The interactive Graph Visualization System *daVinci* V1.2

UNIVERSITÄT BREMEN

Michael Fröhlich, Mattias Werner

Nowadays, the importance of a visualization for graph structures is obvious. Directed graphs are very common in modern computer applications: module dependencies in a software project, file systems on storage devices, dataflows in a program, the structure of a computer network, time dependencies in a project management system, the tree of chapters in a structured document and so on. The graphical representation of these partly huge and complex objects could give a beholder the foundation for getting an overview, looking down for details, exploring interesting areas and finally obtaining the understanding of the structure. Sometimes one can find specialized visualization tools for a concrete application, but these tools are often integrated in the program that handles the graph; they are not designed for a general use. Moreover, a viewer has often only a limited influence on the way the graph is represented.

daVinci is an interactive visualization system for directed graphs which tries to overcome these deficits. The philosophy of *daVinci* is to be independent from an application and to allow the definition of the visualization. *daVinci* is able to load a graph in a readable term representation from a file and offers an interface for the connection with a graph administrating application. With this interface, an application program is able to send graphs to the visualization system as well as define application specific menus and simple user dialogues. A connected application is informed about events like user selections of graph nodes and edges, selections of application generated menus or the result of user dialogues. By using *daVinci* this way like an abstract user interface, an application program can offer the user the possibility to work on the graphical view of a graph.

The visualization of a graph is not static in *daVinci*. The user can manipulate the graphic interactively to obtain a better view. The most important features of the current version (*daVinci* V1.2) are:

- Application interface for the connection with a graph administrating program.
- Automatical graph layout considering aesthetics like edge crossing minimization (using an improved version of the algorithm of Sugiyama), edge bend minimization, ...
- Manual node and edge placing for refining the automatical layout.
- High quality scaling from 100% down to 1% with preservation of all interaction possibilities.
- Interactive abstraction technics like omission of uninteresting subgraphs or edges.
- Colour support for the visualization of different node or edge types.

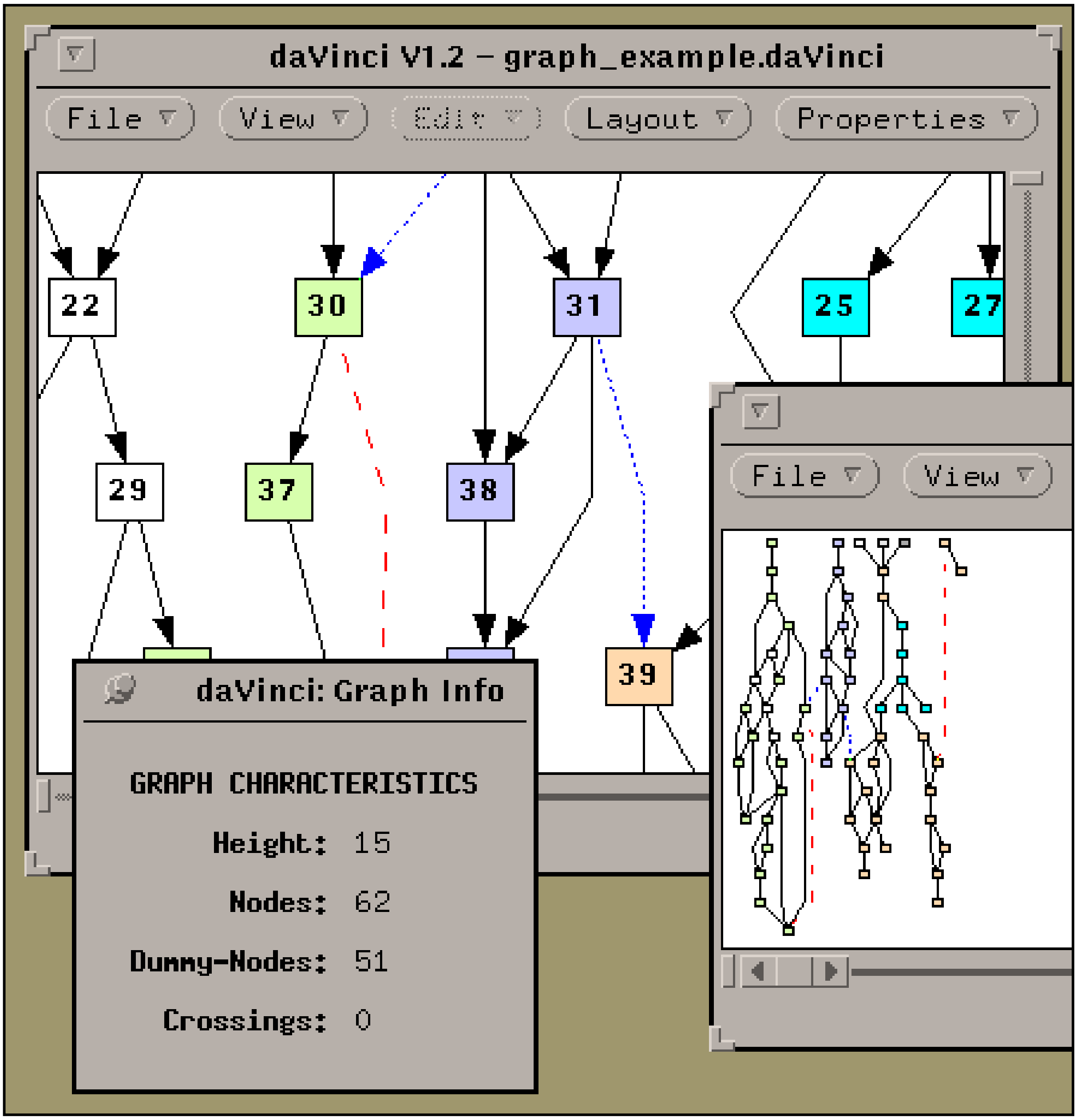
The opportunity to define the kind of visualization of a graph is not supported in the current version. A graph structure is always displayed in a standard form by showing nodes as boxes and edges as lines with arrows. The possibility for a user to have a precise influence on the way the visualization is done will be realized in one of the next releases of *daVinci*.

The *daVinci* graph visualization system is a development of the Institute for Formal Methods in Software-Engineering at the University of Bremen. The authors are Michael Fröhlich and Mattias Werner. *daVinci* is basically intended as the representation layer of a system for formal and correct software development by transformations (“*PROSPECTRA 2*”). A relevant transformation system has to keep a huge library of modules, specifications, developments, transformations, proofs, different versions of these objects etc. From these facts ensues the necessity of a visualization of this library.

daVinci has been implemented since the end of 1992. The system is written in the pure functional language *ASpecT*, developed at the University of Bremen by Jörn von Holten and Richard Seifert. The graphical user interface of *daVinci* is realized with the OPEN LOOK toolkit *XView*.

daVinci and *ASpecT* are both free available for non-profit use by anonymous ftp from wowbagger.pclabor.Uni-Bremen.DE (Internet: 134.102.228.9) in the directories /pub/graphics/daVinci and /pub/languages/ASpecT. The functional language *ASpecT* is ported to several platforms like Sun3, Sun4 (Solaris 1.x and 2.x), Sun386i, IBM RS6000, VAX (Ultrix), NeXT, Apple Macintosh (A/UX), PC (OS/2 and Linux), Amiga and Atari ST/TT. *daVinci* is available as a binary program for Sun SPARCstations with Solaris 1.x (SunOS 4.1.x) and Solaris 2.x (SunOS 5.x).

To contact the *daVinci* group please write by e-mail to daVinci@Informatik.Uni-Bremen.DE.



Visualization of a graph with *daVinci*