UMIACS Retreat
August 25, 2011

UMIACS

Amitabh Varshney

UNIVERSITY OF MARYLAND

Welcome!

Goals of the Retreat

- Introspection and reflection about our Institute

- Developing and working towards a shared vision

- Opportunity for community building

- Overall to improve our Institute!

Broad Strokes

- Free and frank discussions amongst all faculty

- Build upon strengths, fix weaknesses

- Take stock of our challenges

- Learn from our collective past

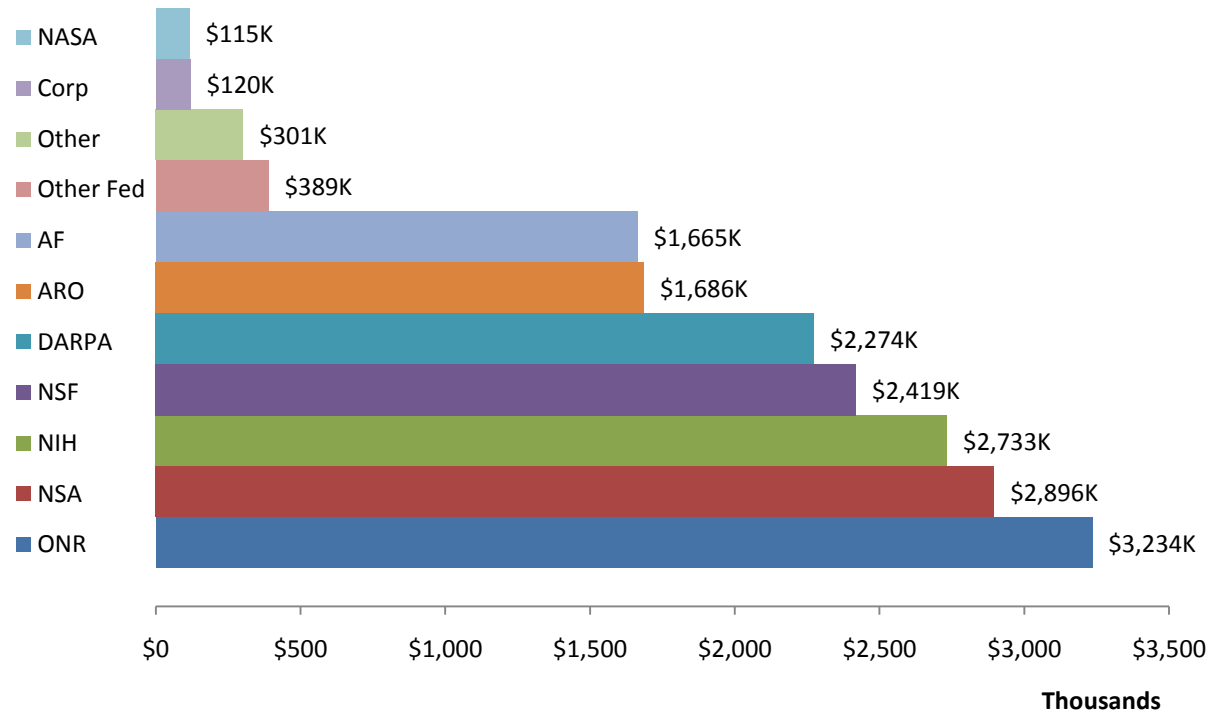- Actionable items on how we can improve
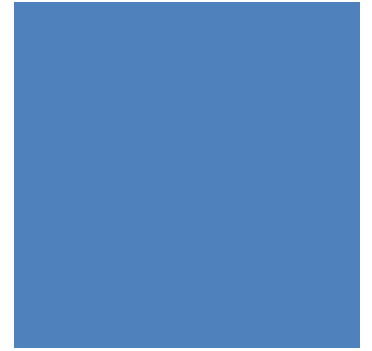
Current State

