Open Source AI

Open source has emerged recently as viable model of software development. With great success stories such as Linux, Perl, Apache, and others, the open source movement has produced truly useful software, even appearing to challenge the long established commercial giants. The development model has worked for operating systems and Web servers, but could an open source AI project be successful?

Of course, many academics have always made their source code available to other researchers, but rarely has an AI project drawn a large, collective effort such as is common with open source projects. However, some open source, or free unrestricted use, AI projects have recently made the spotlight.

One such project is the Festival speech synthesis system from the Centre for Speech Technology Research at the University of Edinburgh. Festival is a general, multi-lingual speech synthesis system supporting many API's (application programming interfaces). In addition, Festival has a complete development environment for further research into speech synthesis techniques. Festival is written in C++ and comes with a Scheme-based command interpreter (a freely available project in its own right, named SIOD) for general control.

The goal of Festival is a tall order: to make "speech synthesis as natural, flexible and efficient as human speech." They haven't quite reached that goal yet, but you can sample Festival's current state-of-the-art from the CSTR Web site (listed below).

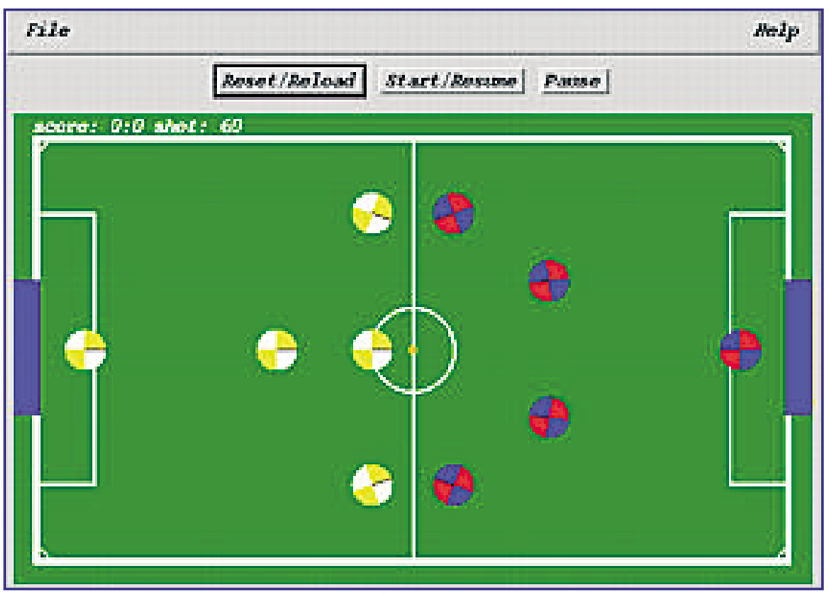

Figure 1.

Although Festival has been developed completely at CSTR, many other groups have contributed to its success, including:

- Faculte Polytechnique de Mons are working on MBROLA (as in "umbrella"), a collection of voices for Festival, including Portuguese, German, English, Spanish, French, Dutch, and Romanian. For many languages, both male and female versions are available.
- IMS, University of Stuttgart, offers a text pre-processor to create German-speaking Festival.
- CMU has developed the Festvox project, which offers documentation, tools, scripts, and examples of building new voices in Festival.
- Oregon Graduate Institute's Center for Spoken Language Understanding offers a speech toolkit for easily building spoken language systems, including speech recognizers, and dialog builders that work with Festival.

CSTR provides an excellent set of tools for getting started in text-to-speech research, but it is also a very nice system if you are only interested in adding speech to an existing project. Festival even comes with a speech server, so you need only send the text string you want spoken to a device, and it does the rest.

On the other end of the speech problem lies, of course, recognition. CMU recently announced that they were turning their Sphinx speech recognition system open source. Sphinx is a large vocabulary, speaker-independent, speech recognition system that CMU's speech group has been developing for the last few years. Although it isn't yet well suited for conversations with background noise, it seems to work well over the telephone or in a quiet cubical.

I had a chance to speak to Sphinx recently over CMU's Movieline, and it did quite well in recognizing my freestyle, unconstrained phrases. Although Sphinx and Festival are

very good, I'm not sure that these two systems could yet talk to each other.

The Sphinx source code is also available on-line, with other tools from CMU's speech group.

There are also other AI projects of various levels of sophistication now being released as open source, or freely available with some limitations. To name just a few:

- XRCL, the University of Arkansas' Extensible Robot Control Language with support for a fuzzy-logic, behavior-based controller
- NLPserver and NLBean™, Mark Watson's open source systems for Natural Language Processing
- ALICE, Richard Wallace's chat robot
- PDP++, CMU's and PITT's rewrite of their classic neural network simulation system

Can AI professionals successful collaborate on open source software? Do you know of a successful AI open source project or other item suitable for the News section in Intelligence? We'd like to hear from you. Please send your item to Douglas Blank at dblank@csce.uark.edu.

For further information on the above projects, follow the links below. Notice that each package has its own distribution license and limitations on use.

SIOD: people.delphi.com/gjc/siod.html
Festival: www.cstr.ed.ac.uk/projects/festival/
Sphinx: www.speech.cs.cmu.edu/sphinx/
XRCL: ai.uark.edu/xrcl/
NPL server: www.markwatson.com/
ALICE: alicebot.org/
PDP++: www.cnbc.cmu.edu/PDP++/PDP++.html

Programming Robots in Java

This month, the CMU MultiRobot Lab released their second version of the TeamBots system. Originally called JavaBots, TeamBots has had more than a name change recently.

