Finally, we wish to thank Springer Lecture Notes in Computer Science (LNCS), and in particular Alfred Hofmann and his team, for a very nice and efficient co-operation in preparing this volume.

May 2005

Sotiris Nikoletseas

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Τα Παιδιά Παίζει

The Interaction Between Algorithms and Game Theory*

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The theories of algorithms and games were arguably born within a year of each other, in the wake of two quite distinct breakthroughs by John von Neumann, in the former case to investigate the great opportunities – as well as the ever mysterious obstacles – in attacking problems by computers, in the latter to model and study rational selfish behavior in the context of interaction, competition and cooperation. For more than half a century the two fields advanced as gloriously as they did separately. There was, of course, a tradition of computational considerations in equilibria initiated by Scarf [13], work on computing Nash and other equilibria [6, 7], and reciprocal isolated works by algorithms researchers [8], as well as two important points of contact between the two fields *à propos* the issues of repeated games and bounded rationality [15] and learning in games [2]. But the current intensive interaction and cross-fertilization between the two disciplines, and the creation of a solid and growing body of work at their interface, must be seen as *a direct consequence of the Internet*.

By enabling rapid, well-informed interactions between selfish agents (as well as by being itself the result of such interactions), and by creating new kinds of markets (besides being one itself), the Internet challenged economists, and especially game theorists, in new ways. At the other bank, computer scientists were faced for the first time with a mysterious artifact that was not designed, but had emerged in complex, unanticipated ways, and had to be approached with the same puzzled humility with which other sciences approach the cell, the universe, the brain, the market. Many of us turned to Game Theory for enlightenment.

The new era of research in the interface between Algorithms and Game Theory is rich, active, exciting, and fantastically diverse. Still, one can discern in it three important research directions: *Algorithmic mechanism design*, *the price of anarchy*, and *algorithms for equilibria*.

If mainstream Game Theory models rational behavior in competitive settings, *Mechanism Design* (or *Reverse Game Theory*, as it is sometimes called) seeks to create games (auctions, for example) in which selfish players will behave in ways conforming to the designers objectives. This modern but already

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