- Several successful interdisciplinary centers

- Outstanding faculty

- Very good infrastructure

- Corporate partnerships are mostly at an individual level

- Educational presence is virtually nil

- Excellent overall reputation on the campus

- Web presence and PR is minimal

UMIACS FY 11 Research Funding

Total: $17.85 Million

UMIACS FY 11 Expenses

Categories	Amounts
STATE BUDGET	
Faculty & Staff salaries only (equals total State Budget)	$3,333,458
DRIF FUNDS USED FOR OPERATING EXPENSES	
Computer Supplies	$57,848
Facilties/keys/parking	$33,768
Phones/Fed Ex	$107,582
Office Supplies	$32,274
Equipment	$135,348
Licenses/software	$39,796
Other	$8,500
Power	$27,996
Storage and network	$30,000
Maintenance	$102,047
Hourly students	$116,830
TOTAL DRIF	**$691,989**

Corporate Donors

Federal Agencies Interactions

Corporate Interactions

Entrepreneurship

Zumobi
Ben Bederson

XMTT Inc.

XMTT Inc.
Uzi Vishkin

Komoku
Bill Arbaugh

VisiSonics
Ramani Duraswaimi

Progress in the Last Year

- New Research Frontiers Award:
  - $210K thus far (Physics, Chemistry, CBMG, Biology, Mechanical Engg, Robotics Center, Computer Science)
- First Steps towards Web Presence and Visual Content

UMIACS Updates/Initiatives

News Features

UMIACS News Features

Next XMT desktop supercomputer prototype could provide a solution to common programming difficulties

Uzi Vishkin, a professor in the Electrical and Computer Engineering Department and the University's Institute for Advanced Computer Studies (UMIACS), explains the need to invest in research and development of modern computing systems that can be easily programmed. "The production of market application that are easy to program is a huge need for the American economy," remarked Vishkin. "Modern computers have all become multi-core parallel processors. Making such computers easier to program would be beneficial to the economy because it would enable the nation to use local talent."

The use of parallel processors allows multiple instructions to be executed in parallel much faster than serial computing, which, in principle, could only execute a single instruction at the same time. Parallel processing technologies have been used for years to create supercomputers; however, now chipmakers are designing mainstream computers with hardware that computer programmers often find too challenging to handle. Vishkin argues that the lack of productivity derives from a low comfort level in understanding the interaction between algorithms and architecture among hardware designers. "We need to replace the current build-first figure-out-how-to-program-later approach to hardware design," he said. "Instead, start with a simple abstraction based on a well-developed theory of parallel algorithms and then build the system," said Vishkin.

Such hardware design may already be in place. In 2007, Vishkin and his team at the Clark School of Engineering created a parallel processing supercomputer prototype, promising computing speeds a hundred times faster than desktops at the time. The prototype's ease-of-programming has been extensively demonstrated. The school's Explicit Multi-Threaded (XMT) prototype, or desktop supercomputer, had sixty-four processors. The National Science Foundation and the Department of Defense funded the project.

Now, using a simulator of the desktop supercomputer with a thousand processors in a single chip, students have been able to use the parallel algorithmic theory in order to solve advanced programming problems using algorithms and the *Parallel* Random Access Machine (PRAM) theoretical model. As explained in his Communications of the ACM article published in January, an abstraction encapsulating the parallel algorithmic theory concept makes "many instructions available for concurrent execution," resulting in inductive step-by-step instructions for concurrent functions. When Vishkin's students used the simulator of the new XMT supercomputer to solve different complex computing problems, the solutions turned out to be 11 to 43 faster than using the most modern systems currently provided by vendors.

"The objective now is to take the prototype to the next level: to build the thousand processors prototype," said Vishkin. After three decades of working in parallel computing, he is eager to deliver a prototype closer to the commercial version that would be appealing for mass-market use.

About Dr. Vishkin:
Uzi Vishkin has been Professor at the University of Maryland Institute for Advanced Computer Studies (UMIACS) since 1988. Per his ACM Fellow citation, he "played a leading role in forming and shaping what thinking in parallel has come to mean in the fundamental theory of Computer Science". He is the inventor of the explicit multi-threaded (XMT) many-core architecture, which is backed by six issued patents.

