ABSTRACT

This paper describes a few aspects of the current research and teachings in the field of C.A.A.D. in the School of Architecture at the University of Genoa.
In particular it analyses the capacity of a small system, which a single professional can afford and which provides a simple approach for the teaching of automatic drawing. This analysis has not yet been completed, because it is a part of a thesis [*] which is currently being written.

Genova, May 1986
Approaching C.A.A.D. at Facoltà di Architettura di Genova

The aim of this paper is to present both the didactic and research trends of our department in the field of Computer Aided Architectural Design (C.A.A.D.), in other words the resources of informational systems in architectural planning and design.

In the great debate about the working structures in so-called "Post-Industrial Era" the role of telecommunication is emerging, as a transformation factor of the entire society which is oriented around the exchange of information.

From this trend, a new type of building is emerging: commercial and civic centres, that are promoted as buildings with integrated systems of telecommunications; an architect should be attracted by this trend, not only from a planning point of view, but also from a practical point of view. He must ask himself whether traditional designing tools have become anachronistic and inadequate.

As people gradually changed their minds, about planning after the introduction of reinforced concrete, so might one begin to alter one's mentality about design by reanalyzing the resources of telecommunication.

An architectural design is a very complex organism where problems of various types and degrees "live" together. In order to solve such problems, the specific skills of many designers are required. The quality of the solution can be damaged by a poor exchange of information among the architects, the clients and the builders.

In search of a good exchange of information, architects are becoming more interested in computers; however this initial interest has been curbed by general misinformation about this subject. Thus only certain sectors of architectural applications have been developed.

The same kind of division into sectors in architectural computer applications is present in our School; till now it has only been possible to research into the use of using computers as automatic drawing tools.

At the beginning of the work in this field our experiences were oriented to the comprehension of this phenomenon; then we tried to point out the moments in building procedures that are fit to an automatic approach.

In this period, about 1977-84, we had a medium-sized computer, industry dedicated, PDP-11/34A, built by Digital Corporation; with this instrument we made some experiences in graphics programming, and we had some results, but with a great waste of time and money.

Now we believe that it is not advantageous for an architect to try this way to obtain the software he needs, and to make use of such big computers, that he cannot afford.

Our actual interest is in the world of P.C., and in particular, as a first approach, in Apple Macintosh. We chose it because it is a relatively small, cheap and easy to use object, but it has very good performances for its level.

The configuration we use is a 512Kb RAM, 64Kb ROM unit, with an external 400Kb 3.5" microfloppy drive; now we have placed an order for
upgrading to version PLUS, i.e. 1Mb RAM, 128Kb ROM, 800Kb 3.5" microfloppy internal and external drive.

As future developments we want to explore the field of IBM PC compatible; to research (in theory) the role of computers in architect's job and in modern architecture.

We hope we will have the opportunity to work not only on drawing software, but also with bigger ones, that can manage a whole project.

As a goal, we plan to write a set of 'performance specification' to describe the 'ideal system' for an architect.

PRESENT CHAPTER

A Thesis about:

"Computers applications in architectural design"

I feel that working on this theme is a kind of adventure; so that I will describe it as an experience more than a traditional academic work.

As I approached this subject, I realized that it is often misunderstood, some of the most common reasons are:

- refusing to consider computers as useful instruments because they are unknown objects;
- pretending too much from them without understanding or considering their limits;
- the incapability of reaching the heart of the architectural question and of inventing the new role of the designer aided not only by a pencil, but also by a computer.

From these situations some questions arise:

- How is it possible to save personality and originality from computer's stupidity?
- How to exploit new technologies' opportunities?
- Are computers useful tools to an architect or are they just another way to do the same things, without improving his job?

Perhaps we have the answer to these questions, but only time can say if they are right.

1 Work description

My thesis is divided into some sections, which may be considered as a procedure of approaching architectural design with computers. This procedure has been partly developed with the help of teachers, and partly invented along the way.

We can trace it out as follows:

1- Preparatory phase: (all experiences are useful, such as readings, lectures, conversations, meetings, and so on ... ) in this phase the knowledge of the matter is widened and a distinction is made between the heart of the matter and the aspects which are not strictly connected with it.
2- Bibliography elaboration phase: text translation and updating, in this phase the basic education, necessary to deal with this subject easily is made.

