



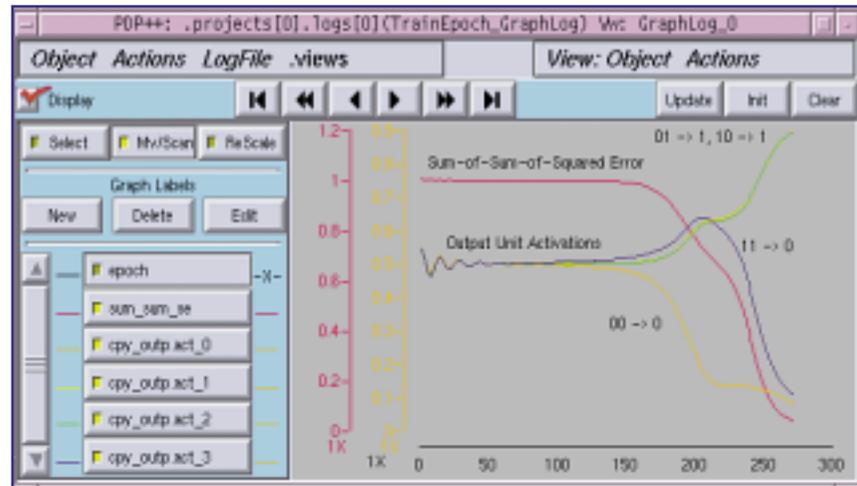
Happy Birthday, PDP++

The classic neural-network simulation system PDP++ recently reached version 2.0. PDP++ represents the next generation of the Parallel Distributed Processing (PDP) software released with *Explorations in Parallel Distributed Processing Handbook* (McClelland and Rumelhart, MIT Press, 1987). The software is easy enough for novice users to pick up, but also powerful and flexible enough for research use.

PDP++ is free and available under a license that allows access to source code and permission to modify but prevents for-profit redistribution. The current version, released in August 2000, is a major upgrade from previous versions.

The new features in version 2.0 are numerous. Microsoft's Windows platform is now fully supported (using the Cygwin environment). Many views were added or improved. The Enviro View, which provides a graphical user interface (GUI) for event and pattern layout, was rewritten. Likewise, the Grid View was rewritten to allow interactively configurable visual layout of your networks. You may now easily view all network weights via the Grid Log. Cluster plots are now easy to create using the new plot interface, and context-sensitive help is available via the Help menu on all objects (through HTML). Also, this version includes lots of bug fixes, with minor improvements all around. In short, every known way to crash software has been fixed.

The full GUI is based on the InterViews toolkit. It allows users to select their own "look and feel." The Network Viewer shows network architecture and processing in real



A Graphlog screen from the new version of PDP++.

time and allows networks to be constructed by pointing and clicking.

Training and testing data can be graphed online, and the network state can be displayed over time numerically or using a wide range of color- or size-based graphical representations. The Environment Viewer now shows training patterns using color- or size-based graphical representations and is interactively configured. Flexible object-oriented design allows mix-and-match simulation construction and easy extension by deriving new object types from existing ones.

Possibly the best aspect of PDP++ is the integrated scripting language, CSS. This built-in language uses C++ syntax, and allows full access to simulation object data and functions. The transition between script code and compiled code is simplified because both are now written in C++. The script editor has command-line completion, a source-level debugger, and provides standard C/C++ library functions and objects. Scripts can control processing, generate training and testing patterns, and automate routine tasks. One nice feature is that

scripts can be generated from GUI actions, and the user can create GUI interfaces from script objects to extend and customize the simulation environment.

PDP++ is an excellent environment for creating and debugging networks and includes many algorithms for training the networks. It provides methods to train feedforward and recurrent-error backpropagation, including continuous, real-time models and Almeida-Pineda algorithms.

PDP++ also is equipped with constraint satisfaction algorithms and associated learning algorithms, including Boltzmann machine, Hopfield models, mean-field networks (DBM), interactive activation and competition (IAC), and continuous stochastic networks. Self-organizing learning algorithms include competitive learning, soft competitive learning, simple Hebbian, and self-organizing maps (called Kohonen nets).

A new 250-page manual on PDP++ is now available in HTML, PostScript, and PDF formats on the PDP++ website (www.cnbc.cmu.edu/PDP++/PDP++.html).

Extendable Intelligence

Unless you are a recent intelligent system, you probably have heard that XML (Extensible Markup Language) has emerged as a standard format for describing data of all kinds. But you may not have heard that James Schoening is launching a project to develop the syntax and semantics of a standard upper ontology covering about 2,000 of the most fundamental and commonly used concepts.

