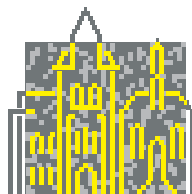


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(Editors)

Algorithmic Game Theory and the Internet

Dagstuhl Seminar 03291 – July 13 to July 18, 2003
Dagstuhl-Seminar-Report No. 386



SCHLOSS DAGSTUHL

INTERNATIONALES
BEGEGNUNGS-
UND FORSCHUNGSZENTRUM
FÜR INFORMATIK

ISSN 0940-1121

Herausgegeben von IBFI gem. GmbH, Schloss Dagstuhl, 66687 Wadern, Germany.

Das Internationale Begegnungs- und Forschungszentrum für Informatik (IBFI) Schloss Dagstuhl ist eine gemeinnützige GmbH. Sie veranstaltet regelmäßig wissenschaftliche Seminare, welche nach Antrag der Tagungsleiter und Begutachtung durch das wissenschaftliche Direktorium mit persönlich eingeladenen Gästen durchgeführt werden.

Gesellschafter:

- Gesellschaft für Informatik e.V. – Bonn
- TH Darmstadt
- Universität Frankfurt
- Universität Kaiserslautern
- Universität Karlsruhe
- Universität Stuttgart
- Universität Trier
- Universität des Saarlandes

Summary

The seminar was devoted to the most important recent developments in the area of the Algorithmic Game Theory connected to the problems arising from, and motivated by, the Internet and other *decentralized* computer networks. The most defining characteristic of the Internet is that it was not designed by a single central entity, but emerged from the complex interaction of many economic agents, such as network operators, service providers, designers, users, etc., in varying degrees of collaboration and competition. The major questions that arise in that context are in analysis of its performance and in evaluation of its long term equilibria. They include all sorts of completely new questions that lie on the interface of the fields of networks, algorithms and game theory.

The focus of the workshop was on the following specific topics:

- *design of efficient algorithms for game theoretic problems connected to the Internet,*
- *inherent complexity of game theoretic problems,*
- *resource allocation and stability,*
- *Nash equilibria,*
- *market equilibria,*
- *mechanism design,*
- *economic aspects of the Internet,*
- *combinatorial auctions and*
- *cost allocations, network design.*

Some new broadly applicable techniques have emerged recently in the above areas and the workshop has addressed those developments and new fundamental insights. The workshop has also addressed and formulated important open problems of the area and identified most challenging research directions for the future.

The 47 participants of the workshop came from various research areas connected to the main topic of the workshop. The 31 lectures delivered at the workshop covered wide body of recent research in the area. In addition, a special evening session was devoted to presentation of open problems.

The meeting was held in a very pleasant and stimulating atmosphere. Thanks to everyone who made it a very interesting and enjoyable event!

Program

Monday, July 14th, 2003

09:00 – 09:10 Opening

Chair:

Marek Karpinski

9:10 – 9:40 Nikhil R. Devanur (Georgia Institute of Technology)

Market Equilibrium: Algorithms for the Linear Case

9:40 – 10:10 Vijay Vazirani (Georgia Institute of Technology)

Market Equilibrium when Buyers have Spending Constraints

10:10 – 10:40 Steven Low (CalTech – Pasadena)

Duality and Stability Models of Internet Congestion Control

Chair:

Vijay Vazirani

11:00 – 11:30 Daniel Lehmann (University of Jerusalem)

Equilibria in Exchange Economies

11:30 – 12:00 Rudolf Müller (Maastricht University)

On the Complexity of Auctions

Chair:

Daniel Lehmann

15:00 – 15:30 Yoav Shoham (Stanford)

On the non-comparable paranoias of game theory and cryptography

15:30 – 16:00 Subhash Suri (University of California at Santa Barbara)

Nash Equilibrium Load Balancing

Chair:

Mark Jerrum

16:30 – 17:00 Rahul Sami (Yale University)

Computation in a Distributed Information Market

17:00 – 17:30 Artur Czumaj (New Jersey Inst. of Technology)

Worst-Case Equilibria for Server Farms

Tuesday, July 15th, 2003

Chair:

Martin Dyer

09:00 – 09:30 Christos Papadimitriou (Berkeley)

Nash Equilibria and Complexity

09:30 – 10:00 Milena Mihail (Georgia Institute of Technology)

Algorithmic Performance on Power Law Graphs

10:00 – 10:30 Elias Koutsoupas (University of California at Los Angeles)

Coordination Mechanisms

Chair:

Michael Paterson

11:00 – 11:30 Rica Gonen (University of Jerusalem)

Incentive Compatible Multi-Unit Combinatorial Auctions

11:30 – 12:00 Piotr Krysta (MPI für Informatik)

Computing Equilibria for Congestion Games

Chair:

