THE USE OF GRAPHIC DATA BASES IN THE TEACHING OF GEOMETRY

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The paper I present to you today doesn't intend to provide relevant innovations in the field of processing program designs or software technology, a field I don't work in.

Although I respect other opinions, I feel that the uncontested aid which using computers to teach architecture means should preferably and primarily be oriented towards searching for ways to better transmit and explain what we have, up to now, been teaching through other means.

However, the novelty and advantages of recurring to this new instrument should not make us fall into the mistake of letting it be used as a substitute of teachers' and students' work. The computer is simply another instrument; of great potential eficacy, but nevertheless just an instrument.

This seemingly clearly evident and simple idea has interesting consequences. The most important of which is that: those who apply computers to teaching the different subjects which compose the career of Architecture's study plan should be teachers of those subjects who know something about computers, and not computer experts who know some things about the subjects.

This is, in my opinion, the main reason for the fact that, up to now, there have been very few contributions from information systems to the field of teaching methodology.

My research concerns this matter. It searches for concrete pedagogical applications that can be developed starting from existing computer technology, and tied to the educational needs of the subject-matter that I work in at the Projects Department of the School of Architecture of the University of Navarra, where I teach Descriptive Geometry in the first year of undergraduate studies.

I want to make clear, for those not familiar with current Architecture carreer study plan contents in Spain, that this subject intends to teach the future architects to properly know and work with the different architectural representation systems, (dthedric, conical, axonometric...) which constitute the language that will be used to express their future creations.

It is evident that in a subject like this one, continually translating from two-dimensional to three-dimensional spaces and objects, real or imaginary, we can find many applications for modern computer technologies. Some of them we have seen already in this conference.

I think, normally, it would be logical for those of us teaching Architecture to study the way in which we can academically take advantage of systems advances and innovations, but that these should be developed by real specialists in this matter.

In this way for example, in what concerns the subject I work in, I feel that it would be senseless to discover ways, methods or programs which would allow students to do on a computer screen what they had, up to now, been doing with the the pencil and compass, ruler and cardboard. I mean that just by using the computer, instead of traditional methods to do geometry, students will not learn more geometry than before. They will probably learn less, even if they end up knowing a great deal about processing information We should try to get this new technology to provide advantages for a better understanding of the different subjects, and to better educate students.

When teaching geometry, most questions hive a strong theoretical -conceptual- base, derived from the position and spacial and dimensional relationships of the represented bodies and volumes. In the end however, on paper, they all translate into more or less complicated drawings. Presenting these properly is the real difficulty of teaching this subject.

Up to now, and ever since Monge began the scientific sistematization of the dthedric system of representation, transmitting the concepts and the science of geometry has forced us to use complicated drawings with long and detailed descriptions of how they were done. This makes writing and using texts or manuals in this subject very difficult.

Drawing can be more or less costly; explaining how each line was drawn can be unending. This is where modern computer technology comes in. That is because, without loosing expositional precision and clearness, it can develop matters progressively, successively presenting the elements which intervene, instead of having, to describe all those operations. This allows for greater clarity and conciseness in the needed explanations: an image is worth a thousand words.

As a teacher I have tried to find, among the vast array of possibilities offered by infographic applications, those that will case understanding of the subject I teach, which presents a lot of problems to students not used to imagining and mentaly recreating the reality drawn before their eyes. The computer can recreate that space they can't imagine for them, and do it over and over again whenever necessary.

For this reason our intention is twofold: on one hand, presenting geometrical questions simply, in a graphic and three-dimensional way; and on the other, arrange them in such a way that students could use them according to their needs and in the order most beneficial to each one, as many times as needed.

To this end, two years ago, I began working, with the aid of the Computer Technology Center of my university, in the preparation of a graphic data base which could be at the students' disposal, the same as textbooks, for them to look up as freely as possible.

These data bases should play the role of a live book. The illustrations teach as much as the texts; this could then be reduced to mere concepts once there is no need to describe processes which could be seen onscreen. Therefore it was essential that the bases be organized to allow for repeated viewing by the student as many times as needed to reach a perfect understanding of the matter consulted.

Also, from the beginning, I decided to structure the developments in a way that, whenever possible, the students could themselves help in the preparation, This needed very simple computer applications that did not need extensive programing knowledge.

With all this in mind, we felt it would reach much higher returns if we worked with Macintosh, which clearly offers the highest short-term benefits from an educational standpoint.

We began working with Hypercard, but results were not all that satisfactory, and the programming needed was quite complex. This presented very high amounts of time invested in comparison to the time needed to prepare the data base entries.

For this reason, in relation with whit we said before, we looked for other applications, better suited to our needs, and we finally used MacroMind Director to prepare the animated sequences which compose the data base with the underlying drawings base prepared previously with Claris Card. The computer used was a Macintosh LC II.

We intend to develop the whole list of contents to our subject, but to do this we will need, on top of the allotted time, in evaluation of the real teaching advantages it entails to achieve optimal results.

We present here an example referred to one of the subject's lessons, chosen as an experiment to help develop the rest. It refers to the process of calculating buildings' conical perspectives. It is intended to help first year of arquitecture students understand the conical perspective approach.

The data base refered to is composed of four different interrelated sections and an introduction.

The introduction tells the user about the way data is organized and about the so called "sailing keys," used to access the needed information.

The last screen of the introduction shows a list of contents to chose the different files one can access.

As can be seen, it offers three options. They have a pressumed order of usage, but you can avoid one of them and study the others more carefully because there is an extra "help" section which can be accessed from any of the other three to solve possible doubts arising from having skipped one of the other planned sections.

The sections are all organized in the same way. They are composed of a variable number of files. All of them have a very brief text with an idea or concept, and several "keys:" a blue one and a red one to move backwards and forwards in the files, and a green one which activates the animated illustration which graphically explains the text. An ambar colored key allows, the student to replay the sequence as many times as he wants.

Eventhough we intended to allow students freedom to move among the Files, we have limited this in order to restrict the student from moving around anarchically to the point of not knowing where to go. Once inside one of the data base sections, the student can only exit by going through it completely in ascending or descending order. This is not a problem however, because they each have around 15 files at most, and you can switch from one to the next immediately.

The order we've wanted to maintain does not restrict the possibility of consulting the help section for any of the concepts appearing on the file, the precise meaning of which may not be known. Any access to a help section will later return back to the point where it was started to maintain the exposition's order. These consultations refer to a series of highlighted terms on the Files; experience will let us know if it is necessary to expand the list of these, something possible to the extent that we enhance the number of files and data bases developed.

We believe the generic content of the sections presented in the example can be the same for almost all those made for descriptive geometry; this is:

Concepts

Spatial meaning of these
Two-dimensional graphic execution

We think this to he a very simple outline which will allow the student access to the level in which he himself feels lacking.

God willing, this upcoming academic year, we will have a series of facts which will allow for a first evaluation of the higher or lower teaching, efficiency of this plan we are so hopefully working on.

We hope to use it soon, not only as a consulting element, but also in teaching; using it as a teacher's aid. We are preparing a pilot experience of this which will hopefully be ready in upcoming months.