An ontology is a set of terms and formal definitions. Schoening's project will be limited to "the upper level," which gives definitions of general-purpose terms and a structure for compliant lower-level-domain ontologies. The project is estimated to contain between 1,000 and 2,500 terms, plus roughly 10 definitional statements for each term. It is intended to provide the foundation for ontologies

of much larger size and more specific scope.

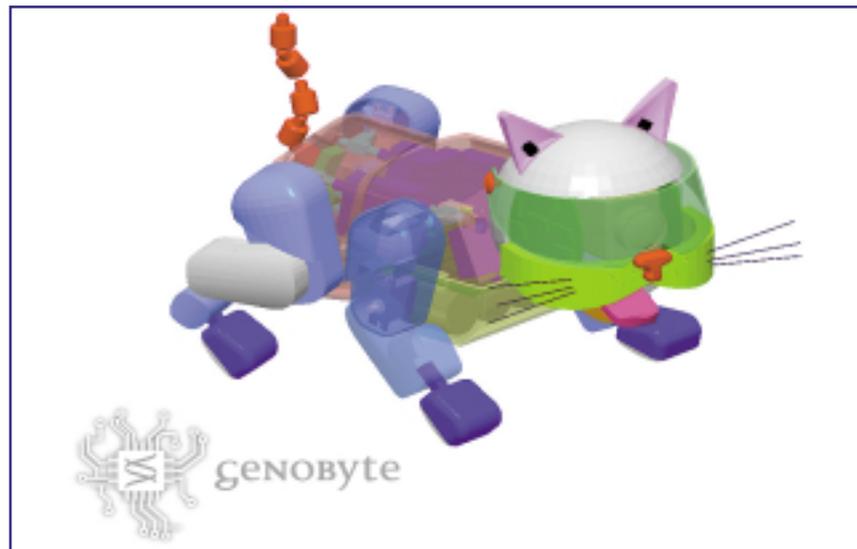
Schoening chairs the IEEE Learning Technology Standards Committee and co-chairs a U.S. Department of Defense panel on XML. IEEE has approved a 6-month "scope and purpose" study by the IEEE Standard Upper Ontology Study Group to review the technical feasibility of the project.

AI Hype Watch

Of all fields, it is probably easier for those in artificial intelligence (AI) to make claims that are just a little bit beyond reality. This section of the News is dedicated to keeping ourselves in check and to keeping an eye on newsmakers that have made extraordinary statements. Of course, sometimes hype is not our fault. Sometimes the media tend to exaggerate just a tad. In any case, we'll report what we find here. If you encounter a report in the press, or directly from the researcher's mouth, send us a note at hypewatch@dangermouse.uark.edu.

An online article in Australia's *The Age* begins: "Professor Hugo de Garis ... fears that his experiments may ultimately lead to the extermination of the human race." Well, where can an article go from there? Further into the article, it continues, "A massively powerful artificial brain could easily develop contempt for its comparatively puny human makers," says Professor de Garis...

First, the facts. De Garis has indeed begun a 12-month study to attempt the evolution of Robokitty, a field programmable gate array



Genobyte's Robokitty is based on an FPGA Cellular Automata Machine (CAM) that contains 72 million silicon neurons.

(FPGA)-based cellular automata machine (CAM) that contains 72 million silicon neurons. He estimates that 130 billion such CAM cells can be updated per second, allowing a neural network module to be trained in about a second.

Of course, we need to discuss the ethics of AI, but it is probably a bit premature to worry about the extermination of the human race. On the other hand, if your name is Robokitty

and you are reading this article, please ignore my ramblings...

You may have seen Sony's robot dog, AIBO, in the news recently. On a Sony website we saw, "Since AIBO is equipped with adaptive learning and growth capabilities, each pup can develop its own personality, shaped by the praise and scolding of its owner. ...He responds to touch, thanks to his pressure-sensitive

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New Griddle Makes Robot Chef Practical

AccuTemp, of New Haven, Indiana, demonstrated to attendees of a recent West Coast restaurant trade show their hamburger- and pancake-cooking robot. Flipper, as he is affectionately known, made its debut at the show to demonstrate AccuTemp's new even-cooking griddle. The griddle boasts accurate and consistent temperature control across its surface that makes it easy for a robot to produce perfectly cooked hamburgers, pancakes, and so on.

Flipper can work two shifts per day, 7 days a week. It can cook 500 hamburgers or 300 orders of fries an hour. The only problem with the system is that AccuTemp isn't that interested in being in the robot business. "We just took the robot out of our manufacturing plant. It normally is a spot welder. We gave it a different program, put some magnetic clips on its arm, and now it cooks hamburgers," said a company spokesperson.

