LOCAL PROCEEDINGS of the

14th International Conference on

Computer Systems
and Technologies

CompSysTech'13

Ruse, Bulgaria, June 28-29, 2013

Editors

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Computer Systems and Technologies, *CompSysTech 2013*
LOCAL PROCEEDINGS of the 14th International Conference on Computer Systems and Technologies
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Papers included in these Proceedings were triple reviewed by independent referees.

The International Conference on Computer Systems and Technologies - *CompSysTech'13*, 28-29 June 2013, took place at Ruse University in Ruse, Bulgaria. This Conference is a well known International event in Computing in Europe.

PREFACE

CompSysTech'13 is the Fourteenth Bulgarian International Computer Science and Technologies Conference, organized by the Association for Computing Machinery, N.Y., USA, via its Bulgarian Chapter – **acmbul** in association with the Bulgarian Academic Society of Computer Systems and Information Technologies and the Bulgarian Union of Automation&Informatics This Conference is the 26th **acmbul** event during the last 23 years and it is the first Bulgarian Conference in Computing.

This year the ***CompSysTech'13*** Conference celebrates 110 years from the birth day of John Atanasoff, famous computer inventor. According to this, a special speech was explained at the opening ceremony of the conference. It is:

"*JOHN ATANASOFF 110 YEARS FROM THE BIRTH*" by Blagovest Sendov.

Many thanks are due to all Programme Committee Members for the huge and very strong work again. Over 90 papers were submitted to the PC. The experts in computing, from 28 countries, wrote more than 310 reviews.

The Conference included 2 keynote talks, 1 industrial paper and 49 research papers. Forty-two of the research papers as well as papers with the keynote talks and industrial paper are included in ACM ICPS Vol. 767. The remaining 7 papers, which ranked after the first 42, are included here.

The Conference topics include the following fields of the latest achievements in Computing:

- Operating Systems and Computer Networks:
- Hardware Design and Modelling
- Image Processing and Computer Vision
- Software Engineering
- Web Services, Cloud Computing and Distributed Systems
- Language Processing and Computer Linguistics
- Data Encoding and Cryptography
- Educational Aspects of Computer Systems and Technologies (e-Learning)

An additional session "the youth and the ICT" was organized this year too.

A special ***CompSysTech'13*** PC Jury selected the best Papers for each session. The results are given in the ACM ICPS Vol. 767.

Over 120 participants from many countries around the world had the chance to get acquainted and exchange ideas on the topics concerned, as well as on some of the latest advancements in Computing.

Special thanks should be extended to the Local Organizing Committee and to all sponsors of ***CompSysTech'13***.

Many thanks are also due to the ***CompSysTech'13*** LOCAL PROCEEDINGS Publisher University of Ruse.

Finally, thanks are also due to the ***CompSysTech'13*** PC Technical Secretary Yordan Kalmukov, ***CompSysTech'13*** Submission&Review System Developer and Administrator, Irena Valova, Technical Support&Advice and UAI staff, especially Eugenia Dimitrova, who helped with the organization, and of course to all presenters, authors and participants who took the trouble to prepare papers for inclusion in these proceedings.

Boris Rachev   Todor Stoilov
Angel Smrikarov   PC Co-Chair
Editors

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WELCOME

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Dear Member of Academy Sendov
Dear Guests, Dear Colleagues,

It is my pleasure to WELCOME you, some of you for a second time, to our city and to our university!

We highly appreciate the efforts of the Academic Society in Computing, of which the Department of Computer Systems and Technologies in Ruse is a member, to have an active scientific life. The national and international projects of the society are fully supported by the management of the University of Ruse.

It is our pleasure and honour to host the *CompSysTech* International Conference for the fifth time. Although this is only the 14th edition of this conference, it is already well known not only in Bulgaria, but in Europe too. The fact that today in this hall there are scientists from 17 countries, is an eloquent evidence for this. Another evidence for the attractive power and the level of the conference is the fact that for the last 6 years the *CompSysTech* papers have been published in the Digital Library of the Association of Computing Machinery, the most prestigious organization if the field of Computing, and are indexed by SCOPUS.

I wish all participants in the conference successful presentations, beneficial contacts and a pleasant stay in our beautiful Danube city.

Hristo Beloev
Rector

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The *CompSysTech'13* International Conference is organized by the **Academic Society of Computer Systems and Information Technology** and by the **Association for Computing Machinery,** N.Y., USA via its Bulgarian Chapter **– acmbul.**

The *CompSysTech'13* is held under the patronage of:

o   Bulgarian Ministry of Education, Youth and Science;
o   Bulgarian Academy of Sciences (BAS);
o   John Atanasoff Society of Automatics and Informatics;
o   Bulgarian Chapter of IEEE Computer Society;
o   Bulgarian Chapter of IEEE Communications Society.

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