

Representation of multidimensional complex data, using 3D, sound and animation: the ISO-3D project

Monique NOIRHOMME-FRAITURE
Institut d'Informatique- University of Namur (FUNDP)
Rue Grandgagnage, 21, B-5000 Namur, Belgium
e-mail:mno@info.fundp.ac.be

Abstract: The ISO-3D project aims to develop tools in order to analyse and represent business information from large collections of data depending strongly upon time, integrating new analysis techniques called Symbolic Analysis.

We have developed new visualisation techniques that can represent the same "object" at several epochs. Each object is characterised by variables that can be expressed by an interval or by a categorical distribution. For the representation, we use 2D animation, 3D and sound.

Keywords: visualisation, symbolic data, 2D, 3D, animation and sound.

1. Introduction

The goal of ISO-3D is to develop methodology and tools that offer a way to analyse business information from a large collection of data. The main technology objective is the integration of 3D interface library with knowledge extraction techniques in order to propose an efficient way for the user to improve the business analysis. Focus user applications are portfolio management and TV-audience. The data considered here are multidimensional and depend strongly upon time. In order to reduce the size of the data warehouse, data are resumed in patterns or Symbolic Data [1] characterised by variables that can be expressed by an interval or by a categorical distribution. For example, instead of considering daily or even hourly data, as it is recorded, we can summarise them in weekly information. If the variable of interest is the value of the portfolio, it is not given anymore by a unique observation, but by an interval [min, max].

2. ISO-3D Architecture

In the ISO-3D project, a library of graphical components has been designed in order to explore or interpret the data. Some treatment modules appeared to be necessary for the transformation and the aggregation of the data. The implemented treatment modules work on symbolic pyramidal algorithm, symbolic principal component analysis and dissimilarity calculus. Graphical library and treatment modules are integrated in a whole package. Exchanges between modules follow the client/server InfoBus technology.

3. The Graphical Library

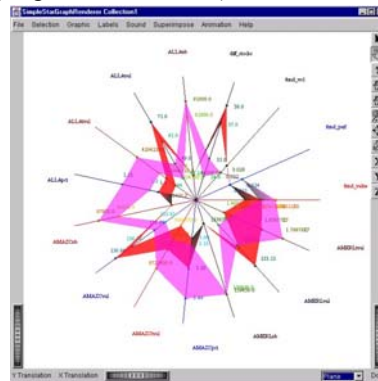
The graphical library [2] uses 2D and 3D, animation and sound. It is developed in Java, Java Media Framework and Open Inventor (using OpenGL standards). Facilities are provided for changing viewpoints, rotating figures, zooming, changing colours and labels, saving images in GIF or PS format.

Seven modules are available:

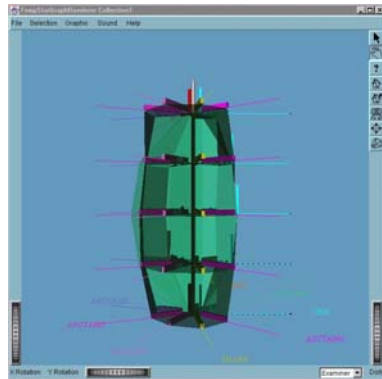
Table shows symbolic data in the standard table way.

3D-Space allows the representation of traditional data (for example means) in the Euclidean 3D space, with informative colour and shape.

Simple Star shows a Symbolic Object in a plan, in a star iconic way [3]. Superposition and animation are provided. Sound can be used for identifying the type of variable.



Simple star representation



Temporal Star representation

Temporal

Star allows to display the evolution of a Symbolic Object according to time. Sound can be used to give the dissimilarity between objects. Stars representing objects at different epochs are thread on the time axis. A transparent veil is available to show the internal and external envelope of the figure [3].

Hyperbolic and Flags allow the representation of a hierarchy or pyramid.

3D-Cube shows the objects in the space of principal components. Animation is provided to show the evolution of an object according to time.

Control Chart displays the confidence limits interval of a principal component according to time.

When clicking on a particular object in Temporal

Star, 3D-Cube and Hyperbola, it is possible to show the object in the Simple Star way (see more details into [2]).

The ISO-3D project is a two-year ESPRIT project sponsored by the European Community inside the Telematic fourth framework programme (it ended in January 2001). The Consortium partners are: EADS/Matra S&I (Paris - co-ordinator), FUNDP (Univ. of Namur - scientific responsible), DMS (Univ. of Naples), TGS (Bordeaux), ING-Bank (Amsterdam), CISIA (Paris), IMFM (Univ. of Ljubljana), University of Paris-Dauphine.

References

- [1] Analysis of Symbolic Data by H.H. Boch and E. Diday (Eds), Springer-Verlag Berlin 2000 (425 pages, ISBN 3-540-66619-2)
- [2] ISO-3D User Manual, 2001 (at <http://www.info.fundp.ac.be/~adb/iso3d/User-Manual-ISO3D.pdf>)
- [3] Le son dans les interfaces IHM: Application à la représentation de données complexes by M. Noirhomme-Fraiture in Actes des deuxièmes journées Multimédia, Namur, 11-12 Sept. 2001, PUN Namur