To learn more about Dr. Vishkin, click here.
To find more information on the XMT model and parallel computing, click here.
To read Vishkin's article on the multi-core dilemma published on the NIST web site, click here.

UMIACS News Features

Leafsnap's creators to receive the 2011 Edward O. Wilson Pioneer Award

Professor David Jacobs will receive the 2011 Edward O. Wilson Biodiversity Technology Pioneer Award for co-inventing Leafsnap, the First Mobile App for Plant Identification. This award honors individuals who have significantly contributed to the preservation of biodiversity. "As computer scientists we usually do work that is just within our field, so it's nice to see that people in other fields appreciate what we do," said Jacobs. "This has been a great project. It's really been a great collective effort."

Years ago, Professor Jacobs and Professor Peter Belhumeur of Columbia University, approached Dr. John Kress, then Chief Botanist at the Smithsonian, to build a system that identifies pictures of plant species using the object recognition techniques they developed. After obtaining a grant from the National Science Foundation, and thanks to the collective effort of students, specialists and volunteers, Leafsnap was launched in May. The app has been a resounding success: it had over a third of a million downloads in the first two months.

Leafsnap can analyze the photograph of a leaf and instantly search a collection of leaf images, acquired under the supervision of the Smithsonian Institution, to help you identify the tree. The technology behind this free app is similar to that of face recognition. Once you snap the picture of the leaf with your iPhone or iPad, the image is uploaded to a server to search for a match, and within seconds it returns with results of possible species. "This type of visual recognition makes people more engaged," said Jacobs. "[Leafsnap] gives you the information that helps you to figure out what you are looking at."

Currently Leafsnap's species gallery contains details about all the trees in New York City and Washington, D.C. The App's inventors plan to increase this collection to include the trees in continental United States, about 800 species. According to Jacobs, volunteers' contributions could help the growth of the present gallery. "A lot depends on how enthusiastic people are, " he remarked.

Jacobs and his co-pioneers are now trying to make this botanists' guide available on the Android platform. They are also considering the possibility of advancing the reach of this technology. "Most people are interested in having object recognition at their fingertips," explained Jacobs. "There are a lot of biologists interested in using this for other kinds of organisms, like insects or seashells. There might be some challenges to overcome for that, but the possibilities are really interesting."

The 2011 Edward O. Wilson Biodiversity Technology Pioneer Award will be presented to Jacobs and his co-inventors by The American Museum, the world's oldest continually operating museum of its type, in October.

About Dr. Jacobs:
David Jacobs has a PhD in Computer Science from MIT, where he was a member of the Artificial Intelligence Lab. He joined the University of Maryland in 2002, after spending ten years working at the NEC Research Institute.

For more information about Dr. Jacobs, click here.

UMIACS News Features

Jack Minker to receive the 2011 Heinz R. Pagels Human Rights Award

Professor Emeritus Jack Minker will be awarded the 2011 Heinz R. Pagels Human Rights Scientists Award from the New York Academy of Sciences for his work on human rights and scientific freedom of scientists. This award honors scientists for their contributions to safeguard or advance the human rights of other scientists throughout the world. Minker said that he is honored to receive the award. Other recipients of the award include Nobel laureate, Andrei Sakharov and the Cuban Economist Martha Beatriz Roque Cabello. "To be in distinguished company with Sakharov and other famous people, who worked very hard for the human rights of scientists, is overwhelming," said Minker.

