

Defense Advanced Research Projects Agency

DARPA & KR: Closing the Loop

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Created in 1958 in response to Sputnik launch

Agency mission:

To maintain the technological superiority of the U.S. military and prevent technological surprise from harming our national security by sponsoring revolutionary, high-payoff research that bridges the gap between fundamental discoveries and their military use.



DARPA's Role in Science and Technology







DARPA's IT Legacy



Internet/NGI **Optical**, ATM, Sonet, TCP/IP, **Packet** Workstations, Switching, HTTP Windows RIPTION-**Search Engines** DEF-CATEGOR DARPA is credited with EF-RELATIO **Linear Algebra** between a third and a half Libraries of all the major innovations in computer science and Natural Language & technology." **Speech Processing** What Will Be, Michael Dertouzos, **RISC – Microprocessors**, **Harper Collins Parallel Processing** PCs, Graphical Interfaces, Icons, Time Sharing, **Firewalls** Trained Researchers

SWANS Conference, 4/7/2005

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Speech and Language Understanding and Translation

Phraselator

- TIDES/EARS (automated processing of Arabic dispatches)
- LCS (Listen-Communicate-Show) spoken language interaction system





DARPA's AI Impact on DoD

- Planning Systems
 - DART (Dynamic Analysis Replanning Tool)
 - ACPT (Air Campaign Planning Tool)

- Decision Support Systems
 - CPOF (Command Post Of the Future)
- Robotic & Autonomous Systems
 - PackBot











DARPA's AI Impact on DoD



Simulation/Training TacAir-Soar



- Image/Signal Understanding
 - BCAMS (Bosnian Cantonment Area Monitoring System)
 - ASF (Automated Signal Filtering)

Intelligent Agent-Based Systems

 NCOT (Network-Centric Operating Technology)







- The ability to acquire, through experience, models of the world (including other entities and self), and use them productively to solve novel problems and deal successfully with unanticipated circumstances
- Acquiring models = *learning*
 - Including: by observation, exploration and experiment, teaching and coaching, reading
- Using models = *reasoning*
 - Including: "mental simulation," hypotheticals, plausible inference, logical thinking

Will yield robust, adaptable, transparent, supervisable, autonomous systems





Developing Cognitive Systems:

Systems that know what they're doing

A cognitive system is one that

- can reason, using substantial amounts of appropriately represented knowledge
- can learn from its experience so that it performs better tomorrow than it did today
- can explain itself and be told what to do
- can be aware of its own capabilities and reflect on its own behavior
- can respond robustly to surprise



Notional Anatomy of a Cognitive Agent







Notional Anatomy of a Cognitive Agent







Notional Anatomy of a Cognitive Agent

































- Dealing with the messiness of the real world
 - Non-logical statements (e.g., defaults, statistical assertions)
 - Uncertainty
 - Fuzzy concepts
 - Mixed representations (use each for what it's best)
 - Mismatch of vocabularies integration, translation
 - Scale
- Representation of and reasoning about actions, processes, flows
 - Temporal change
 - Creation and destruction of objects
- Trust and transparency
 - Sharing derivations and explanations
- Decrease barriers to knowledge creation
 - Accessibility to the untrained, use of the masses
 - Automatic methods
- Please send us a Program Manager!



Join us for the Second Cognitive DARPA Systems Conference





THE 2ND COGNITIVE SYSTEMS CONFERENCE

SPONSORED BY THE INFORMATION PROCESSING TECHNOLOGY OFFICE - DARPA



May 19-20, 2005 Hyatt Regency Crystal City Arlington, VA

Links

Overview

Overview The last two years have seen exciting growth in the area of Cognitive Systems - computational systems that reflect the human mental faculties of knowing, perceiving, conceiving, reasoning, judging, and learning. DARPA's Information Agenda Processing Technology Office (IPTO) has initiated several new and substantial programs supporting research in Steering Commitee Cognitive Systems, and numerous new research efforts, sessions at conferences, and workshops have sprung up to pursue the major challenge of building integrated intelligent systems whose reasoning, perceiving, and learning Hotel Information capabilities interact and support one another in intimate and significant ways. Registration In November of 2003, IPTO sponsored the first Cognitive Systems Conference, which comprised four outstanding technical sessions in key topic areas, two exceptional invited lectures, a student poster session, and a major celebration of IPTO's 40th anniversary. The conference was oversubscribed, the dialogue was excellent, and by all measures the Cognitive Systems 2005 Help meeting was exceptional. Given the success of the first gathering, we are announcing the second Cognitive Systems Conference, to be held May 19-20, 2005, in Arlington, Virginia, Most of the planning for this conference has been carried out by an outstanding Steering Committee from the technical community, led by Selmer Bringsjord (RPI) and Daniela Rus (MIT). The committee has done a wonderful job in putting together an ideal agenda, and we are eager to have your participation. If the meeting is half as exciting and thought-provoking as the first one, it will be well worthwhile. In the stule of the first meeting, we will have a single track of sneekers addressing four primery themes

SWANS Conference, 4/7/2005

www.cogsys2005.com