A Generic Compound Graph Visualizer/Manipulator : D-ABDUCTOR

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1 Introduction

We often exploit diagrams when we think something. One reason of using diagrams is that they are good media to represent and organize personal thought, and to share ideas among persons on group works. However, editing, reforming, and redrawing diagrams, which are necessary on thinking processes, are troublesome works. Moreover they might be unessential for thought. D-ABDUCTOR is a generic compound graph visualizer/manipulator which is implemented to support such the human thinking processes by using sophisticated techniques for diagram visualization/manipulation in a direct manipulation and animation environment. D-ABDUCTOR can effectively support the processes to manipulate the diagram interactively and to organize idea fragments into an integrated diagram. D-ABDUCTOR is still undergoing updates and technical evolution.

2 Features and facilities

Features of D-ABDUCTOR are summarized as:

- Fast automatic drawing algorithm for a higher class of graphs: compound graphs
- Advanced GUI based on menu, direct manipulation, animation and fisheye view environment
- Communication among multiple set of D-ABDUCTOR on a network and interface for applications
- Multi-media support.

Facilities of D-ABDUCTOR include[1]:

Compound graphs: D-ABDUCTOR provides an environment to deal with diagrams of a generic class of graphs called compound graphs which represent both adjacency and inclusion relationships among nodes[2].

Automatic graph drawing: D-ABDUCTOR provides a fast automatic layout facility of compound graphs utilizing a Sugiyama style extended drawing algorithm[2]. Certain operations chosen by the users can trigger the invocation of this facility for visual response.

Graph editing: D-ABDUCTOR provides various editing operations from standard operations(e.g. create/delete/move a node or link, change color/width/shape of a node or link) to group operations(e.g. create/resolve a group node) in a menu and direct manipulation environment.

Collapse and Expand operations: D-ABDUCTOR allows groups of nodes to be represented by one node(information hiding).

Fisheye view: Our fisheye view facility called Diagram Dressing changes size and visibility of nodes according to their importance. More important nodes become larger, and less important nodes become smaller or omitted. Structure of diagrams, semantics of nodes and the specific user's viewpoint influence the importance of nodes[3].

Display with Animation: D-ABDUCTOR can display the instantaneous visual change with an animation so that the user's mental map is preserved[3]

Communication: Multiple set of D-ABDUCTOR can communicate with each other on a network to share database called Card Base consisted of diagram data, text data and images. D-ABDUCTOR can communicate with other applications through the language 'Simple.'

Language 'Simple': The language Simple is designed to store the current graph and communicate with other processes. Graphs can be created, edited, loaded and saved through Simple. Furthermore, Simple has the capability to record working histories with D-ABDUCTOR and so we can replay the editing histories. D-ABDUCTOR works as an interpreter of Simple.

The system architecture and facilities of D-ABDUCTOR are shown in Fig. 1.

Fig. 1. System architecture and facilities of D-ABDUCTOR.

3 Sample Screens

Sample screens of D-ABDUCTOR are shown in Fig. 2 and 3. In Fig. 2 some of menus and dialog boxes are opened and a small diagram with images is shown in the Main Window. Text can be placed into nodes by using a text editor(Create Menu). Graphic images can also be attached to nodes instead of text. Any node (whether a group node or leaf node) can be connected together with links(Mouse Operation). Each node has several handles allowing links to be attached. Pre-defined actions such as adding a new node or link can be set up to trigger the automatic layout facility and redraw the diagram (Layout dialog box). Diagrams can be oriented north, east, south and west (Layout dialog box). In Fig. 3 larger examples are shown. The sizes of nodes in both diagrams are changed by the diagram dressing facility (Dressing dialog box).

D-ABDUCTOR has been implemented in C as an application of X Window system (V11R5) by using a GUI toolkit XView. D-ABDUCTOR does not have the facilities to edit text and therefore the user should prepare a text editor such as Emacs in the same environment. D-ABDUCTOR is delivered as a SPARC binary for Sun workstations (SunOS 4.1.x). The binary is available for non-profit use by anonymous ftp from ftp.fujitsu.co.jp in the directory /pub/misc/abd2.23.tar.gz.

The usage of D-ABDUCTOR other than idea organizations includes layout for documentation, outline processing, software engineering, WWW browsing, CAI design, database schema design and so on.

Fig. 2. A sample screen: a small diagram with images, menus and dialog boxes.

Fig. 3. Diagrams of a binary tree (upper) and a compound graph (lower). The number of leaf nodes in each diagram is 100. In both cases the diagram dressing facility is utilized. Two marked nodes are focused in the upper diagram and three in the lower.

References

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