An internationally recognized leader in the field of human rights of computer scientists, Minker became involved with human rights in 1972 when he was asked to join the Committee of Concerned Scientists (CCS) and to be in charge of finding human rights violations of people in computer science. "It was something I could not refuse to do," said Minker, who continues to serve with the CCS as its Vice-Chair. He has also been Vice-Chair of the Committee on Scientific Freedom and Human Rights (CSFHR) of the Association for Computer Machinery (ACM). Minker's main efforts in this area occurred between 1974 and the mid 1990's, during which there were many problems with scientists' human rights. Computer Scientists and other men and women of science were often harassed and sometimes prevented from working, from sending their children to the best schools and from holding scientific seminars. Many of them were imprisoned and had their lives threatened. Minker led multiple struggles for the release and more humane treatment of members of the Soviet Union scientific community such as Anatoly Shcharansky, cyberneticist Professor Alexander Lerner, and physicist Dr. Andrei Sakharov.

As Vice-Chair of CSFHR, Minker wrote about violations in Argentina, Czechoslovakia, South Africa, the Soviet Union, Pakistan, Poland, Rumania, and other countries. He published four reports in the Communication of the ACM listing 300 computer scientists, who had human rights problems in 13 different countries. According to Minker, verifying the accuracy of the information collected was crucial; he dedicated his evenings and weekends to finish the reports. After the first report was published in 1981, people began to send him letters about their relatives, who were experiencing human rights violations. He also sent copies of the report to the computer scientists who were listed in it and, if their location was unknown, to their families. "The reports brought to the readers' attention facts about specific human beings who had their rights violated so they weren't forgotten," said Minker.

Even as he worked on advancing the human rights of scientists, Minker continued to be a dedicated professor and a leading authority in artificial intelligence, deductive databases, logic programming and nonmonotonic reasoning. He was also the first Chairman of the University of Maryland's Computer Science Department two years after he started his work in human rights. Amid all his accomplishments, he considers his endeavors as a humanist the best thing he has done during his career. "I have done good work in science and I received some awards, but the most rewarding work that I have done is my work in human rights," said Minker. "Helping to build up a department is very satisfying, but to help a human being is a different thing. To give them hope is very rewarding. It is worth all the effort."

Minker shares this award with Dr. Binayak Sen, a famous Indian pediatrician and defender of human rights committed to helping indigenous tribes in the poorest areas of India. The Heinz R. Pagels award will be presented to Minker and Sen by the New York Academy of Sciences, an independent nonprofit organization committed to advancing science, technology, and society worldwide, in September.

About Dr. Minker:
An active member of the Association for Computing Machinery (ACM) since 1958, Jack Minker has performed extensive service for the scientific community, including being the founding journal editor of The Theory and Practice of Logic Programming. Among his many awards are the 1996 University of Maryland Presidential Medal and the ACM and American Association for Artificial Intelligence (AAAI) 2005 Allen Newell Award. Minker