TeamBots is a Java-based collection of application programs and Java packages for multiagent, mobile robotics research. The system supports prototyping, simulation and execution of multirobot control systems. Robot control systems developed in TeamBots can run in simulation and on mobile robots, including Probotic's Cye robot and Nomadic Technologies' Nomad 150 robot. A port to K-Team's Khepera is expected to be made soon.

One of the most important features of the TeamBots environment is that it supports prototyping in simulation of the same control systems that can be run on mobile robots. In addition, the simulation environment is quite flexible. For example, TeamBots supports multiple heterogeneous robots running heterogeneous control systems. Complex (or simple) experimental environments can be quickly designed with walls, roads, opponent agents, and various types of obstacles.

TeamBots includes an inter-robot communication package, RoboComm, that provides broadcast, unicast or multicast of any Java data structure.

Because TeamBots is 100% Java, one might question the speed of a multirobot control system. But in running TeamBots, I didn't find speed to be an issue. In addition, the system is very easy to learn, even for those students that didn't know Java. I have found it to be a very rewarding experience for the students as they can become productive very quickly. Most of the student teams had 5-player robot soccer teams playing within a few hours.

The system includes a simulation of the RoboCup small-size league play, and many example teams developed by students. RoboCup is an annual robot competition. The Fourth Robot World Cup Soccer Games and Conferences will take place this year in Melbourne, Australia, and will be held from August 26 - September 2 at the Melbourne Exhibition Centre.

RoboCup, is meant to be an international initiative to foster AI and intelligent robotics research by providing a standard problem (soccer) where a wide range of technologies can be integrated and examined. TeamBots is an excellent tool to use to explore this area.

The TeamBots distribution is a full source-code release, and the TeamBots software is freely available for non-commercial use; however, commercial use requires a license.

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TeamBots has had a team of contributors over the last couple of years, including Dr. Tucker Balch, Professor Manuela Veloso, and Professor Ronald C. Arkin.

You can find more information about TeamBots at www.TeamBots.org. For further information on items mentioned above, follow these links:

KHEPERA: www.k-team.com/links/software.html

NOMADICS: www.robots.com/

RoboCup: www.robocup.org/

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 Lisa Meeden at *meeden@cs.swarthmore.edu*.

New Books

"Advances in Genetic Programming, Volume 3" edited by Lee Spector, William B. Langdon, Una-May O'Reilly, and Peter J. Angeline. A Bradford Book.

"Artificial Intelligence: Critical Concepts in Cognitive Science, Volumes 1-4", published by Routledge of the UK. Due out this year.

"Information Visualization: Perception for Design", by Colin Ware. Morgan Kaufmann Publishers.

"The Robot in the Garden: Telerobotics and Telepistemology on the Internet" by Ken Goldberg of the University of California, Berkeley. Coming Spring 2000 from MIT Press.

A few upcoming AI Events

1. Conference on Computational Intelligence for Financial Engineering. CIFER-2000 will be held March 26-28, 2000 in New York, New York. www.ewh.ieee.org/tc/nnc/cf/cifer00
2. The Fifth Practical Application Expo. PA EXPO 2000 will be held April 10-14 in Manchester, England. www.practical-applications.co.uk/Expo2000/index.html
3. Eleventh Annual Midwest Artificial Intelligence and Cognitive Science Conference. MAICS 2000 will be held 15-16 April at the University of Arkansas, Fayetteville, Arkansas. http://csce.uark.edu/maics2000/
4. Language Technology Join Processing Conference. ANLP/NAACL will be held April 29-May 3 in Seattle, Washington. www.aclweb.org
5. Workshop on Interactive Robotics and Entertainment. WIRE-2000 will be held May 14-15 in Pittsburgh, Pennsylvania. www.cs.cmu.edu/~trb/wire
6. Fifth International Conference on Intelligent Tutoring Systems ITS 2000 will be held June 19-23, 2000, Montreal, Quebec, Canada. www.info.uqam.ca/its2000/
7. IASTED International Conference on Artificial Intelligence and Soft Computing.AISC'2000-2000 will be held July 24-26, 2000 in Banff, Alberta, Canada. www.iasted.com

Kumar Chellapilla and David Fogel have evolved a checkers playing program that is reportedly "competitive with human experts." You can play it at www.zone.com, and see the report in Proceedings of the IEEE, September 1999.

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You'll find an updated ALife Central at Scott Robert Ladd's www.coyotegulch.com. It contains reviews and other resources for those interested in ALife. One especially nice feature is its set of Java applets for demonstrating swarm behavior, genetic algorithms, and travelling salesperson optimizations. Although the Java source code isn't yet available, it is said to be coming.

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Brian T. Rice has initiated a new AI language project called Slate, and he is looking for help. Slate is to combine dynamic elements of Self with the patterns and abstractions of BETA, Lisp's abstract syntax tree, Smalltalk-80's recursive interpreter, and a functional object semantics. One planned project is to allow programming through visual gestures. Slate is to be released as an open source project under the GPL (GNU Public License). For more information, see www.tunes.org/~water/slate-home.html.

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Ken Laws orchestrates an e-newsletter called Computists' Weekly, that "keeps artificial intelligence researchers, computer scientists, and students up-to-date on news, trends, grant competitions, job opportunities, online resources, and career issues. It's a newsletter for AI researchers, rather than one about AI techniques." If you like these type of news briefs, then you'll be glad to learn that the US CW membership price has dropped by 50% this year. If you are willing to wait 2-3 weeks and wade through a bit of advertising, you can even get them for free. There are also many other resources available at the Computists Web site (www.computists.com).

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