Although AccuTemp isn't rewriting

its business plan to include robots, the company is opportunistically adapting. You can get a 5-year lease on your own Flipper, complete with griddle and steamer, for \$150,000. Considering you don't need to pay insurance, taxes, and it doesn't require training or breaks, it sounds quite cost-effective.

Interestingly, we see this as a breakthrough in robotics, but AccuTemp's point was that its new equipment is so easy to use that even a stupid robot can cook on it.

Gun-Carrying Robots Shoot First, Ask Questions Later

The world's first armed robot security guard that can open fire on intruders was unveiled in Bangkok this summer. It is one of five Thai-made high-tech robots introduced by the Thailand Research Fund.

Pitikheth Suraksa of the King Mongkut Institute of Technology's Lat Krabang campus, said his roboguard was developed from an unarmed "tele-robot" built in Australia in 1994.

"The robot is equipped with a camera and sensors that track movement and heat. It is armed with a pistol that can be programmed to shoot automatically or wait for a fire order delivered with a password from anywhere through the Internet," Suraksa said.

"How would you debug something like that?" Jared Hudson, an undergraduate at the University of Arkansas asked. Very carefully, we suspect.

AI Hype Watch

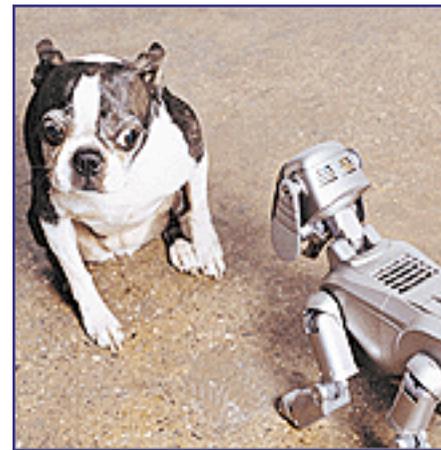
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head." I guess that reads better than "Since AIBO is equipped with a random number generator, each machine acts differently. ...It responds to touch, thanks to a switch in its head."

Sony continues: "AIBO is an autonomous robot that acts in response to external stimulation and its own judgment. It displays various emotional expressions and learns by communicating and interacting with human beings."

We'll be keeping an eye on AIBO, especially around Christmas, no doubt. We suggest keeping AIBO away from Robokitty.

Brazil is reported to be testing an "expert system" program to help judges impose fines, jail sentences, or damage awards for traffic accidents. Three judges in Espirito Santo are testing the Electronic Judge program as part of the Justice-on-Wheels initiative that puts judges and court clerks on the street in vans with laptop computers.



Sony's AIBO robot dog examines a biological version. The dog is supposed to adapt to an owner's commands.

Most of the cases handled require simple yes-or-no questions to be answered with no interpretation of the law. (Half the people who use the system are reportedly glad to have disputes settled quickly. The other half, we're guessing, lost their disputes.)

The program was developed in Visual Basic by Judges Pedro Valls Feu Rosa of the state's Supreme Court of Appeals. Although this is an interesting use of computing in the legal system, calling this an expert system seems to be an exaggeration.

Robotic Gas Attendants Replaced by Humans

Shell Oil Company recently abandoned a 3-year experiment with robotic gas pumps. The system was being tested in Indiana and California and worked pretty well. It required a special colorful gas cap and protective rubber target.

Although the system reportedly worked well in clear weather, rain and snow created problems for the vision system, a spokesperson for Shell said. It also had problems with ever-chang-

ing car designs. Each robotic pump cost about \$40,000 more than a regular pump.

It didn't sound like Shell was trying too hard to get people to use the system, however. They charged people an extra dollar per gallon (recall the high prices of gas anyway this past summer), and also required them to buy the \$20 special gas cap. About 300 people tried the experiment.

AAAI Robot Competition

The American Association for Artificial Intelligence (AAAI) held its annual Robot Competition this year in Austin, Texas, in association with AAAI's yearly conference.

This year three robot contests were held: a repeat of the "Hors d'oeuvres anyone?" competition, where robots serve food to conference attendees; a new event called Urban Search and Rescue (USAR); and the continuing "robot challenge."

The contests allow teams from colleges, universities, and other labs to show off their best attempts at solving common robotics tasks in a competitive environment. Teams compete for place awards as well as for technical innovation awards, which reward particularly interesting solutions to problems. In addition, winning teams are awarded research-class robots.

