

IEEE Transactions on Evolutionary Computation

Special Issue on Search-Based Software Engineering

I. AIM AND SCOPE

Software engineering involves a task for searching a solution that balances a number of constraints to achieve optimal or near-optimal solutions [5]. The current procedures require time consuming human activities. The methods do not usually scale to solve real-world software engineering problems. A growing trend has begun in recent years to move software engineering problems from human-based search to more machine-based search. As a result, human effort is moving up the abstraction chain to focus on guiding the automated search, rather than performing the search itself. This emerging software engineering paradigm is known as Search- Based Software Engineering (SBSE). It uses search based optimization techniques, mainly those from the evolutionary computation literature to automate the search for optimal or near-optimal solutions to software engineering problems.

While evolutionary computation has been successfully applied to the design of engineering artefacts in civil, mechanical and electronic engineering, the search process cannot directly optimize these materials; the search ranges over a design space, guided by a simulation of a model of reality. The search space and guidance are very different when we apply computation search to software. SBSE find a new and potent possibility for search based optimization: the Evolutionary Algorithms can directly optimize the engineering material: the programs themselves [6].

The SBSE approach can and has been applied to many problems in software engineering that span the spectrum of activities from requirements to maintenance and reengineering [1][2][3][4][5]. Already, success has been achieved in requirements, refactoring, project planning and management, testing, maintenance and reverse engineering. However, several challenges have to be addressed to mainly tackle the growing complexity of software systems.

II. THEMES

In this special issue, we will invite papers that address problems in the software engineering domain through the use of evolutionary computation search techniques. We particularly encourage papers demonstrating novel search strategies or the application of computational search techniques to new problems in software engineering. Applications may be drawn from throughout the software engineering lifecycle by investigating the application of search based software engineering approaches for the automation of all phases of the software development process, including the analysis, design, implementation, testing, and maintenance of large software systems. Specific topics can include the application of evolutionary computation to the following areas:

- Component-based systems
- Data mining for software engineering
- Empirical software engineering
- Human-computer interaction
- Knowledge acquisition and management

- Maintenance and evolution
- Software testing, verification, and validation
- Product line development methods
- Refactoring and program understanding
- Requirements engineering and software development
- Software Analysis
- Software architecture and design

III. SUBMISSIONS

Manuscripts should be prepared according to the "Information for Authors" section of the journal found at <http://iee-cis.org/pubs/tec/authors/> and submissions should be done through the journal submission website: <http://mc.manuscriptcentral.com/tevc-ieee/>, by selecting the Manuscript Type of "SBSE Special Issue Papers" and clearly marking "SBSE Special Issue Paper" as comments to the Editor-in-Chief. Submitted papers will be reviewed by at least three different expert reviewers. Submission of a manuscript implies that it is the authors' original unpublished work and is not being submitted for possible publication elsewhere.

IV. IMPORTANT DATES

Submission deadline: May 24, 2016

Author notification: September 15, 2016

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Final version: December 15, 2016

V. GUEST EDITORS

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REFERENCES

- [1] Langdon, William B., and Mark Harman. "Optimising existing software with genetic programming." *IEEE Transactions on Evolutionary Computation*, 19, no. 1, (2015).
- [2] Sahin, Dilan, Marouane Kessentini, Slim Bechikh, and Kalyanmoy Deb. "Code-smell detection as a bilevel problem." *ACM Transactions on Software Engineering and Methodology (TOSEM)* 24, no. 1 (2014): 6.
- [3] Harman, Mark, S. Afshin Mansouri, and Yuanyuan Zhang. "Search-based software engineering: Trends, techniques and applications." *ACM Computing Surveys (CSUR)* 45, no. 1 (2012): 11.
- [4] Mkaouer, Wiem, Marouane Kessentini, Slim Bechikh, Kalyanmoy Deb, and Ali Ouni. "Many-Objective Software Remodularization Using NSGA-III." *ACM Transactions on Software Engineering and Methodology (TOSEM)* 24, no. 3 (2015): 17.
- [5] Deb, Kalyanmoy, and Himanshu Jain. "An evolutionary many-objective optimization algorithm using reference-point-based nondominated sorting approach, part I: solving problems with box constraints." *Evolutionary Computation*, *IEEE Transactions on* 18, no. 4 (2014): 577-601.
- [6] Harman, Mark. "Why the Virtual Nature of Software Makes it Ideal for Search Based Optimization", 13th International Conference on Fundamental Approaches to Software Engineering (FASE 2010), 1-12

