

Rethinking RAM: Testing alternative models of computation

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1 Project Summary

General Area: Models of Computation in Algorithms

Keywords: RAM, computational models, benchmark

Question: The RAM model of computation is the traditionally assumed environment of most algorithm analysis, but it is questionable whether it serves as an accurate model of modern computers. This project will experimentally test the RAM model versus the recently proposed VAT model. *Is Jurkiewicz and Mehlhorn's Virtual Address Translation model experimentally superior to the traditional Random Access Machine for modeling computational complexity?*

Responsibilities:

LACHUT

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Budget: \$1,000,000 (!!!)

Deliverables: Progress Report, Final Report, Presentation Slides

2 Deliverables

This project will produce four final products.

Progress Report The investigators will submit a report on the status of the research, noting significant changes to the research or newly uncovered difficulties. This report will also include a draft outline of the final report.

Final Report The project will produce a final report to answer the question of which, whether RAM or VAT, is the more accurate model of modern computation. This determination will be based on three factors.

Algorithm Analyses The investigators will do algorithm runtime analyses of a set of algorithms. The conclusions of the two models will be compared.

Benchmark Results The report will include the results of real-world benchmarking of procedures based on the selected algorithms.

Source Code The report will be accompanied by the source code for the benchmarking evaluations.

Presentation Slides The project will produce an oral presentation and accompanying slides. The presentation will be a summary of the project report noting the key findings of the research.

3 Issues

There are two primary difficulties to be overcome for the completion of the project.

VAT Analysis As the Virtual Address Translation computing model is very new, little can be known about it. Prior to starting this project, the investigators know of only two people who currently understand the model and have done work with it. This means two things.

Will the model work Prior to beginning the project, the investigators cannot know if algorithm analysis under the new model will be a tractable problem in every attempted case.

Lack of helpful resources There is necessarily a lack of resources to assist the investigators should the model prove especially difficult to master.

Benchmarking It may be difficult to devise the most correct way to benchmark the running times of the implementations of the selected algorithms. Each tested procedure must run multiple times on multiple, varied inputs, and perhaps even on different operating systems to determine if there is a single model of computation that is superior.

4 Biographical Sketch

4.1 David Lachut

4.1.1 Professional Preparation

- University of Maryland, Baltimore County Computer Science
Ph.D. 2015
- University of Arkansas Physics B.S. 2009

4.1.2 Appointments

- Research Assistant University of Maryland, Baltimore County
2012–Present
- Research Assistant University of Arkansas
2010–2012

4.1.3 Publications

- D Lachut, et al., "Minimizing Intrusiveness in Home Energy Measurement," in BuildSys '12, Toronto, ON, 2012, pp 56-63. (Best Paper Nominee)
- S Rollins, et al., "A Mobile System for Annotation of Home Energy Data," UMBC CSEE Technical Report TR-12-CS-03 [under submission]
- A Nelson, et al., "Wearable Multi-sensor Gesture Recognition in Assistive Devices for Paralysis Patients," UMBC CSEE Technical Report TR-12-CS-01

4.1.4 Collaborators and Other Affiliations

Collaborators

- Nilanjan Banerjee
Department of Computer Science and Electrical Engineering
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- Lazeeb Choudhury
Kevin Moran
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Sami Rollins
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Graduate Advisor

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4.2 Kaustav Lahiri

4.2.1 Professional Preparation

- University of Maryland, Baltimore County Computer Science
- University of

4.2.2 Appointments

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4.2.3 Publications

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4.2.4 Collaborators and Other Affiliations

Collaborators

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Graduate Advisor

- Adv
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