Alan Schultz of Naval Research Laboratories did an outstanding job of organizing the exhibitions and competitions. Lisa Meeden of

Swarthmore College took care of the details of the competitions and did a great job in keeping everything running smoothly.

The objective of the USAR contest is to give participants the opportunity to work in a domain of practical importance. Robots had to enter a fallen structure, find human victims, and direct human rescuers to the victims. Victims could be found by their body heat, motion, sound, or skin color.

This year marked the first year for the USAR event. The National Institute of Standards and Technology (NIST) designed (with Schultz's help) and built a USAR structure in which the victims were to be searched and rescued. The impressive structure contains areas of easy, medium, and hard degrees of difficulty for autonomous mobile robots to move about.

The "easy" area of the USAR

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AI for IAs

According to a report by the Cahners In-Stat Group, Internet appliances (IAs) are expected to increase by a factor of 15 between now and 2004. The report predicts sales of IAs will exceed 37 million units in 2004, up from slightly more than 2 million in 1999. Consumer reliance is expected to shift from sophisticated computers to cheaper, easy-to-use IAs such as TV set-top boxes, Web phones, and Internet terminals.

Such an increase in connectivity should pique the imaginations of those interested in distributed systems, agency, and cooperative robotics. Harnessing the power and possibilities of these appliance networks with an easy-to-use interface is sure to be a hot field.

Big, Spindly Cells Cause Many to be Self-aware

Researchers at the California Institute of Technology (Caltech) have found clusters of large neurons unique to the brains of humans and a few closely related primates. The neurons are found in the frontal lobe near the corpus callosum. The spindle-shaped cells are almost large enough to be seen with the naked eye (well, with the skull cap removed and if you stand close enough). These cells are thought to enhance thoughts, including problem solving, self-control, and self-awareness. In brief, these are the cells that allow researchers to figure out what these cells are used for.

AAAI Robot Competition

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course was still a challenge for many of the robots, because it contains glass walls (hard to detect for laser and sonar) and objects that fell below the line of some robots' sensors. However, the medium and hard degrees of difficulty were designed to give robotics researchers something to attempt for the next few years. For example, the "hard" area contained a ramp and large holes that robots were to avoid lest they come crashing down to the area below.

In the USAR event, Swarthmore College took first place, with the University of Arkansas, and University of South Florida taking second and third, respectively.

Swarthmore demonstrated a system that could enter an area and produce panoramic images with areas containing possible victims highlighted. They used a Magellan Pro from RWI, which is now a part of iRobot. The University of Arkansas used three robots that attempted to find victims using sound localization cues. They used two Pioneers from ActivMedia, and a B21R from RWI. The University of South Florida used teleoperated robots (an Urban and an ATRV2, both from RWI) and actually found victims in the arena. Unfortunately they were penalized by the judges for having nonautonomous systems.

The "Hors d'oeuvres anyone?" competition was held during the final evening of the AAAI conference. Robots provided the snacks at the conference banquet. Again, Swarthmore took top honors, followed by University of Arkansas and University of South Florida, respectively.



ActivMedia's AmigoBOT (activmedia.com) is a new alternative to high-priced robotics. AmigoBOT was one of the prizes awarded at the AAAI Robot Competition.



The University of South Florida used a teleoperated ATRV2 from Real World Interface to find victims in the Urban Search and Rescue. Here their robot is shown exploring one of the most difficult parts of the contest.

Both Swarthmore and the University of Arkansas had rendered faces on small LCD screens, and the University of Arkansas created a moving mouth and eyebrows via

Recognizing Speech

The Education Development Center, Inc. (EDC), together with the Communication Enhancement Center at Children's Hospital, Boston, recently launched a three-year project, funded by the Department of Education, to explore the use of speech-recognition software (also known as voice recognition) for writing by secondary students with disabilities. For three years, researchers will explore, develop, pilot, publish, and market an integrated set of products that include adaptations for students with disabilities, tools for educators, and much more.

EDC has a website (www.edc.org/spk2wrt/lab.html) called Speaking to Write (abbreviated spk2wrt). There you can find a Resource Lab where you can view documents on EDC's speech-recognition technologies.

I Think I'm Learning Japanese, I Really Think So

In the Computists Weekly free e-mail update, Bill Park was reportedly trying the Transparent Language tutor for Japanese from transparent.com. Transparent.com's goal is to provide a language community portal on the Web. It hopes to eliminate language barriers between different cultures around the world. To that end it offers services and software for learning languages.

