

Ptolomaeus: The Web Cartographer*

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The hugeness of the Web and its continuous growth have made navigation in the Internet extremely difficult. The new advanced features provided by HTML extensions and scripting languages allow a common browser to manage powerful hypermedial representation in each single page but leave unsolved some structural problems of the Web. In fact, the process of finding information by surfing the Web is mainly hindered by the lack of a reasonable schema in the hyperspace; broken and redundant links make the problem even worse. This leads the user to become "lost in the hyperspace" (LH-Syndrome).

Ptolomaeus is a system that helps the users to deal with the complexity of the Web, by generating and visualizing Web *maps*. It is written in Java and consists of a robot, which explores the Web with a user defined configuration, and of a graph drawing algorithm which draws the map and allows customizations.

Ptolomaeus maps give a pictorial representation of the Web, using a graph in which each node is a Web page and each edge a link between two pages. We think that a clear representation of the structure of Web sites greatly enhances the exploring capabilities of a common browser, weakening the LH-Syndrome.

Several other tools have been recently developed "around" the idea of Web maps. A comparison among the most popular of such tools can be found in the enclosed tables. We have considered features concerning the visualization, exploration, and browsing. The meaning of the fields is the following. **Tool:** commonly adopted name of the tool. **Company:** university, research institution, or private company that develops the tool. **Layout:** type of drawing convention adopted for the maps. **Type of Graph:** type of graphs that can be displayed. Several tools require the graph to be a tree and this is a severe limitation on the usability for understanding the portion of the Web that is under exploration. **Visualization:** specific visualization features. **Browser:** possible links with some browser. **SW Requirements:** minimal software suite required for using the tool. **Robot:** main features of the robot. **Notes:** other remarks.

The approach that have been used in Ptolomaeus in order to find the best suitable layout algorithm follows two main ideas. A hierarchical representation: users explore the Web from a starting page toward other related pages perceiving a hierarchical structure. Graph structure of the Web: information is both in the pages and in the links between them.

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According to these two principles we have chosen the drawing technique proposed by Sugiyama, Tagawa, Toda. In Ptolomaeus this technique is implemented with some customization. Particular emphasis has been given to the readability of the map, by using visualization features such as icons and colors to represent different kinds of Web objects and by using clear labels written inside each node. Further, Ptolomaeus provides several layout facilities which allow to evidence relations between pages, to contract not interesting nodes, to zoom the map.

Other facilities are present in Ptolomaeus concerning exploration and browsing. A user can setup Ptolomaeus to work with his/her preferred browser and can navigate in an unusual interesting way by alternating automatic exploration and direct browsing. A map can be seen as a complex bookmark which represents the whole structure of a site instead of a single page. Web designer can exploit Ptolomaeus as a valuable help in the design and maintenance activities. In, fact Ptolomaeus evidences broken links, structural anomalies, and provides, in the "Applet version", the users with an on line map usable in the exploration of the Web site.

Further info at www.dia.uniroma3.it/~vernacot/ptolpage.htm.

Tool	Company	Layout	Type of Graph	Visualization	Browser
astra	mercury	radial	spanning tree	animation, small labels	any
site server	microsoft	radial on a sphere	spanning tree	rotation, small labels	explorer
hy+	u.toronto	hierarchical	graph	rough labels	mosaic
web cutter	ibm haifa	hierarchical radial	spanning tree	truncated labels	any
webmap	u.frankfurt	hierarchical	spanning tree	numeric labels	mosaic
merzscope	merzcom	radial - one level	spanning tree	labels outside the map	any
webspaces	u.minnesota	cone trees	spanning tree	rough labels	no
powermapper	electrum-m	directory tree	spanning tree	long labels	proprietary
ptolomaeus	u.roma3	hierarchical	graph	long labels	any

Tool	SW Requirements	Robot	Notes
astra	win95/nt	fully customizable	report generator
site server	win95/nt	fully customizable	site manager
hy+	unix	navigation driven	
web cutter	win95/nt (java 1.1)	partially customizable	applet
webmap	unix	navigation driven	
merzscope	win95/nt (java)	single-step exploration	
webspaces	unix and geomview	not customizable	
powermapper	win95/nt	partially customizable	link checking oriented
ptolomaeus	win95/nt,unix (java 1.1)	fully customizable, dynamic pages	applet, contractions

Tool	Reference
astra	www.ns.dk/mercury/astra/
site server	http://www.microsoft.com/siteserver
hy+	
web cutter	http://www-ee.technion.ac.il/issy/papers/webcutter/PAPER40.html
webmap	www.tm.informatik.unifrankfurt.de/Veroeffentlichungen/Doemel/WWWFall94Aabstract.html
merzscope	www.merzcom.com
webspaces	www.geom.umn.edu/docs/weboogl/webspaces/webspaces.html
powermapper	www.electrum.co.uk/
ptolomaeus	www.dia.uniroma3.it/~vernacot/ptolpage.htm