Wai-Kau Lo

Work Address
Department of Computer Science
University of Toronto
Toronto, Ontario
M5S 3G4 Canada
Phone: (416) 978-4837

Home Address
88 Cooperate Drive, Suite No. 1017
Scarborough, Ontario
M1H 3G6 Canada
Phone: (416) 296-0663
Email: wklo@cs.toronto.edu

UNIVERSITY EDUCATION

University of Toronto. Doctor of Philosophy in Computer Science, January, 1997.

University of Toronto. Master of Science in Computer Science, January, 1993.

University of Hong Kong. Bachelor of Science in Computer Studies (first class honours), June, 1990.

RESEARCH INTERESTS

My research interests are in fault-tolerant distributed computing, with emphasis on shared-memory systems in which processes communicating via shared objects. I currently focus on studying

- the relative power of shared objects to support fault-tolerant implementations of other objects.
- practical aspects of implementations of objects in shared-memory multiprocessors.

SUMMARY OF PAST RESEARCH

Ph.D. thesis: On the relative power of shared objects in fault-tolerant distributed systems.
Advisor: Professor Vassos Hadzilacos.

A fundamental question in distributed shared-memory computing is to determine whether a given set of "base" object types can be used to implement a new type. In my Ph.D. thesis, I studied this problem in a fault-tolerant setting, where implementations must work even if all but one processes that share the objects may crash. Such implementations are called wait-free. A wait-free hierarchy classifies object types on the basis of their strength in supporting wait-free implementations of other types. Such a hierarchy is robust if it is impossible to implement objects of types that it classifies as "strong" by combining objects of types that it classifies as "weak". I proved that, if nondeterministic types are allowed, the only wait-free hierarchy that is robust is the trivial one, which lumps all types into a single level. This result implies that, in general, it is not possible to determine the power of a concurrent system that supports a given set of primitive object types by reasoning about the power of each primitive type in isolation.

Master thesis: Using failure detectors to solve Consensus in asynchronous shared-memory systems.
Advisor: Professor Vassos Hadzilacos.

It is well-known that Consensus is unsolvable in asynchronous shared-memory systems consisting of only registers where processes may crash. In my Master thesis, I studied the use of failure detectors introduced by Chandra and Toueg to overcome this impossibility result. Informally, a failure detector is a device that provides information about which processes have crashed. I presented several Consensus algorithms using different types of failure detectors, established some lower bounds and impossibility results, and determined the weakest failure detector that can be used to solve Consensus in asynchronous shared-memory systems.

PROFESSIONAL EXPERIENCE

Teaching Assistant (9/1991–5/1994), Department of Computer Science, University of Toronto.
Courses: Introduction to Computer Application (first year course);
Introduction to Computer Programming (first year course);
Data Structures and Algorithm Analysis (third year course).
Duties: Responsible for giving weekly tutorials to the students;
Assisted professors in grading assignments.

Research Assistant (9/1990–8/1991), Department of E&E Engineering, University of Hong Kong.

PROGRAMMING EXPERIENCE

Term projects

Implemented a collision detection algorithm in C for a physical based simulation system (graduate course).
Implemented an algorithm using the LINPACK package to solve the problem of nonlinear least squares approximations (graduate course).
Designed and implemented a queuing network simulation system in Turbo Pascal with graphical animation (undergraduate final year project).

Consultation projects

Designed and implemented several accounting packages using Turbo Pascal and Clipper.

Proficiency

Platforms: SUN, SGI, IBM PC/Compatible.
Languages: C, C++, Pascal, Turing, Prolog.

PRIZES AND SCHOLARSHIP

Canadian Commonwealth Scholarship (1991–1996).

Hong Kong University Alumni Prize (1991).

Chan Kai Ming Prize (1990).

PUBLICATIONS

Wai-Kau Lo and Vassos Hadzilacos. Using failure detectors to solve consensus in asynchronous shared-memory systems. In *Proceedings of the Eighth International Workshop on Distributed Algorithms*, LNCS 857, pages 280–295. September 1994.

Wai-Kau Lo. More on t-resilence vs. wait-freedom. In *Proceedings of the Twelfth ACM Symposium on Principles of Distributed Computing*, pages 110–119. August 1995.

Wai-Kau Lo and Vassos Hadzilacos. All of us are smarter than any of us: more on the robustness of the Consensus hierarchy (Part I). Technical Report CSRI-348, University of Toronto, Toronto, Ontario, Canada, June 1996. Available at ftp://ftp.cs.utoronto.ca/pub/reports/csri/348. An extended abstract of this technical report appeared in *Proceedings of the Twenty-ninth ACM Symposium on Theory of Computing*. May, 1997.

Wai-Kau Lo and Vassos Hadzilacos. All of us are smarter than any of us: more on the robustness of the Consensus hierarchy (Part II). Technical Report CSRI-351, University of Toronto, Toronto, Ontario, Canada, October 1996. Available at ftp://ftp.cs.utoronto.ca/pub/reports/csri/351.

Wai-Kau Lo and Vassos Hadzilacos. On the power of shared object types to implement one-resilient Consensus. Technical Report CSRI-357, University of Toronto, Toronto, Ontario, Canada, January 1997. Available at ftp://ftp.cs.utoronto.ca/pub/reports/csri/357. An extended abstract of this technical report is to appear in *Proceedings of the Sixteenth ACM Symposium on Principles of Distributed Computing*. August, 1997.

REFERENCES

Professor Vassos Hadzilacos
Department of Computing
Imperial College
180 Queens' Gate
London SW7 2BZ
England
Phone: +44-171-594-8355
Fax: +44-171-581-8024
Email: vh3@doc.ic.ac.uk

Professor Faith Fich
Department of Computer Science
University of Toronto
10 King's College Road
Toronto, Ontario
M5S 3G4 Canada
Phone: (416) 978-6183
Fax: (416) 978-1931
Email: fich@cs.toronto.edu

Professor Prasad Jayanti
Room H1-B51
IBM T.J. Watson Research Center
30 Saw Mill Road
Hawthorne, NY 10532
USA
Phone: (914) 784-7316
Fax: (914) 784-7455
Email: jayanti@watson.ibm.com

Other references available upon request.