



UPCRC Illinois

Universal Parallel Computing
Research Center

Making parallelism easy



ILLINOIS

Vision

Making parallel programming synonymous with programming

Parallel computing is becoming pervasive; client-focused mass market applications are now driving parallel programming. We face a new challenge: one that emphasizes productivity over high performance; and one that addresses the needs of the broad community of application developers. In such an environment, parallel programming must be accessible to all programmers.

The vision of the Universal Parallel Computing Research Center at the University of Illinois is built on the premise that there is no magic bullet, no one-size-fits-all solution. Parallelism can be made easy, but the research will be difficult. And the solutions—like the problem—will be multi-threaded.

With funding and support from Microsoft and Intel, the UPCRC at Illinois is tackling one of the most complex problems facing industry today—making parallel programming synonymous with programming.

Models

We are all parallel thinkers.

Tools

Simplicity is hard.

Execution

How does a millipede move its legs?

Applications

The end-goal: better applications

Parallel programming can be **child's play**—as any child that has programmed with Squeak Etoys or StarLogo can attest. We believe that most parallel programming should not be “computer science”; rather, it should be simple, intuitive ways to express parallelism—ways that make sense for each application domain, and ways that avoid subtle synchronization bugs by design.

While parallel languages must become simpler, hardware is becoming more complex. To bridge this gap, we need increasingly **sophisticated tools** under the hood. Information and flexibility that are available at the programming level must be passed down and leveraged. Mappings must be dynamic, based on advanced optimization techniques to adapt to successive generations of chips. New tools must be developed to ensure efficiency and correctness of legacy and emerging code.

Future microprocessors will contain hundreds, and perhaps **thousands of cores**. Different cores may be specialized for different tasks; some cores may become defective over time, and power constraints will require a sophisticated management of computing resources. This complexity must be encapsulated to present a simple execution model to the software.

Parallel computing can enable new **human-centered applications** like conversational web browsing for safer information access in the car or kitchen, authoring assistance for creating and sharing personalized documents, blogs, photos, and videos, and immersive collaborative environments with 3-D images of ourselves. To enable these applications, we must develop new scalable parallel approaches to natural language processing, vision, graphics and multimedia, and use these to drive our work on parallel computing.



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Illinois

Parallel computing is in our blood.

The University of Illinois has been a leading institution in parallel computing research for more than four decades. Illinois innovation in parallel computing began with generations of the ILLIAC, the CEDAR machine, and the Illinois Cache Coherence Protocol and helped define the landscape of multiprocessors. Today, Illinois is poised to install the largest academic supercomputer and start a center for petascale computing. Through UPCRC, Illinois will help usher in a new era of parallel computing for consumer systems with coordinated and multi-disciplinary research that draws upon Illinois leadership in parallelism.



Join

Want to join Illinois in making parallelism easy?

UPCRC is a joint research effort of the Illinois department of computer science and the Coordinated Science Laboratory. Research is conducted by faculty members and graduate students from the departments of computer science and electrical and computer engineering at the University of Illinois at Urbana-Champaign. For information about parallel computing research opportunities or graduate studies, contact:

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UPCRC Workshops and Summer Institutes

Connect with academic and industry leaders in parallelism. Immerse yourself in the latest developments in parallel computing research and education. For more information and a schedule of events, visit www.upcrc.illinos.edu.

To receive UPCRC news and event updates, visit

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