Demonstrative Prototype of the Statistical Methods.

Maria da Graca Pereira

GEIASC
Caixa Postal 606
88010-970 - FlorianÛpolis, SC
Brazil
mgp@matrix.com.br

Abstract

This paper deals with the introduction of hypermedia technologies in statistical methods as well as their applications in the training of students. A hypermedia prototype to show statistical methods was develop and the toolkits are Toolbook and Kappa. Several screens was developed in a electronic book. The screens show the calculations modules. Some statistical graphs are showed through the screens. The electronic book shows about theoretical methods to calculate means, medians and variance for samples and it provides a deep knowledge about statistical methods.

The consultation sessions are quite complete, allowing the student to learn the theory and practice to solve statistical problems. An hypertext system represents the information, in a different way from others usually employed because it is presented as a non-linear mode and, therefore, allowing to take advice with information in agreement with user interests.

Hypertext and hypermedia systems allow us to reach the following objectives:

* The structure of the classical text files;
* Non-Linear navigation on any selected order of the stored text;
* Cooperation, i. e., information with different formats, text, graphs, images, video and voice;
* Interaction, what means, sophisticate access tools, as graphical interfaces.

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The paper debates about publications that suggest the benefits of hypermedia systems applications in personal training models.

Introduction

Expert systems are composed of tasks that require reasoning, communication and flexibility, so that the results that appear through their execution may approximate the reasoning of an expert in solving the problem focused on. This is usually done by applying a series of rules to a set of facts. A significant amount of knowledge can be stored in these systems, which are able to simulate human reasoning, drawing conclusions beyond the mere data stored in the computers. This ability is called inference (See , for examples, Waterman, 1986, Fischler & Firschein, 1987, Rich, 1988).

A number of recent articles on research have focused on the implementation of such systems, provided with processes of inference, applied to problems from many different areas of human knowledge. (See, for examples, Johnson, 1983, Sriram & Adey, 1987, Pereira, 1995).

During the development of the system and throughout the whole period of research with the students, guidelines were considered, establishing a goal in the solution of a problem, as presented by Polya (1986).

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The Tools Utilized

The tool chosen for developing the system is shell KAPPA and ToolBook, which works in a Windows environment. These softwares were selected because it

makes possible the treatment of numerical and symbolic data. Furthermore, through graph resources, it provides a friendly interface with the user (see KAPPA, 1993 and ToolBook, 1994). The Toolbook presented a part of multimedia, with sound and images. This screens are friendly for the student.

The author integrated the toolBook and KAPPA, for we can use the resources of multimedia of the ToolBook and the part of expert system for KAPPA. The integration is very important in work for education. Shell KAPPA is a software that works with a programming directed towards an object. The components of system domain are represented in it by structures called objects. The objects, characterized by classes or instances, may represent concepts or concrete things. Frames are utilized in representing objects through the set of their attributes (slots) and values. They have an absorbing hierarchical structure. The domain of knowledge processes are represented by means of methods, functions and production rules which must be codified in language KAL.

The reasoning used to solve the problems that are proposed may be either forward or backward. In forward reasoning, the system continuously tests the rules selected and produces results accordingly, while backward reasoning demands establishing a goal to be attained. Another important characteristic of shell is that it provides mechanisms for defining expressions similar to the programming in conventional language. This was one of the reasons for choosing this shell for developing an expert system whose domain of knowledge consists of Statistical Methods.

Developing the Software

Into the ToolBook, we can show to student a class, that he/she can study out side class room. For more information one part of the software is made in Expert system. The process of building an expert system, also known as knowledge engineering, involves a kind of interaction between the builder of the expert system, called the knowledge engineer and one or more experts in some problem area. In the case of the system built up here, the knowledge engineer models knowledge, strategies, as well as theoretical and practical methods to solve the problem being focused on. The result is a computer program that solves the problems in nearly the same way as the expert.

A teacher's experience as Professor of Statistics went through the process of knowledge acquisition and was modelled on forms of representations of knowledge, such as frames and production rules. Consequently the system developed emulates the procedure of a teacher for the topic under consideration.

By means of screens, the student interacts with the system, which introduces him/her to various tests, guiding him/her as to their suitability in different situations. In order to provide interface through screens, functions were created that use the pre-defined functions on KAPPA, read the data supplied by the user, send messages and give final answers. Production rules were also applied as a form of representation of knowledge. The rules utilized consist of one set of conditions and another of actions. If all the conditions are shown to be present, then the actions are carried out. Although a complete description of the system developed may not be viable here, it is nevertheless important to give some idea of its. The system presents the method step by step, seeking to make the student participate as much as possible, understanding and giving his/her opinion on the conclusions reached, through the messages sent by the screen and the reading of the student's replies to the questioning of the system.

In this study not only the theoretical aspect of the domain of knowledge was considered, as well as techniques of artificial intelligence, in choosing the tools to build up the system, but also the pedagogic aspect. For this reason, the guidelines studied for the solution of a problem were those suggested by Polya . The following points were studied and considered in developing the system:

*Understanding the problem: Why is the unknown? What are the data? What are the conditioners?

*Working out a plan: To find a connection between the known and the unknown, sometimes one may need to consider auxiliary problems if an immediate solution cannot be found, but eventually it will be necessary to arrive at a plan for solving the problem.

*Carrying out the Plan: At this point, the following questionings arise: Is it possible to verify clearly that the step is correct? Is it possible to show that it is correct?

*Retrospect: Examine the solution obtained, with the following questions: Is it possible to verify the result? Is it possible to verify the argument? Is it possible to get the result in a different way? Is it possible to perceive this at a glance? Is it possible to utilize the result or the method to solve some other problem?

In addition to these guiding principles, we also considered that the professor should help the student somewhat sparingly, that is, s/he should not help the student, either too much or too little, but in such a way that a fair portion of the work is done by the student himself. In this study, the professor is concerned with putting himself in the place of the student, perceiving his point of view, and

seeking to understand what the student expects of the software, asking a question or indicating on the screen a step that might help the student himself.

The software sets out to follow Polya (1986) in its various phases of development, always considering:

1) Helping the student: making it possible for the student to acquire as much experience with independent research as possible.

2) Questions and recommendations: making inquiries to focus the attention of the student on the problem.

3) Imitation of practice: developing in the student the capacity for solving problems, instilling in his mind some interest in the problem from a practical point of view.

The expert system that was developed considers all the points mentioned above when he presents the theory to the student, while he is questioning him/her and receiving his/her reply.

Conclusions

The software shows the importance of applying techniques of Artificial Intelligence to teaching and hypertext in the same work. It enables the student to have an orientation for independent study outside the classroom. Furthermore, the system motivates the student, sending friendly messages on interactive screens.

The system, which is now in the prototype phase, is to undergo a very important process of validation, when it will be presented to groups of students and a deeper study of its efficacy will be made regarding its application to teaching.

We consider very important jointed multimedia resource with expert system. We have a software for learning complete in this situation.

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