3- Dedicated system knowledge phase: a market research and an analysis of the working world, as well as the use of school instruments, in this phase the indispensable practical experience is made.

4- Final phase: survey of the work made, in this phase all that is necessary to illustrate this work [1] is produced.

In my case the final phase will be as follows:

a) a paper containing abstracts of the experiences, bibliographic and other material collected and elaborated, (all writing, illustrating and editing functions will be performed by means of computer);

b) some of the drawings I made with the Macintosh Personal Computer;

c) some cards about the software I analyzed and others about the practical problems I mean to solve;

b) and c) are strictly connected because b) is the visualization of c)

I find the work with practical problems very useful and interesting; these problems are due to proposals made by some students and some teachers; everyone had a drawing problem and we tried to solve it with mac.

Every problem has particular characteristics, so it is necessary to applicate the proper software among those presently available.

Even if this computer is not a big working station it has good performances with a lot of the problems proposed.

The cooperation with these people is useful both to spread the matter, and to test the software with real problems and with architects' requirements; these reasons are stimulating to try to obtain the maximum from the instrument and from the user's creativity.

In fact, even if the first approach to Macintosh is very easy, I have found out that it is fundamental to have experience in its usage in order to find a high-level solution to representation problems.

Up to now I have worked on a lot of items, but there is space only for a few little examples at the end of this paper.

In September I'll bring more detailed and advanced results, bigger drawings and a wider documentation.

2 Some considerations about the matter

My work is not finished yet, therefore I can only write some considerations at a stage of this work; moreover, since this subject is very wide, it takes a long time to deal with it thoroughly.

[1] Obviously there is no specific distinction between these phases, because, as said, what is talked about is an experience, a kind of journey in which various kinds of inputs at different moments are met.
I have found the situation of c.a.a.d. quite confused and indefinite, and I feel the need to see how it stands and to clarify my ideas.

**The first** point is the very existence of computer application to architecture and of its reasons:

**a** the informational system development to other fields that can be useful for this field, such as computer graphics, c.a.d., expert systems and so on [2]. Also technological progresses with computers allow new possibilities of calculation for drawings and designing.

**b** the interest of some architects in c.a.a.d. when they realize that the computer:

- can solve some of the requirements of a professional office, such as speed and precision in some repetitive works;
- can help the designer to make a better project, with the output of many different drawings of the same thing in a short time, so that a better verification of the design is possible;
- does not eliminate the role of creativity in drawing, because it cannot substitute human originality, sensibility and intelligence; at its best, it can be another tool -instead of pencil- for the designer, it can be another way to express oneself at a very high level;
- makes communication easier between the designer and the client, overcoming the problems posed by the specialized language of the technician, by providing more drawings and the simulations;
- makes it easier to modify the project, because it eliminates the costs, time and toil of human drawing, so that a better interaction between the client and the architect is possible (if the architect is impartial ...)

- can for these reasons facilitate the transition from a kind of architecture that is only drawn to a real projected one.
- provides new jobs for people who specialize in this field:

  1. in professional offices, where a good organization needs to have a person completely dedicated to the new instrument;

  2. in architectural schools: even if a subject to teach does not exist yet, it is necessary to direct an experience and to develop a research in this field.

**c** computers charm and characteristics:

- computers are not like usual household appliances with their stated functions, but they have many possible usages. Everyone can invent a usage of his own and can meet the limits of his instrument; he can also find that those who that have built it do not know all its possibilities.

[2] It is also important to clarify the differences between c.a.a.d. and these other applications, because there is much confusion about this matter and this is negative for c.a.a.d.
- to learn how to use a computer it is necessary to make some experience on it, because it is not sufficient to read its instructions as is the case for other devices. This characteristic is important to understand the degree of development of the applications. It is a question of the time spent on it. For these reasons many busy architects dislike and refuse the aid of the computer.

Perhaps this is the main feature of computers' usage: it can be turned into an useful tool for everyone ...,an architect can obtain a good means to communicate his ideas, so can a good drafter and so on.

