Chinmay Kulkarni

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Objective

To invent new forms of computer interaction that go beyond the desk and make computing invisible. I hope my graduate and professional endeavors will form a strong foundation and lead to a permanent research position in this field.

Education

B.E. (Hons.) in Computer Science — Jun 2005 - May 2009
Birla Institute of Technology and Science — Pilani, India
Thesis topic: "Semantic constructs in transactional memory", advised by Prof. Eduard Ayguade, Polytechnic University of Catalunya, Spain.

Overall GPA: 8.93 /10.0; Major GPA: 9.82/10.0

RYK Science College — Jun 2005 - May 2009
Intermediate Board of Secondary School — Nasik, India
Education 12th Grade
Vocational focus on Electronics and Computer Science.
Marks Obtained: 87.5%

Test Scores

GRE: Verbal: 650/800, Quantitative: 800/800
TOEFL: 114/120. Writing: 29, Speaking: 27.

Publications

1. Tomic S, **Kulkarni C.**, Perfumo C., Armejach A, Unsal A., Cristal A., Valero M. EazyHTM– Eager-Lazy Hardware Transactional Memory *The 42nd Annual IEEE/ ACM International Symposium on Microarchitecture (MICRO)* 2009.
2. **Kulkarni C.**, Unsal O., Cristal A., Ayguade E., Valero M. Turbocharging Boosted Transactions: Or How I Learnt to Stop Worrying and Love Longer Transactions *Proceedings of the 14th ACM SIGPLAN symposium on Principles and Practice of Parallel Programming* 2009.
3. **Kulkarni C.** AssoCAPTCHA: Designing human-friendly secure CAPTCHAs using word associations *26th Annual Conference on Human Factors in Computing Systems- CHI* 2008

Under Review

1. Danyel Fisher, Avneesh Sud, **Chinmay Kulkarni** "Animated Voronoi Treemaps for Dynamic Data" Under review for *28th Annual Conference on Human Factors in Computing Systems- CHI* 2010

Work Experience

Research Developer — Oct 2009– present
Microsoft Research — Bangalore, India
I am primarily involved in two projects:

1. **Digital Heritage** is a platform for creating rich, engaging narratives that support interactive exploration both within the narrative and by linking to external resources (such as webpages).
   Creating such a narrative is today a tedious manual task that requires significant design and programming knowledge.
   I am working on creating an authoring tool that would let someone with no technical skills to develop such narratives. Apart from the actual development of the tool, I am also involved in designing the workflow and a supporting UI that encourages creation of narratives that are coherent and easy to explore.

2. **Infix for Bing** [redacted: covered by NDA]

Research Intern Jun 2009 – present
Microsoft Research Redmond, WA
Mentored by Danyel Fisher.

1. Created a client-server architecture (ASPX on server, Silverlight on client) that enables progressive rendering of treemaps for large datasets (such as the Windows source base: $\sim 350,000$ files).
2. Designed and deployed a web-based between-subjects study that compared user accuracy while reading treemaps. User were shown two rectangles with known aspect-ratios and asked to compare areas ("which is larger?"). They were also asked to compare areas of two irregular shapes (nodes from a Voronoi treemap). We found statistically significant correlations between user-accuracy and the percentage difference in actual sizes (for Voronoi regions and rectangles) and the aspect-ratios (for rectangles). The study enables us to find an upper-bound for user-accuracy for rectangular-treemap algorithms based on their average aspect ratios. It also enables us to compare accuracy of Voronoi treemaps with the best rectangular algorithms (Work under review at CHI 2010).

Research Intern Jan 2009 – May 2009
Barcelona Supercomputing Center Barcelona, Spain
Supervised by Prof. Osman Unsal and worked closely with Prof. Adrian Cristal towards my undergrad thesis:

1. Formulated correctness constraints to ensure atomicity for transactional memory systems given semantic information about abstract operations performed.
2. Articulated the concept of semi-opaque transactions that allowed programmers to expose *selective* changes from within an atomic block; formulated correctness criteria for this construct; and created a runtime system that supports the same. Applications include communication and collaboration among memory transactions.
3. Co-designed a hardware transactional memory (HTM) system that uses eager conflict-detection and lazy conflict-management. Performance closely approximates an idealized lazy HTM system (Details in Publication 1).

Summer Intern May-2008 – Jun 2008
Barcelona Supercomputing Center Barcelona, Spain
Worked with Prof. Osman Unsal and Prof. Eduard Ayguade on abort-characterization of boosted transactions and developed a linear-time algorithm for detecting chains of waiting transactions and deadlocks. System throughput for long transactions is improved by up to 200% and changes in client-code are required (Details in Publication 2).