Elias Koutsoupas

15:00 – 15:30 Jason Hartline

Profit Maximizing Envy-Free Auctions

15:30 – 16:00 Bernhard von Stengel (London School of Economics)

Hard-To-Solve Bimatrix Games

Chair:

Leonard J. Schulman

16:30 – 17:00 Amitabh Sinha (CMU – Pittsburgh)

Min-max Payoffs of a Location Game

17:00 – 17:30 Aaron Archer (Cornell University)

Approximate Truthful Mechanisms for a Combinatorial Auction

Wednesday July 16th, 2003

Chair: Noam Nisan

09:00 – 09:30 Eva Tardos (Cornell University)

Network Design Games

09:30 – 10:00 Amir Ronen (Technion – Haifa)

Optimal Auctions – A Theoretical Computer Science-based Approach

10:00 – 10:30 Tim Roughgarden (Cornell University)

Pricing Networks with Selfish Routing

Chair: Eva Tardos

11:30 – 12:00 Sven de Vries (TU München)

On Ascending Vickrey Auctions for Heterogeneous Objects

20:00 Evening Session

Chair: Vijay Vazirani

Thursday July 17th, 2003

Chair:

Christos Papadimitriou

09:00 – 09:30 Noam Nisan (University of Jerusalem)

*Characterization of truthful combinatorial auctions I :
Are there non-VCG mechanisms ?*

09:30 – 10:00 Ahuva Mu'alem (University of Jerusalem)

*Characterization of truthful combinatorial auctions II:
Truthfulness, monotonicity, and IIA*

10:00 – 10:30 Ron Lavi (University of Jerusalem)

*Characterization of truthful combinatorial auctions III:
Proof of main theorem*

Chair:

Rica Gonen

11:00 – 11:30 Leonard J. Schulman (Caltech)

Router Congestion Control

11:30 – 12:00 Eric Friedman (Cornell University)

Fairness and Stability of Sharing Protocols for the Unlicensed Bands

Chair:

Sven de Vries

15:00 – 15:30 Meir Bing (University of Jerusalem)

Representing Substitutes Valuation

15:30 – 16:00 Anupam Gupta (Carnegie Mellon University)

Approximation Algorithms via Cost Sharing

Friday July 18th, 2003

Chair:

Miklos Santha

09:00 – 09:30 Michel de Rougemont (Universite Paris Sud)

Definable Strategies in Games

09:30 – 10:00 Petra Berenbrink (Simon Fraser University)

Utilitarian Resource Assignment

Participants

- Archer, Aaron (Cornell University)
- Berenbrink, Petra (Simon Fraser University – Burnaby)
- Bing, Meir (The Hebrew University of Jerusalem)
- Blum, Norbert (Universität Bonn)
- Czumaj, Artur (NJIT – Newark)
- de Rougemont, Michel (Université Paris Sud)
- de Vries, Sven (TU München)
- Devanur, Nikhil R. (Georgia Institute of Technology)
- Dyer, Martin (University of Leeds)
- Fleischer, Lisa K. (IBM TJ Watson Research Center)
- Friedman, Eric (Cornell University)
- Gonen, Rica (The Hebrew University of Jerusalem)
- Gupta, Anupam (Carnegie Mellon University – Pittsburgh)
- Hartline, Jason D. (Microsoft Research – Mountain View)
- Hauptmann, Mathias (Universität Bonn)
- Jerrum, Mark (University of Edinburgh)
- Karpinski, Marek (Universität Bonn)
- Koutsoupias, Elias (National and Capodistrian University of Athens)
- Krysta, Piotr (TU Dortmund)
- Lavi, Ron (Hebrew University)
- Lehmann, Daniel (The Hebrew University of Jerusalem)
- Low, Steven (CalTech – Pasadena)
- Mihail, Milena (Georgia Institute of Technology)
- Mu’alem, Ahuva (Hebrew University)
- Müller, Rudolf (Maastricht University)
- Nekrich, Jakov (Universität Bonn)
- Nisan, Noam (The Hebrew University of Jerusalem)
- Papadimitriou, Christos H. (University of California – Berkeley)
- Paterson, Michael (University of Warwick)
- Ronen, Amir (Technion – Haifa)
- Roughgarden, Tim (Stanford University)
- Sami, Rahul (Yale University)

- Santha, Miklos (Université Paris Sud)
- Schulman, Leonard J. (Caltech)
- Shoham, Yoav (Stanford University)
- Sinha, Amitabh (Carnegie Mellon University – Pittsburgh)
- Suri, Subhash (University of California – Santa Barbara)
- Tardos, Eva (Cornell University – Ithaca)
- Vazirani, Vijay V. (Georgia Institute of Technology)
- Vöcking, Berthold (RWTH Aachen)
- von Stengel, Bernhard (London School of Economics)
- Wegner, Peter (Universität Bonn)