Sara Salem Hamouda

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OBJECTIVE

Continuing to design practical distributed programming models for unreliable cluster systems. A practical programming model in my definition is one that considers performance, resilience and productivity as first-class design principles.

RESEARCH INTERESTS

- High-level distributed programming models
- Resilient termination detection protocols for dynamic task graphs
- Resilient distributed in-memory data stores
- Automated formal verification of distributed protocols

EDUCATION

Australian National University, Australia **02/2014-current**
PhD Student, Research School of Computer Science
Topic: Resilience in High-Level Parallel Programming Languages
Advisors: Steve Blackburn, Josh Milthorpe, and Peter Strazdins
Expected Submission Date: 08/2018

Cairo University, Egypt **09/2006-12/2010**
Master of Computer Science, Faculty of Computers and Information
Topic: A Multi-Resource Ontology Builder
Advisors: Samir AbdelRahman, Amr Badr, and Ibrahim Farag

Cairo University, Egypt **09/2002-05/2006**
Bachelor of Computer Science, Faculty of Computers and Information
Excellent grade with honor degree (94.14%), first rank.

PUBLICATIONS

- (Under review) D. Grove, S. S. Hamouda, B. Herta, A. Iyengar, K. Kawachiya, J. Milthorpe, V. Saraswat, A. Shinnar, M. Takeuchi, O. Tardieu, Failure Recovery in Resilient X10, TOPLAS Journal.
- (Under review) S. S. Hamouda and J. Milthorpe, Resilient Optimistic Termination Detection for the Async-Finish Model, PODC 2018.
- S. S. Hamouda, B. Herta, J. Milthorpe, D. Grove, and O. Tardieu, Resilient X10 over MPI User Level Failure Mitigation, X10 workshop, PLDI, 2016.
- S. S. Hamouda, J. Milthorpe, P. E. Strazdins, V. Saraswat, A Resilient Framework for Iterative Linear Algebra Applications in X10, PDSEC workshop, IPDPS, 2015.
- E. Hossny, S. Salem, and S. M. Khattab, Towards Automated User-Centric Cloud Provisioning: Job Provisioning and Scheduling on Heterogeneous Virtual Machines, INFOS 2012.
- S. Salem, S. AbdelRahman, A Multiple-Domain Ontology Builder, COLING 2010.

AWARDS

- Best PhD Poster Presentation Award, IPDPS, 2015
- Most Impactful Idea Award, ACT Hackathon, 2014
- Australian National University PhD scholarship and HDR merit scholarship, 2014-2018
- Ideal Teaching Assistant Recognition, Faculty of Computers and Information, Cairo University, 2007, 2008, and 2012.
- Cairo University Graduation Honor for overall undergraduate excellence, 2006.

RESEARCH POSITIONS

PhD Student, Australian National University **02/2014-current**

The objective of my PhD project has been improving the resilience support of high-level parallel programming languages. I choose the X10 language as a basis for my study for its productivity features, and recent support for user-level fault tolerance. My research identified performance and productivity issues in Resilient X10 and contributed efficient resilient protocols and easy-to-use application frameworks to address these issues.

My main contributions are:

- a message-efficient resilient termination detection protocol, that is formally verified using TLA+.
- a double in-memory replication protocol for storing critical runtime data consistently in the presence of failures. The protocol is formally verified using TLA+.
- an in-memory resilient store with transactional support for asynchronous data updates.
- integrating X10 with MPI-ULFM to provide scalable failure detection, fault-tolerant collective and agreement operations to X10.

Research Intern, IBM T. J. Watson Research Center **07/2015-11/2015**

- Internship Mentors: Josh Milthorpe and David Grove
- Ported Resilient X10 to MPI-ULFM (User Level Failure Mitigation).
- Extended LULESH benchmarking application with Checkpoint/Restart support.

Masters Student, Cairo University **09/2006-12/2010**

Automatic Extraction of Ontologies from Multiple-Domain Content:

- The thesis identified two problems occurring when generating a single ontology from a multiple-domain corpus: inaccurate estimation of concept significance, and loss of relevant definitions for concepts that have different meanings in different domains.
- Using clustering and simple word-sense disambiguation techniques, we extract a multi-layered ontology that models the abstract concepts, their specialized meanings, and their concrete instances in different domains. More precise answers to ontology queries were obtained using our ontology.

RESEARCH VISITS

Habanero Group, Rice University **06/2016-07/2016**

- Supervisor: Vivek Sarkar
- Studied the implementation of data-driven task-based runtime systems and their resilience challenges, using the Open Community Runtime (OCR) and the Concurrent Collections (CnC) framework.
- Completed a basic proof-of-concept implementation to demonstrate the applicability of user-level fault tolerance in OCR using two simple applications.

TEACHING POSITIONS

Tutor (Casual), Australian National University **02/2016-11/2017**

Practical Lab Sessions:

- COMP3320/6464 (High Performance Scientific Computation), 2016.
- COMP1100 (Programming as Problem Solving), 2016.
- COMP7240 (Introduction to Database Concepts), 2017.
- COMP4300/8300 (Parallel Systems), 2017.
- COMP2400/6240 (Relational Databases), 2017.

Teaching Assistant (Full-time), Cairo University **02/2007-02/2014**

Practical Lab Sessions:

- Logic Design, 2006.
- C++ Programming, 2006, 2007, 2008, 2009.
- Data Structures, 2007, 2009.
- Introduction to Computer Science, 2008, 2009, 2011, 2013.

- File Structures, 2008.
- Operating Systems, 2006, 2007, 2008, 2009, 2010, 2011.
- Compilers, 2010.
- Computer Organization, 2013.

INDUSTRY EXPERIENCE

Software Engineer (Part-time), Centrivision, Egypt **07/2006-01/2010**
07/2010-06/2013

- Helped develop enterprise systems for the telecommunication company 'Etisalat Misr'.

Selected Projects:

- Tariff Plan Migration Engine: A configurable rule-based engine for managing and executing tariff plan migration rules.
- Customer Support System: The main customer-care interface for viewing and updating customer profiles.
- High-Usage Tracking System: A system for identifying suspected high-usage fraud cases.
- Used Technologies: J2EE, Java Server Faces (JSF), Web Services, Oracle Databases.

OPEN SOURCE

External Contributor, X10 Programming Language and Applications

- https://github.com/x10-lang/x10
- https://github.com/x10-lang/x10-applications
- Main contributions: productive resilient frameworks, integration with MPI-ULFM, and resilient LULESH application.

Owner, X10 Programming Language (Fork)

- https://github.com/shamouda/x10
- Optimistic finish (resilient termination detection protocol), and the transactional resilient store.

Owner, X10 TLA+ Specifications

- https://github.com/shamouda/x10-formal-spec
- Formal specification of replication and termination detection protocols I developed during my PhD.

REFRENCES

Steve Blackburn, steve.blackburn@anu.edu.au
Professor, Australian National University
Chair of PhD Supervisory Panel

Josh Milthorpe, josh.milthorpe@anu.edu.au
Lecturer, Australian National University
Main PhD Advisor

Peter Strazdins, peter.strazdins@cs.anu.edu.au
Associate Professor, Australian National University
Secondary PhD Advisor