Teaching Experience

Teaching Assistant
BITS Pilani Pilani, India
Theory of Computation Fall 2008
Operating Systems Spring 2008
Created supplementary teaching material, self-evaluation tests, answered student problems and queries; maintained the course website.

Service

Reviewer: Volunteered for CHI 2010.

Other Responsibilities

Coordinator, Mantra Awards- 2007 Fall 2007
BITS Pilani Pilani, India
Mantra Awards reward undergraduate and graduate students at BITS in areas of Leadership, Social welfare, Entrepreneurship, and Innovation

Vice President (Networks) 2007-2008
Center for Entrepreneurial Leadership, Pilani, India
BITS Pilani
Managed networking responsibilities for the Center with companies, alumni and other voluntary organizations.

References

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More Information

For more information about the above projects and to download papers, please visit my hompepage: http://www.chinmaykulkarni.info/ucbapp

Abstracts for publications are also included in the appendix below.

Appendix

Publication Abstracts

1. Tomic S, **Kulkarni C.**, Perfumo C., Armejach A, Unsal A., Cristal A., Valero M. EazyHTM– Eager-Lazy Hardware Transactional Memory *The 42nd Annual IEEE/ ACM International Symposium on Microarchitecture (MICRO)* 2009.

   Abstract Transactional Memory aims to provide a programming model that makes parallel programming easier. Hardware implementations of transactional memory (HTM) suffer from fewer overheads than implementations in software, and refinements in conflict management strategies for HTM allow for even larger improvements. In particular, lazy conflict management has been shown to deliver better performance, but it has hitherto required complex protocols and implementations.

   In this paper we show a new scalable HTM architecture that performs comparably to the state-of-the-art and can be implemented by minor modifications to the MESI protocol rather than re-engineering it from the ground up. Our approach detects conflicts eagerly while a transaction is running, but defers the resolution lazily until commit time. We evaluate this EAger-laZY system, EazyHTM, by comparing it with the Scalable-TCC-like approach and a system employing ideal lazy conflict management with a zero-cycle transaction validation and fully-parallel commits. We show that EazyHTMperforms on average 7can commit in parallel even if there is only one directory present, and does not suffer from cascading waits.

2. **Kulkarni C.**, Unsal O., Cristal A., Ayguade E., Valero M.
   Turbocharging Boosted Transactions: Or How I Learnt to Stop Worrying and Love Longer Transactions *Proceedings of the 14th ACM SIGPLAN symposium on Principles and Practice of Parallel Programming* 2009.

   Abstract Boosted transactions offer an attractive method that enables programmers to create larger transactions that scale well and offer deadlock-free guarantees. However, as boosted transactions get larger, they become more susceptible to conflicts and aborts. We describe a linear-time algorithm to detect transactions that cannot make progress, which transactions need to be aborted, and when. The algorithm guarantees zero false positives with minimal aborts. Our proposals, as implemented in DSTM2, increase the transactional throughput of the system, often by more than 30%.

3. **Kulkarni C.**
   AssoCAPTCHA: Designing human-friendly secure CAPTCHAs using word associations *26th Annual Conference on Human Factors in Computing Systems- CHI* 2008

   Abstract CAPTCHAs are challenge-response tests to verify that the user is a human (and not a program/robot). CAPTCHAs use problems that are trivial for humans to solve, but are hard for computers. Unfortunately, CAPTCHAs have focused only on one aspect of human ability: image/word recognition. This paper explores the usage of other human abilities: particularly, finding associations between related concepts; to design secure, human-friendly Human Interaction Proofs (HIPs)

   In this paper, we present AssoCAPTCHA: CAPTCHAs so designed that they require no greater user-interaction than conventional solutions, yet have orders of magnitude greater security. Preliminary tests confirm user acceptance and efficiency of the system.

Under Review

1. Danyel Fisher, Avneesh Sud, **Chinmay Kulkarni**
   "Animated Voronoi Treemaps for Dynamic Data"
   Under review for *28th Annual Conference on Human Factors in Computing Systems- CHI* 2010

Abstract The Voronoi Treemap is a space-filling treemap technique that relaxes the constraints of rectangular nodes. Its organic shapes maintain a one-to-one aspect ratio, are flexible with their placement, allowing stable zooming and dynamic data values. However, it is unclear whether users are able to carry out treemap tasks with Voronoi treemaps. In this paper, we first articulate the tradeoffs that go into generating dynamic treemaps. We then present innovative features that allow Voronoi Treemaps to smoothly represent dynamically-changing data. We confirm that Voronoi Treemaps can be a successful visualization technique with a perception-based user study, which shows that users are as able to interpret the regions generated by Voronoi treemaps as they are to interpret the regions generated by other treemap algorithms; a second study shows that Voronoi Treemaps are as effective as other treemap algorithms for visualization. We conclude that animated Voronoi treemaps are an effective visualization of streaming hierarchical data.