Pasta-3: A Graphical Direct Manipulation Interface for Knowledge Base Management Systems

Michel Kuntz

ECRC, Arabellastrasse 17, 8000 Munich 81, West Germany
Phone (89) 926 99 125
email kuntz%ecrc de@pyramid com

Pasta-3 is an end-user interface for D/KBMSs based on the **graphical Direct Manipulation** (DM) interaction paradigm, which relies on a bit-mapped, multi-window screen and a mouse to implement clickable icons as the main representation of information This style of interaction enables end users to learn quickly and remember easily how the system works Pasta-3 gives complete access to the D/KBMS, since its users can carry out all manipulation tasks through it schema definition, schema and data browsing, query formulation, and updating These tasks can be freely mixed, combined, and switched Pasta-3 interfaces to the KB2 knowledge base system, implemented in Prolog and built over the EDUCE system which provides a tight coupling to a relational DBMS KB2 uses the Entity-Relationship data model, extended with inheritance and deduction rules KB2 was developed by the KB Group at ECRC

Pasta-3 uses Direct Manipulation in the strong sense of the term DM of the actual graphical representations of the application data and not just DM of commands operating on that data Besides the high degree of integration in the overall design, major innovations with respect to earlier work include enhanced schema browsing with active functionalities to facilitate correct user understanding of the KB structure, "synchronized" data browsing that exploits the underlying semantic data model to make browsing more powerful, and a graphical query language providing full expressive power (including certain recursive queries, nested subqueries, quantification)

Pasta-3 provides interactive design support that has significant **ergonomic** advantages over the usual approach to this problem In Pasta-3 different types of schema information -- the basic E-R diagram, the inheritance lattices, the properties of each E-R item -- are displayed in separate windows, which makes accurate reading of such information much less difficult than in the usual case where all these layers are thrown together in a single graph, which makes misinterpretation hard to avoid

For schema and data browsing, Pasta-3 offers facilities that build more **semantics** into the browsing processes One type of schema browsing tool is a subgraph computation capability which automatically finds and displays the paths that connect arbritrary E-R items This helps end users to correctly perceive the schema structure Data browsing includes "synchronised" browsing, a functionality which shows simultaneously data from several Entities all sharing the same Relationship and indicates which values from each Entity are associated with given values from the others

Pasta-3's **DM query language** replaces the textual language without loss of expressive power it offers a new, sophisticated DM editing capability for the same formal constructs Query specification takes place in a window containing icons representing the components of the query expression which can be created, destroyed, and modified all by clicking and dragging through the mouse Queries can be recursive and involve logical variables, quantification, and subqueries Expressions mixing both KB2 statements and Prolog predicates can also be formulated

The **video** shows Pasta-3 actually being used, in real time and under normal conditions It includes sequences demonstrating all three major functionalities schema design, browsing, and querying It gives an example of the subgraph computation capability and builds a simple query from scratch, going through all the steps needed to do so The demonstration also includes work with other types of Pasta-3 windows (e g property sheets)

The **video** has an English-language sound track explaining everything that is seen on the screen The camera zooms in and out in order to show full screen overviews (giving a good idea of the general "feel" of the interface) and close-ups of work with mouse and icons (allowing the viewer to see as much detail in the video as an actual user would, seated in front of the workstation)