

Graphviz - Open Source Graph Drawing Tools

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1 Graphviz Release

dot and neato are layout utilities that read graphs as text streams and write layouts in formats for web pages, documentation, interactive front end programs and downstream graph processors. **dot** makes hierarchical layouts; **neato** is a spring embedder with postprocessing to improve node placement and edge routing. **graphviz** tools (particularly, **dot**) have been adopted as a visualization service by the W3C Resource Description Framework XML project at MIT, and the Doxygen software engineering system. Graphviz was recently distributed on about 500,000 CDROMs as an add-on package for the SUSE Linux release, and is redistributed by Debian, Mandrake, SourceForge, and soon OpenBSD.

dotty and grappa are interactive, customizable graph editors. **Dotty** is a scriptable graph editor for Unix/X11. It also runs as a Microsoft Windows port (but looks suspiciously like an X11 program). **Grappa** is an extendible Java GUI with full attributed graph data structures. It has been adopted by software engineering projects such as MIT's Alloy, RMTTool, and others.

webdot, perldot, tcldot. **webdot** (and **webneato**) can run as remote web servers that create web content transparently. A URL may specify the location of a graph description and the MIME type of the intended layout. The **webdot** server pulls the graph description and inserts its layout in the HTTP stream. **webdot** is written as a server-side tcl or perl program. For more general graph programming, these are bindings so that **dot** and **neato** are available to perl and tcl programs.

Stream tools and foundation libraries. When graphs are large or complicated, there are many benefits to pre-processing that extracts interesting subgraphs before visualization. It may be informative to extract a subgraph induced by nodes specified by a predicate, collapse edge chains, remove transitive arcs, or apply node colors automatically. Underlying our tools are basic graph data structure libraries and Spline-o-matic, a generic path planner for drawing arcs around obstacles in diagrams.

2 Dynagraph and Montage

Dynagraph. While batch layout often works well, in other situations graphs are intrinsically dynamic and should be displayed as an animation of incrementally stable drawings. **Dynagraph** is a completely new software platform for this. The base is a heavily templated C++ library for attributed graphs that supports modular, efficient, typesafe algorithms libraries. **DynaDAG** is an on-line version of the **dot** variant of Sugiyama's

hierarchical drawing algorithm. It relies on an external viewer such as Montage or an incremental version of Grappa.

Montage is a general OLE implementation as a set of COM objects and interfaces. There are many intricate details to implementing diagram editors that can fully cooperate with Microsoft Windows programs, including Word and other document editors, and scripting languages such as Visual Basic. Management of embedding of active objects, windowless controls (for drawing overlapping edges), toolbars, persistence of non-hierarchical objects including selection and cut-and-paste are some examples of the services that Montage provides. Montage itself provides a generic canvas free of application semantics. **Histogram** is an example application that provides a nonlinear web click history graph for Internet Explorer. To our knowledge, Dynagraph-for-Montage is the only fully OLE-aware non-Microsoft application.

Dynagraph software is not yet released as open source; contact the authors for information on availability.

Further information is found at www.graphviz.org.



Fig. 1. Histogram screenshot. This application was written as a 100 line C++ program that combines the Dynagraph and Microsoft Internet Explorer COM objects. The graph is a clickable nonlinear history display.