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Search Based Software Engineering

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Preface

Message from the SSBSE 2016 General Chair

In its eight edition, the conference was organized, for the first time, in North America. USA was proudly selected to host the event at Raleigh in North Carolina as a co-located event with ICMSE 2016. The decision to organize the event in USA was based on the great success of the first North American SBSE symposium (NasBASE15) organized by my research group in Detroit and mainly in recognition of the growing SBSE community in North America and different other locations around the world. SSBSE emphasized and introduced different originalities to the event. We organized, for the first time, a panel about SBSE support for blind and visually impaired programmers. We used a double-blind submission and review process providing a fair and relevant evaluation of the papers submitted to the conference. We attracted several sponsorship grants to support the conference from the National Science Foundation, the University of Michigan-Dearborn, etc. The program of the conference included full and short papers for the different tracks (technical, challenge, graduate students). The conference also attracted top keynote speakers from the computational search area including Carlos Coello Coello, Yew-Soon Ong, and Patrick Reed.

This great event would not have been possible without the tremndous help of many people, to whom I would like to express my gratitude. First, I would like to thank our program chairs, Federica Sarro (University College London, UK) and Kalyanmoy Deb (Michigan State University, USA). They led the review process with great dedication to every detail and made a huge effort to provide an outstanding and very high quality scientific program. I extend this recognition to all members of our Program Committee, for the dedicated work in the review and selection process of our papers. Next, I thank our graduate student track chairs, Ali Ouni (Osaka University, Japan) and Thelma Elita Colanzi Lopes (State University of Maringa, Brazil), and our SBSE challenge track chairs, Leandro Minku (University of Leicester, UK) and Tanja Vos (Polytechnical University of Valencia, Spain), for their hard work in organizing these two special tracks. I would also like to give special thanks to Wiem Mkaouer (University of Michigan, USA), our Web chair, for accepting the important challenge of creating and maintaining our website. Also, I thank our publicity chair, Yuanyuan Zhang (University College London, UK), for the important job of advertising our event. Finally, I also thank the SSBSE Steering Committee, chaired by Gordon Fraser (University of Sheffield, UK), for their vote of confidence in giving us the privilege of organizing SSBSE 2016. I must also mention and thank our long list of sponsors, who believed in our proposal and had confidence in me and in the field of SBSE. Without their support, SSBSE 2016 would not have been nearly so special. I hope you enjoy reading these proceedings as much as I enjoyed organizing the event.

August 2016 Marouane Kessentini

Message from the SSBSE 2016 Program Chairs

On behalf of the SSBSE 2016 Program Committee, we are pleased to present the proceedings of the 8th International Symposium on Search Based Software Engineering.

This year SSBSE was hosted in North America for the first time, continuing to bring together international researchers to exchange and discuss ideas and to celebrate the latest progress in this rapidly advancing field.

It was a privilege for us to serve as program chairs and we believe that the quality of the program reflects the excellent efforts of the authors, reviewers, keynote speakers, panel presenters, and organizers.

First and foremost we are grateful for the widespread participation and support from the SBSE community. This year, SSBSE attracted a high number of submissions (48 for all tracks) from 20 different countries, namely: UK (25 authors), Brazil (23 authors), USA (14 authors), Italy (11 authors), China (9 authors), India (6 authors), Spain (5 authors), Germany, Iran, Ireland, and Korea (4 authors), Austria (3 authors), Belgium, Canada, France, and Lebanon (2 authors), as well as Algeria, Denmark, Norway, and Poland (1 author).

We would like to thank all the authors for their high-quality contributions. Specifically, we received: 25 research papers, nine short papers, seven graduate student papers, and seven challenge papers. Given the success of the double-blind review procedure introduced for the first time in 2014 for the research track, this year we maintained it for all the tracks but the challenge track. Each submission was reviewed by at least three Program Committee members and followed by an on-line discussion. At the end of the review process, 13 papers were accepted to the research track, four papers were accepted to both the short paper and the graduate student tracks, and seven papers were accepted to the challenge track.

We would like to thank the Program Committee members and the additional reviewers for providing timely, detailed and constructive feedback, and for actively participating in the on-line discussions. To acknowledge their precious effort we decided to introduce in this edition an award for the best reviewer.

We also wish to thank the general chair, Marouane Kessentini, who brought SSBSE to North America and put on, together with his team, such an enjoyable event. We are grateful to Leandro Minku and Tanja Vos for organizing an exciting challenge track, and to Ali Ouni and Thelma Elita Colanzi Lopes for chairing the graduate student track, which attracted twice as many papers as in the previous year: Graduate students are a vital part of any research field. Last but not least, we thank Wiem Mkaouer (Web chair) and Yuanyuan Zhang (publicity chair), for their precious help in reaching out the community.

