Adaptive Computing that Enhances Collaboration in Networked Environments

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Abstract— **This report describes the culmination of the 13th installment of the "Adaptive Computing (and Agents) for Enhanced Collaboration" (ACEC) track. ACEC focuses on collaborative computing that occurs dynamically among web-accessible software systems and devices. The articulation of these network artifacts must be controlled by adaptive, intelligent control mechanisms, sometimes realized as agents. ACEC has for over 13 years brought together researchers from multiple disciplines to address the challenges associated with effective, just-in-time collaboration. The track this year showcases papers that explore emerging models and design patterns for adaptive architectures for a varied set of domains such as robotic and crowdsourcing.**

Keywords-agent-based computing; service-oriented computing; enterprise collaboration

I. INTRODUCTION

Consumer-to-consumer, consumer-to-machine, and machine-to-machine interactions are more pervasive than ever before in an environment where human-controlled social networking is tightly integrated with the Internet of Things (IoT). Functional and nonfunctional requirements are evolving, just-in-time, and architecture will more and more need to adapt to changing user needs. In a similar fashion, adaptive computing techniques and software agents will be required to meet the challenges when realizing these environments. These techniques must support the collaboration among humans *and* software components alike.

Furthermore, with the increase networked connectivity of individuals and organizations, there is a strong requirement for models, algorithms, and tools that support *dynamic*, *flexible,* and *open* collaboration. Adaptive computing and *service* technology–from the Service Oriented Computing (SoC) community–provide the modularity and robustness to address these emerging challenges.

ACEC has focused on research initiatives and projects that leverage the adaptability, autonomy, and intelligence of first-class software agents and other autonomic models for the collaboration of systems of systems. In recent years, the track has spanned emerging topics around collaboration and adaptability that includes but are not limited to Cloud Computing, Crowdsourcing, and Social Networking. The 13th meeting of ACEC continues to welcome papers from two focus areas:

- Adaptive and Agent-based Services; and
- Adaptive Techniques for Organizational/Enterprise Use of Emerging Web Paradigms, e.g. Cloud, Crowd-sourcing, and Mobile Apps.

These two focus themes represent important areas that leverage the distributed and decentralized nature of service-oriented environments with the proactive and autonomous characteristics of agents to provide solutions for complex problems that are difficult to address using more traditional technologies.

The papers presented during the track reflect the aim of the call, addressing one or more of the suggested topics. In particular they address:

- *Dynamic* and *flexible* collaboration by means of negotiation;
- *Open* collaboration focusing on interoperability;
- *Services* in connection with SoC and social networks.

Papers at ACEC have historically represented significantly applied solutions and each year authors devise innovative solutions to real-world problems that people face daily. Over the past 13 years, we believe the research

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produced at ACEC continues to have impact on enterprise computing environments in industry and government.

In the rest of this report we will summarize the content of the papers accepted for presentation at IEEE WETICE 2014 conference, and articulate overarching conclusions drawn from these contributions.

II. Overview of Track Papers

This year, there were two papers accepted as FULL-PAPERS and one paper accepted as a SHORT PAPER for presentation at IEEE WETICE 2015 conference. A summary of these papers is presented below.

For the full paper session, the first paper *"Engineering Self-Adaptive Systems with Role-Based Architectures"* is authored by Annabelle Klarl. This paper introduces a holistic development process for implementing self-adaptive systems with a general separation of concerns between adaptation logic and application logic. A unique innovation is the modulation of behavioral modes into well-defined units that can be adopted by components independently. The paper further describes, by example, a rich specification technique that can be used to articulate the adaptation logic. The author leverages established architectural patterns.

In the second full paper, Julian Jarrett and M. Brian Blake introduce a *"Collaborative Infrastructure for On-Demand Crowdsourced Tasks"*. This paper introduces a descriptive architecture that uniquely categories the infrastructure required for crowdsourced tasks (CT). The authors describe the distinct functionality required to manage the underlying crowdsourcing operations for real-world scenarios. The authors leverage standard design patterns in an architecture to generically support the breadth of crowdsourcing functionality.

The final paper is a short paper, *"A Semantic Framework for Modeling Adaptive Autonomy in Task Allocation in Robotic Fleets"* by Domagoj Drenjanac, Slobodanka Dana Kathrin Tomić, and Eva Kühn. The paper introduces the Shared Knowledge Interaction Modelling (SKIM) framework. This framework embodies a model to control adaptive autonomy in mixed teams. This model facilitates the evaluation of performance in interactive systems, and the authors demonstrate the approach when finding an optimal set of robots to execute a certain task.

SUMMARY & CONCLUSION

ACEC, this year, has attracted papers that propose approaches for coordination and collaboration using decentralized and adaptation oriented techniques to address problems in – *web service compositions*, *workflow-oriented distributed environments, enterprise networks* and *transport systems*.

A result of the accepted papers from this year's track shows a focus in research studies and innovative techniques that closely impact emerging domains and important issues. The organizers believe that this is a trend that will continue to define collaboration technologies in general and, more specifically, future embodiments of ACEC.

In conclusion, we invite all interested researchers to have a look at the WETICE 2016 call for papers, where we will be pleased to organize the 14th edition of the ACEC track.