Lynch named Athena Lecturer

Massachusetts Institute of Technology
The Association for Computing Machinery's Council on Women in Computing [1] (ACM-W) today named Nancy Lynch, the NEC Professor of Software Science and Engineering at MIT and a principal investigator at MIT's Computer Science and Artificial Intelligence Laboratory (CSAIL), as the 2012-2013 Athena Lecturer. The Athena Lecturer award celebrates women researchers who have made fundamental contributions to computer science. It includes a $10,000 honorarium provided by Google.

Lynch developed mathematical approaches to understanding the capabilities of distributed systems, which rely on multiple processors for computation and coordination. These systems include traditional wired networks, modern mobile communications, cloud computing systems, parallel computers and embedded computers in factory machinery. Her contributions include modeling and proof techniques, algorithms and impossibility results that are now in the toolbox of computer scientists who design distributed systems.

"Lynch's work has influenced both theoreticians and practitioners," said Mary Jane Irwin, who heads the ACM-W awards committee. "Her ability to formulate many of the core problems of the field in clear and precise ways has provided a foundation that allows computer system designers to find ways to work around the limitations she verified, and to solve problems with high probability."

In a career spanning more than 30 years, Lynch identified the boundaries between what is possible and provably impossible to solve in distributed settings. She developed new distributed algorithms, created precise models for analyzing distributed algorithms and systems, and discovered limitations on what distributed algorithms can accomplish.

Lynch's breakthrough research with M.J. Fischer and M.S. Paterson produced the "FLP" result. It defined as a mathematical problem the challenge of establishing agreement in asynchronous distributed systems (i.e. those with no timing assumptions) in the presence of failures. This innovation had a major impact on the design of fault-tolerant distributed data-management systems and communication systems.

Lynch's textbook, *Distributed Algorithms,* is the definitive reference on the basics of the field. It introduces readers to the fundamental issues underlying the design of distributed systems, including communication, coordination, synchronization and uncertainty. It integrates the results of distributed algorithms research using a common mathematical framework.

Recent work

In collaboration with A. Shvartsman and S. Gilbert, Lynch developed the RAMBO

(Reconfigurable Atomic Memory for Basic Objects) algorithm, which maintains shared memory in rapidly changing networks that cannot assure access to a central server for data storage. It was originally envisioned for military applications as a means to preserve vital information for teams of soldiers operating in hostile environments. It also has applications for first responders where a stable infrastructure is not available.

In another recent project, Lynch and her collaborators proposed a new approach to programming mobile networks used for communication and for control of robots, cars and airplanes. It employs a new algorithm that allows actual mobile nodes to emulate some stationary virtual nodes, making the programming of mobile networks much easier. This emulation algorithm replicates the state of a virtual node at nearby mobile nodes, and enables the replicas to be transferred to different mobile nodes.

Background

Lynch heads the Theory of Distributed Systems Group at CSAIL. Prior to joining MIT, she served on the faculty at Tufts University, the University of Southern California, Florida International University and the Georgia Institute of Technology. A graduate of Brooklyn College with a BS in mathematics, Lynch received a PhD in mathematics from MIT in 1972.

An ACM fellow and a member of the National Academy of Engineering, Lynch and her co-authors received the 2001 and the 2007 Dijkstra Prizes in Distributed Computing. She was the first woman to win the ACM Knuth Prize, also in 2007. She was a co-winner of the first van Wijngaarden Prize in 2006 from the National Institute for Research in Mathematics and Computer Science in The Netherlands. In 2010, she received the Emanuel R. Piore Award from the Institute for Electrical and Electronics Engineers.

The Athena Lecturer is invited to present a lecture at an ACM event. Lynch's lecture will be delivered at the 2013 joint meeting of the Symposium on Principles of Distributed Computing (PODC) and the Symposium on Parallel Algorithms and Architectures (SPAA) sponsored by the ACM Special Interest Groups on Algorithms and Computational Theory (SIGACT) and Computer Architecture (SIGARCH). Each year, the Athena Lecturer honors a preeminent woman computer scientist. Athena is the Greek goddess of wisdom; with her knowledge and sense of purpose, she epitomizes the strength, determination, and intelligence of the "Athena Lecturers." The 2012-2013 Athena Lecturer award will be presented at the ACM Annual Awards Banquet, June 16, in San Francisco.

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[1] http://women.acm.org