UMIACS Labs
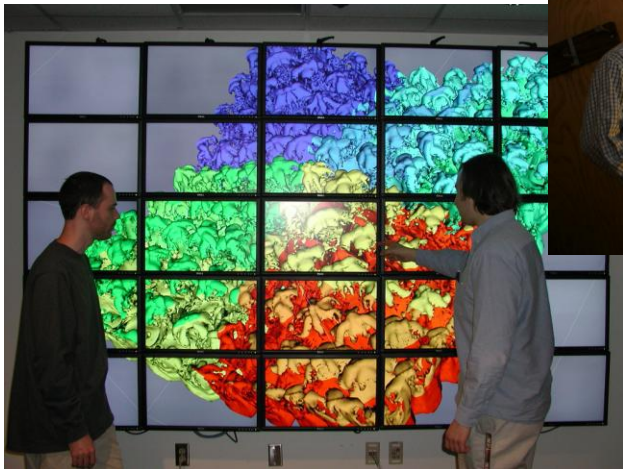
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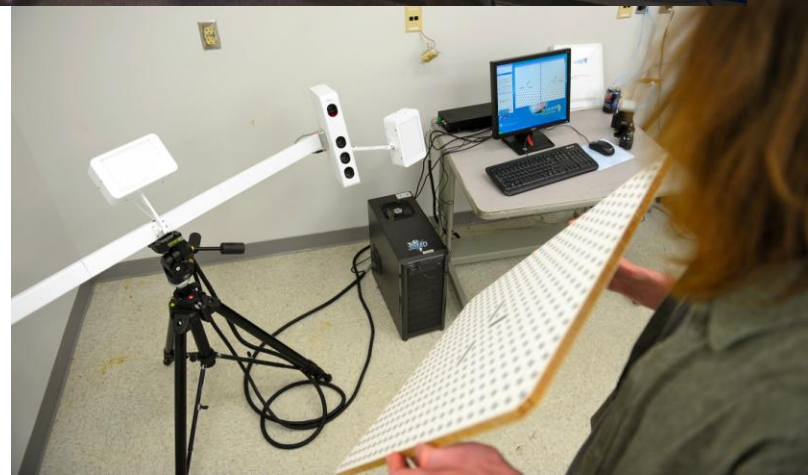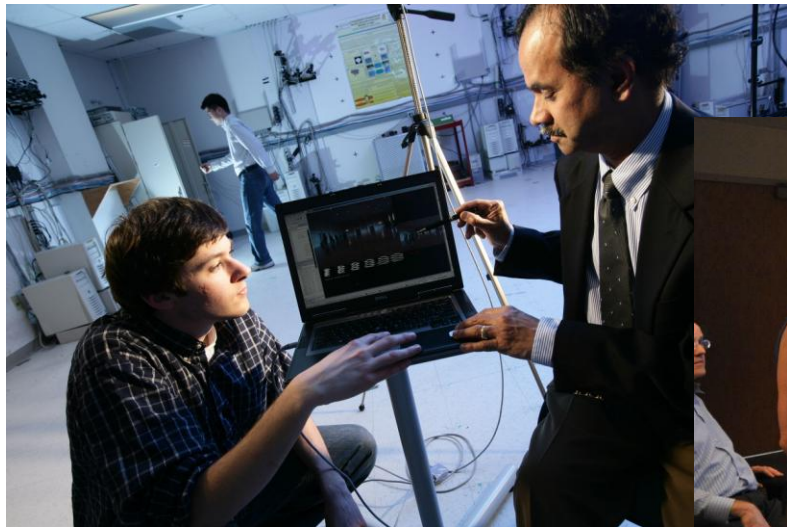
Faculty Books

Retreat Issues

- Research Mission

- Web Presence

- Outreach and Publicity

- Corporate Partnerships

Web Presence

- Committee: Adam Porter (chair), Ben Bederson, Jeff Hollingsworth, David Jacobs

- Scribe: Carl Kingsford

- What should we be doing/presenting on our website that we currently are not, and

- Are there any web strategies that will propel us ahead of the curve in promoting our faculty and our research?

Outreach and Publicity

- Committee: Allison Druin(chair), Amol Deshpande, Dave Doermann, Jimmy Lin, Louiqa Raschid

- Scribe: Jordan Boyd-Graber

- We are very weak in outreach and publicity

- Should we care? If so, what can we do to improve?

Corporate Partnerships

- Committee: Ashok Agrawala (chair), Michael Cummings, Ramani Duraiswami, Bill Rand

- Scribe: Hector Corrada Bravo

- What should UMIACS should be doing in fostering, nurturing, and enhancing our interactions with the industry that we are currently not doing (which is not much!).

Research Directions

- Committee: All of you!

- Scribe: Jeff Foster

Research Mission

- *"The Institute's mission is to conduct basic and applied research in computer and computer-related studies. Although closely affiliated with the Department of Computer Science, the Institute is expected to foster interdisciplinary research."*

Brit Kirwan's Memo August 25, 1985

- We continue to be evaluated on:
  - New Research Directions
  - New Research $$

Research Mission

- The coming hard times …

- How should we seed new areas in UMIACS ?

- Lets guide our discussion through the lens of three research efforts
  - Computational Linguistics: Amy Weinberg
  - Socio-Cultural Modeling: VS Subrahmanian
  - Cybersecurity: Michael Hicks