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SE-CSE 2013: The 2013 International Workshop on Software Engineering for Computational Science and Engineering

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Disclaimer

SE-CSE 2013: The 2013 International Workshop on Software Engineering for Computational Science and Engineering

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***Abstract*—Computational Science and Engineering (CSE) software supports a wide variety of domains including nuclear physics, crash simulation, satellite data processing, fluid dynamics, climate modeling, bioinformatics, and vehicle development. The increase in the importance of CSE software motivates the need to identify and understand appropriate software engineering (SE) practices for CSE. Because of the uniqueness of the CSE domain, exiting SE tools and techniques developed for the business/IT community are often not efficient or effective. Appropriate SE solutions must account for the salient characteristics of the CSE development environment. This situation creates a need for members of the SE community to interact with members of the CSE community to address this need. This workshop facilitates that collaboration by bringing together members of the SE community and the CSE community to share perspectives and present findings from research and practice relevant to CSE software and CSE SE education. A significant portion of the workshop is devoted to focused interaction among the participants with the goal of generating a research agenda to improve tools, techniques, and experimental methods for CSE software engineering.**

***Index Terms*—Software Engineering, Computational Science, Computational Engineering**

I. Introduction

This workshop is concerned with increasing the productivity and quality of Computational Science & Engineering (CSE) software through the use of appropriate Software Engineering (SE) practices. As CSE software continues to increase in importance and prevalence, it is important to continue focused discussion between members of the SE and the CSE communities. Members of each community need to better understand the strengths of the other and identify areas of common interest/need which can be pursued.

Despite its importance, the development of CSE software historically has attracted less attention from the SE community than other subdomains have. Indeed, the development of CSE software is significantly different than the development of business information systems, from which many of the SE best practices, tools and techniques have been drawn. Therefore, in order to identify and develop appropriate methods, tools and techniques for CSE software, members of the SE community must interact with members of the CSE community to understand these differences and determine the most appropriate SE tools, methods and techniques. In addition, we hope to identify aspects of SE practice that are relevant for the education of future CSE developers. These aspects will be provided as suggestions for inclusion in various types of curricula relevant to new CSE developers.

The problem of matching SE tools and techniques to CSE continues to be of great interest and importance. Other than the SE-CSE workshop series, there are very few consistent venues in which to publish this type of important research. Previous endeavors to bring the SE and CSE communities together include two special issues of *IEEE Software* [4], [6], three special issues of *Computing in Science and Engineering* [1]–[3] and a special issue of the *Journal of Organizational and End User Computing* [5]. The SE-CSE workshop series (SE-CSE 2008[1] , SE-CSE 2009[2], SE-CSE 2010[3], and SE-CSE 2011[4]) has gathered computational scientists, software engineering researchers and software developers together to explore issues such as:

- Those characteristics of CSE which distinguish it from general business software development;
- The different contexts in which CSE developments take place;
- The quality goals of CSE;
- How the perceived chasm between the CSE and software engineering communities might be bridged.

II. Workshop Goals

The workshop website, on which a schedule and other resources can be found is located at: http://SECSE13.cs.ua.edu. The SE-CSE 2013 workshop will build on the results of the SE-CSE 2008, SE-CSE 2009, SE-CSE 2010, and SE-CSE

[1]http://SECSE89.cs.ua.edu/
[2]http://SECSE09.cs.ua.edu/
[3]http://SECSE10.cs.ua.edu/
[4]http://SECSE11.cs.ua.edu/

2011 workshops. Most conference or journal venues focus either on the SE domain or on the CSE domain, but rarely on the intersection of the two. Specifically, within the CSE community, there are few places to publish research related to the unique SE challenges faced by CSE developers along with the approaches identified to address those challenges.

The goal of this workshop is to provide a unique venue for researchers from SE and CSE to interact and discuss issues relevant to the intersection of these two fields. The workshop provides an opportunity for members of these two groups to interact when they normally do not have such opportunities. By bringing these groups together, our goal is to support the building of a common research agenda to deal with the complex software development issues present in the CSE domain. Furthermore, the discussion among these two groups of researchers will be invaluable in identifying those aspects of SE that should be considered for CSE education programs.

New researchers are coming into this line of research and are often unaware of each other's work. There is no one preferred journal for publication or other readily found source for researchers with this common interest. So this meeting is an important focal point. We intend to spread a wide net, encouraging attendance from researchers in the many areas of CSE as well as SE, and educators teaching SE to CSE students. One of the main objectives is to provide an opportunity for these scattered communities of researchers to coalesce into a single community.

III. Plans for Discussion at the Workshop

The 2013 workshop is organized in a similar manner as the previous workshops in this series. In the morning paper authors will present brief presentations of their work. The workshop includes two types of papers. Full papers, which will have longer presentations, report on mature research with an eye towards motivating an interesting discussion among the workshop participants. Position papers, which will have shorter presentations, will describe early stage research that can spark interesting discussion among the workshop participants. These presentations provide the context for group discussions about important topics that emerge during the workshop. The following papers are included in the workshop:

- *The Software Development Process of FLASH, a Multiphysics Simulation Code*
- *A Case Study: Agile Development in the Community Laser-Induced Incandescence Modeling Environment (CLiiME)*
- *On the Intersection of SE and CSE*
- *Binary Instrumentation Support for Measuring Performance in OpenMP Programs*
- *Towards Flexible Automated Support to Improve the Quality of Computational Science and Engineering Software*
- *Software design for decoupled parallel meshing of CAD models*
- *Scientific Software Process Improvement Decisions: A Proposed Research Strategy*
- *Water Science Software Institute: An Open Source Engagement Process*
- *Techniques for Testing Scientific Programs Without an Oracle*
- *Design and Rationale of a Quality Assurance Process for a Scientific Framework*
- *POSITION PAPER: Implicit Provenance Gathering through Configuration Management*
- *Position Paper Exploring Issues in Software Systems Used and Developed by Domain Experts*
- *Implementing Continuous Integration Software in an Established Computational Chemistry Software Package*
- *Practical Formal Correctness Checking of Million-core Problem Solving Environments for HPC*

The afternoon will be spent in small group and large group discussions focused around important themes that emerge during the paper presentations. The group discussions are the most important aspect of the workshop because they allow members of the different communities to interact on a more direct basis. In constructing the discussion groups, we will seek to balance the representation from the SE and the CSE communities to provide for more balanced and fruitful discussions.

In previous workshops, some of the discussion themes that emerged included: 1) The unique characteristics of CSE software that affect software development choices; 2) The appropriate context dimensions to describe CSE software; 3) The major software quality goals for CSE software; 4) Crossing the communication chasm between SE and CSE; 5) Effectively involving scientists in software development and training; 6) Measuring the impact of SE on scientific productivity; 7) SE tools and methods needed by the CSE community; and 8) How to effectively test CSE software.

In this workshop, the discussions will build on these themes and identify new topics of interest.

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