



Resource Review: A Web-Based Tour of Genetic Programming

Genetic programming (GP) is a robust, flexible, and intuitive Artificial Intelligence paradigm with an amazingly diverse range of applications. Unfortunately, getting up to speed with current research presupposes an understanding of basic concepts—which, of course, research articles do not have the space to address. To introduce the beginner to the basics of the Genetic Programming technique, applications, implementations, and research, we have prepared the following web-based tour.

GP in the world of artificial intelligence

Because of its broad applicability and interesting roots in biological evolution, Genetic Programming has received its share of articles in the popular press:

http://www.salon.com/tech/feature/1999/08/10/genetic_programming/

This three-page article from the slick Salon.com gives a nontechnical introduction to GP, with descriptions of cool applications and interviews with some of the VIPs from the field. A great “trailer” to whet your appetite for real GP.

<http://www.sciam.com/1096issue/1096techbus3.html>

This briefer (and historically earlier) Scientific American article emphasizes mainly the “automatic programming” abilities of genetic programming. It features applications in aerospace and prosthetics, but has few references to work in other GP areas. Thus it is good for information, but not as a starting point for exploration.

GP tutorials and demos

Motivated now by the knowledge that Genetic Programming is perhaps the most important thing, ever, in the history of humanity (after sliced bread) you are perhaps compelled to learn how it works. To this end, we recommend the following:

<http://www.cs.ucl.ac.uk/research/genprog/gp2faq/gp2faq.html>

The Genetic Programming FAQ (frequently asked questions) is a decent introduction to the field. It includes definitions, links to courses, conferences, and journals.

http://groups.yahoo.com/group/genetic_programming/

If you still have questions after reading the FAQ, you can ask the professionals at the genetic programming mailing list at YahooGroups, with close to 1000 members.

<http://www2.informatik.uni-erlangen.de/~jacob/Evolvica/GP/Java/html/>

Perhaps the most complete of all the tutorials, presents theoretical background and an entire suite of interesting Java applet demos.

<http://www.genetic-programming.com/gpanimatedtutorial.html>

Here the inventor of GP, John Koza, presents a simple animated tutorial.

<http://www.geneticprogramming.com/Tutorial/>

If you're now addicted to GP tutorials, this will provide you with one last fix.

<http://asd.bbn.com/papers/traffic/traffic.html>

Interesting application of GP to the problem of traffic flow optimization.

GP implementations

Now that you know how it works, it's time to get your hands dirty and actually build something!

<http://www.cs.umd.edu/projects/plus/ec/ecj/>

ECJ A complete Java system, probably one of the most mature. If you want to start programming GP in Java in no time, this is probably the way to go.

<http://eodev.sourceforge.net>

A very flexible system written in C++ with an efficient GP implementation.

<http://www.frc.ri.cmu.edu/~mcm/chapt.html>

If you still want to program your own system, you can check out these performance tips for implementing it in C++.

http://perlmonks.org/index.pl?node_id=31147&lastnode_id=864

This article describes a not very standard Perl GP system, which evolves combination of expressions, as opposed to trees that describes expressions. It is genetic programming in the strict sense of the word, but not exactly what you would call "Canonical GP."

These links probably answer the question "Which programming language is the most appropriate for genetic programming?," by telling you "whichever you feel most familiar with, and obviously, not necessarily LISP."

GP research

Once you've got the basics down and have played around a bit with some experiments, you may be wondering about the current state-of-the-art in GP research. To this end, there are several specialized bibliographic search tools:

<http://www.cs.bham.ac.uk/~wbl/biblio/README.html>

Bill Langdon's GP Bibliography, with links to other Evolutionary Computation bibliographies.

<http://citeseer.nj.nec.com/cs>

A searchable repository of all sorts of Computer Science research articles, including many GP papers. If you're lucky, you can actually download a copy of the paper you've found.

<http://www.evalife.dk/bbase>

More than 19,400 references on Evolutionary Computation and related topics.

After all this reading and experimenting, you may be ready to prepare a journal paper. Most GP-related journals, like the one you are reading, are online at <http://www.kluweronline.com/issn/1389-2576>. Evolutionary Computation also publishes GP-related papers, and is available from MIT press at <http://mitpress.mit.edu/catalog/item/default.asp?type=4&tid=25>. Finally, IEEE Transactions on Evolutionary Computation can be accessed online at <http://www.ewh.ieee.org/tc/nnc/pubs/tec/>.

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