- to try to obtain exactly what you need from the computer is very important, but it takes patience and experience. In this case you must demand beautiful drawings from it, without stopping at its first limits; by proceeding step by step you have to obtain excellent results (in some cases of a different kind from classical architectural outputs): the professionality and ability of an architect can be proved also by these computer-aided outputs.

The second point is what can be found about this matter:
   a) at the university
   b) on the market
   c) in the bibliography

The third point: is the direct experience I made on a macintosh, of which I can say now that:

- this kind of instrument is a good worker even if it is cheap
- the specialized preparation needed for its usage is banal: this is right since an architect is not an expert in computer science and he does not have to become. [3]
- to make a good design with a computer it is necessary to have a good know-how in architecture, for none of the architect’s capabilities may be substituted by an object;
   - this involves the learning of a new way to express oneself, and consequently all the toils of learning a new know-how (will it ever be possible to finish? ... ).

[3] It is true, however, that communications between the architects and the programmers should be improved in order to transform and update designer’s instruments.
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APPENDIX I
In this schematics images are obtained by considerable reductions and cuts from the real drawing.

questa è una prospettiva ottenuta come descritto sotto

questo è l'effetto della pulitura con mac 3D

la pulitura del disegno, che così è troppo tecnico, si può fare in due modi: o con lo scollamento e cancellazione facce nascoste in mac 3d, o con la ricalcatura in draw o draft. Se ottenuta con mac 3D è più laboriosa ma ha il vantaggio di lasciare gli oggetti tridimensionali; con gli altri due, invece, si ottiene un'immagine bidimensionale, ma si hanno tutti i vantaggi della elasticità di questi programmi

questo è l'effetto della pulitura con mac draw (apparentemente non è diverso da quello di mac 3D)

questo è un rapido tentativo di adorno del disegno con mac draw

Restituzioni prospettiche del porticciolo di Nervi (Ge)
Sviluppato per il corso di Progettazione I, per l'inserimento da parte degli studenti dei loro progetti
Software usato: Mac 3D e Mac Draw

Note: per l'introduzione dei dati ho usato tavola digitalizzatrice, con cui ho ricalcato il disegno in scala 1:1000, poi ho cambiato scala con banale trasformazione sempre in foglio bidimensionale, usando mac draw. Da qui ho trascritto il disegno in mac 3D, dove ho dato la terza dimensione agli oggetti, sempre in scala. Da questo momento è possibile ottenere banalmente qualsiasi visione prospettica dell'intero fronte del porto. Il software è in grado di occultare le linee nascoste ma in questo caso il disegno è troppo complesso perché ciò sia fatto in tempi accettabili, allora bisogna provvedere a farlo a mano anche aggiungendo particolari descrittivi come da didascalie.
APPENDIX II

MISCELlANEA

Disegno reale in scala realizzato con mac draft
Assonometria di un palazzo per uffici del l'Ansaldo a Genova (richiesto da studenti)

Prospettiva dell'edificio precedente realizzata con mac3D e rielaborata in fretta con mac draw

Prospettiva di un progetto in fase di elaborazione di un gruppo di studenti di un corso di progettazione realizzato con mac 3D

Miscellanea di esempi del funzionamento del software indicato e di lavoro su temi proposti

Software usato: Mac Draw, Mac 3D
APPENDIX III

MISCELLANEA

Disegno di colonnato con ombre senza riferimenti reali, per provare i vantaggi della duplicazione automatica di elementi ripetuti: realizzato con mac draft (le ombre sono fatte a mano)

Fasi della costruzione di una sfera con l'ombra, è il primo disegno che ho realizzato, con mac draw

Rotazione di un elemento geometrico, costruzione, disegno mac draw, fra i primi, come prova delle possibilità del programma.

N.B. solo per ora non riporto esempi di altro software per disegno su cui ho lavorato

Prospettiva di una stanza con una parete divisoria forata in mezzo, la prospettiva è stata fatta con mac 3D; la pulizia con mac draft.

Miscellanea di esempi del funzionamento del software indicato e di lavoro su temi proposti

Software usato: Mac Draw, Mac Draft, Mac 3D
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