In addition to the eight technical sessions, covering a wide range of topics, SSBSE 2016 attendees had the opportunity to hear on advanced topics from three esteemed keynote speakers: Carlos Coello Coello, (hybrid multi-objective approaches), Yew-Soon

Ong (evolutionary multitasking), and Patrick Reed (many-objective visual analytics). We were also very pleased to feature a panel and tool demo session where we explored how SBSE can support blind and visually impaired programmers.

We hope that, with these proceedings, anyone who did not have the chance to be with us in Railegh, will have the opportunity to follow the latest advances of the SBSE community.

August 2016

Federica Sarro
Kalyanmoy Deb

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Keynotes

Evolutionary Multi-objective Optimization Using Hybrid Approaches

Carlos Artemio Coello Coello

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Mexico City, Mexico

Abstract. The use of evolutionary algorithms for solving multi-objective optimization problems has become increasingly popular, mainly within the last 15 years. From among the several research trends that have originated in recent years, one of the most promising is the use of hybrid approaches that allow to improve the performance of multi-objective evolutionary algorithms (MOEAs). In this talk, some of the most representative research on the use of hybrid approaches in evolutionary multi-objective optimization will be discussed. The topics discussed will include multi-objective memetic algorithms, hybridization of MOEAs with gradient-based methods and with direct search methods, as well as multi-objective hyperheuristics. Some applications of these approaches as well as some potential paths for future research in this area will also be briefly discussed.

Towards Evolutionary Multitasking: A New Paradigm

Yew-Soon Ong

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Singapore, Singapore

Abstract. We are in an era where a plethora of computational problem-solving methodologies are being invented to tackle the diverse problems that are of interest to researchers. Some of these problems have emerged from real-life scenarios while some are theoretically motivated and created to stretch the bounds of current computational algorithms. Regardless, it is clear that in this new millennium a unifying concept to dissolve the barriers among these techniques will help to advance the course of algorithmic research. Interestingly, there is a parallel that can be drawn in memes from both socio-cultural and computational perspectives. The platform for memes in the former is the human minds while in the latter, the platform for memes is algorithms for problem-solving. In this context, memes can culminate into representations that enhance the problem-solving capability of algorithms. The phrase Memetic Computing has surfaced in recent years; emerging as a discipline of research that focuses on the use of memes as units of information which is analogous to memes in a social and cultural context. Memetic computing offers a broad scope, perpetuating the idea of memes into concepts that capture the richness of algorithms that defines a new generation of computational methodologies. It is defined as a paradigm that uses the notion of meme(s) as units of information encoded in computational representations for the purpose of problem solving. In this talk, we take a peek into some state-of-the-art memetic algorithms and frameworks of memetic computation. In particular, the new paradigm of multitasking optimization, which was recently proposed and published online in the IEEE Transactions on Evolutionary Computation journal in 2015, is introduced. It was noted that traditional methods for optimization, including the population-based search algorithms of Evolutionary Computation (EC), have generally been focused on efficiently solving only a single optimization task at a time. It is only very recently that Multifactorial Optimization (MFO) has been developed to explore the potential for evolutionary multitasking. MFO is found to leverage the scope for implicit genetic transfer across problems in a simple and elegant manner, thereby, opening doors to a plethora of new research opportunities in EC, dealing, in particular, with the exploitation of underlying synergies between seemingly distinct tasks. Last but not least, some applications of evolutionary multitasking in Software Engineering is showcased.

Discovering Tradeoffs, Vulnerabilities, and Stakeholder Dependencies in a Changing World

Patrick M. Reed

Cornell University, Ithaca, USA

Abstract. Over the past decade my research group has worked to operationalize our many-objective visual analytics (MOVA) framework for the design and management of complex engineered systems. The MOVA framework has four core components: (1) elicited problem conception and formulation, (2) massively parallel many-objective search, (3) interactive visual analytics, and (4) negotiated design selection. Problem conception and formulation is the process of abstracting a practical design problem into a mathematical representation. We build on the emerging work in visual analytics to exploit interactive visualization of both the design space and the objective space in multiple heterogeneous linked views that permit exploration and discovery. Negotiated design selection uses interactive visualization, reformulation, and optimization to discover desirable designs for implementation. Each of the activities in the framework is subject to feedback, both within the activity itself and from the other activities in the framework. These feedback processes transition formerly marginalized constructive learning activities of reformulating the problem, refining the conceptual model of the problem, and refining the optimization, to represent the most critical process for innovating real world systems (i.e., learning how to frame the problems themselves). My presentation will use our recent successful applications in urban water portfolio planning and satellite constellation design to demonstrate the key computational innovations in our MOVA framework.

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Research Papers