One feature of their Japanese

tutor system is the ability to play a native Japanese speaker's pronunciation and then allow you to provide your own attempt via microphone. The system will then rate you on its "correctness meter" on how well it thinks you have done. How well does the meter work? "You can blow your nose and get a 'good' rating for a whole sentence," quips Park. It's a good idea, though, and we hope progress continues.

servo motors. The University of South Florida again sported robots in beautiful costumes.

Two special awards were given to teams exhibiting special attention to integration. The Nils Nilson Integration Award went to the University of South Florida, and the Ben Wegbreit Integration Award went to Swarthmore College.

The final contest was the "challenge," so called for good reason; the goal of the challenge is to create a

robot capable of attending a conference on artificial intelligence. This includes finding its way to the registration booth, registering, and even hobnobbing with the other attendees. In addition, the robot has to present a paper, complete with a question-and-answer period! This is meant to be a decade-long challenge.

Honorable mention was given to Northwestern College for its language processing system. The University of Sherbrooke also received honorable

Cool Projects of the Month

IBM's Lotus Ireland subsidiary will offer a Java-based, real-time, Web chat, translation product in September. The product will allow people that don't speak the same language to chat in real time.

The final release of Visual Prolog 5.2 is now available both in professional and personal editions; the latter is available for free.

Visual Prolog version 5.2 offers many improvements over version 5.1. The Prolog development team said that serious improvements were made in the language and compiler, and the Visual Development Environment, or VDE, is now much more convenient. The team also said that the build time of large projects has been reduced. Together with the improved handling of domains, this results in a much shorter editing, compiling, debugging cycle.

To read more about Visual Prolog, visit www.visual-prolog.com.

mention for its comprehensive approach. Sherbrooke attempted all aspects of the challenge.

In 2001 the International Joint Conferences on Artificial Intelligence (IJCAI) and the AAAI contests, designated RoboCup-01, will be held together in Seattle, Washington, August 4 through 10. Start planning now to participate in the contests. You can find details at www.aaai.org. More robots are promised to be given away. You can see details of the NIST-built USAR structure at www.nist.gov/public_affairs/releases/n00-13.htm.

MLNET is a European "network of excellence" in machine learning, case-based reasoning, and knowledge acquisition. It collaborates with three other European networks—ERUDIT on uncertainty modeling, EvoNet on evolutionary computing, and NEuroNet on neural network computing—on the theme Computational Intelligence and Learning. See www.mlnet.org and www.dcs.napier.coil.

Warren Sarle maintains an excellent FAQ about neural networks (NN) and related techniques. His recommendations for textbooks on NN can be downloaded from [ftp.sas.com/pub/neural/FAQ4.html#A_books_notable_general](ftp://ftp.sas.com/pub/neural/FAQ4.html#A_books_notable_general).

Netlab is a Matlab package for neural networks, more advanced than Matlab's neural-net toolkit. NN textbook author Chris Bishop was one of the developers. It's free, from neural-server.aston.ac.uk/netlab, for Unix or PC.

The National Science Foundation (NSF) recently extended its Small Grants for Exploratory Research supplements. NSF's updated Grant Proposal Guide will become effective October 1, 2000. Broader impacts of proposals, as well as intellectual merit, are now considered. NSF has also updated the CISE Next Generation Software Program announcement. For more information, see www.nsf.gov.

ACM has issued a call for nominations for more than a dozen awards. The deadline is October 31, 2000, for most. See www.acm.org/wardws/ for more information.

Software sociobiologists are finding evidence that programs developed by constrained search processes can be cheaper and more efficient than traditionally written software. Check out Michael Schrage's *Serious Play: How the World's Best Companies Simulate to Innovate*, (Harvard Business School, 1999, 244 pp).

The Synaps Pointer algorithm uses a hybrid combination of GA, SQP, and Simplex linear programming optimization. You can find details, including a comparison of performance, at www.synaps-inc.com.

Need to motivate students to learn Lisp or Scheme? Have them take a look at its use in the Sony Playstation game "Crash Bandicoot" at www.gamasutra.com/features/19991112/GavinWhite_03.htm. New creatures can reportedly be prototyped in just a few minutes.

There is a new website for robotics news at www.angelusresearch.com/ResearchCentral.htm.

Robohoo! (www.robohoo.com) claims to be the world's largest index of robotics resources, organizations, and competitions.

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IN BRIEF

news... news...

Computists International (CI) is closing its doors on its regular membership offer. CI has long provided the main source of this author's news tidbits. However, don't fret: the CI-Freebies will rise to the level of the old service, with advertising covering production costs. You'll find the new free service at www.egroups.com/group/CI-Freebies.

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Do you have an item that you think is suitable for the News section in *intelligence*? We'd like to hear from you. Please send your item to d.blank@csce.uark.edu.

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