

Information Technology Teaching at the University: an experience at the Faculty of Architecture in Naples

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ABSTRACT

The experiences illustrated here refer to didactic activity carried out at the Faculty of Architecture of the University of Naples; in particular these concentrate on the technological aspects of the teaching of architecture. We can consider the evolution of the architect from individual operator to manager of the multi-disciplinary aspects of the building process (*building process manager*) as a reality in today's Italy. The Support Systems of Information Technology (ITSS), can be of great importance for this professional figure, and for this reason it is important to include him/her in the teaching process.

I personally have involved fourth and fifth year and last-year undergraduate students in the following subjects at the experimental stage:

degradation diagnosis supported by an Expert System in courses of the Technology of Building Rehabilitation;

co-ordinated System of tests in degradation of existing buildings;

the use of three-dimensional programmes to survey and visualize the territory; rapid analysis of degradation in the maintenance of urban façades.

In these and other similar works ITSS has played a significant part for a global synthesis in students' methodological approaches, being an introduction to new Information Technology potentialities.

Key Words:

teaching at the University; management of knowledge; project methodology; expert systems.

The new teaching at the Faculty of Architecture

During the last six years I have started to introduce the use of Information Technology for construction as a methodological support to educate the future professional operators at the Faculty of Architecture at the University of Naples. If we consider the architect as a *building process manager*, capable of managing the multi-disciplinary aspects of the building process (information and organisation, project, construction process and its management, trial and maintenance), the Support Systems of Information Technology (ITSS) could have an important role as a methodological and formative approach to different problems.

There is a tendency, in Italy, to use ITSS in developing projects and during building construction, not only in large engineering companies but also in small and medium-sized professional offices. ITSS is widely used in the different phases and



aspects of the project process, for data base, drawing (CAAD), methods of calculation for both structural and plant grid systems, bills of quantities, etc.. For this reason we maintain that it is important during the final years of studies of Architecture to introduce ITSS as a support system in the organisation of the architectural project.

As a matter of fact, the development of ITSS, specifically applied to the Architectural Teaching at the University of Naples, could be important for the students in order to:

- make possible the management of a great variety of different information;
- provide methodological metadesign supports and ways of comparing and linking them;
- integrate the traditional studies with the approaches of different operators in the Architectural Field;
- reduce the present division between school and the operators in the building industry;
- familiarize the students quickly about new technologies in building constructions and changes in procedures;
- cooperate with knowledge engineers, researchers and experts in IT.

This experience was facilitated by the creation of the European Didactic Laboratory at the Department of Architectural Configuration, Design and Planning, working on diagnostic technologies, interventions and maintenance of existent building since 1987. This laboratory was supported by an informatic classroom usable by last-year undergraduates and by a course of 20 students maximum.

In this experience I was helped by a knowledge engineer, Ernesto Burattini, Italian CNR Researcher, who guided the students in their first approach with the computer and in studying, analysing and reducing all problems to the essential, in order to give back representations in terms of logical and descriptive terms.

Degradation diagnosis supported by an Expert System, in courses of the Technology of Building Rehabilitation.

The tutorial experiment at the Architectural School of the University of Naples originated as an application of an Expert System (E S) for pre-industrial building rehabilitation diagnosis, coordinated by Ernesto Burattini, director of the research financed by CNR for the Finalised Building Project (1989/94). This expert system has been designed for real-life situations on the basis of many experts in architectural composition, structural consolidation and technological adjustment, and tested on real cases solved by those experts. We chose to work simultaneously on three different sectors with three different experts: the building is analyzed for historical-typological diagnosis, structural diagnosis and technological diagnosis.


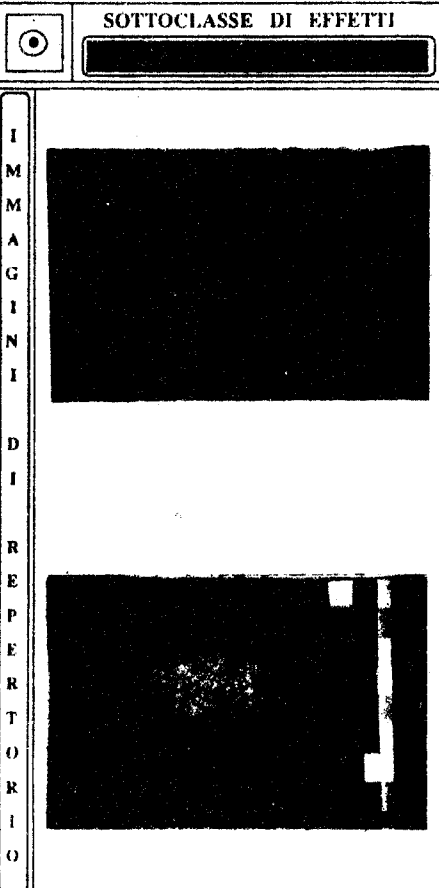
For the entire diagnosis the logical and analytical procedures have been implemented in three different inferential engines. As a result, the knowledge-base was different although co-ordinated.

Two different users were involved in the tutorial experiment of the E S: fourth year students and last-year undergraduates, and they concentrated specifically on the dampness diagnosis applied both to the building and urban environment.

This experience has already been described in detail in the Proceedings of *Caad Instruction, The new teaching of an architect*, at the International Conference of the ECAADE held in Barcelona in 1992, but I think that a short report of the experience could clarify the meaning of my experimental teaching experiences.

We divided the teaching into three phases, thus summarising the work carried out by the experts for the construction of the E S.

the uncertainty in diagnosis. This was due to the co-occurrence of more than one cause. It therefore became necessary to define another phase, *oriented investigation or precise diagnosis*, that involves different technical methods of calculation and often needs investigation *in situ* of the building. For this phase we again used a last-year undergraduate thesis (carried out by Tiziana Saccone) for the experiment. In particular we compared the buildings of two roads in two different areas to obtain a wider application.

| 3  OSSERVAZIONE DEI FENOMENI | |
|--|---|
| 3.4 INDICAZIONI PER IL RICONOSCIMENTO DEI FENOMENI | |
| CLASSE DI EFFETTI | SOTTOCLASSE DI EFFETTI |
| D E F I N I Z I O N E Si presenta come un sollevamento superficiale di materiale di forma, colore e consistenza variabile. |  |
| M A T E R I A L I E' riscontrabile generalmente sugli intonaci, sulle vernici in genere ed altri materiali ad essi assimilabili. | |
| C O L O R E Non presenta un'alterazione cromatica evidente rispetto al supporto, bensì una variazione volumetrica. | |
| U B I C A Z I O N E Come il blistering, si riscontra all'esterno sulle superfici verticali e all'interno indifferentemente sulle partizioni orizzontali e verticali. Se lo si ritrova nella zona basamentale, può essere accompagnato o meno da altri effetti. | |

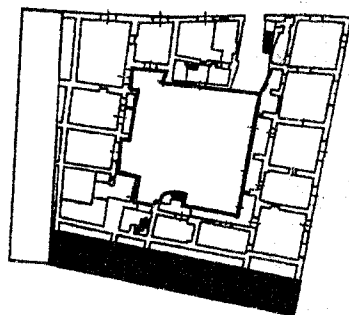
2. Page of Help for the definition of phenomena

Coordinated System of tests on degradation of existing building.

This subject, carried out at research level in a Finalised Building Project of CNR directed by me, was proposed as the subject for a last-year undergraduate thesis, carried out by Antonio Noviello and Ciro Pinelli, in order to examine the theoretical and practical difficulties that non-specialised technicians may encounter in the

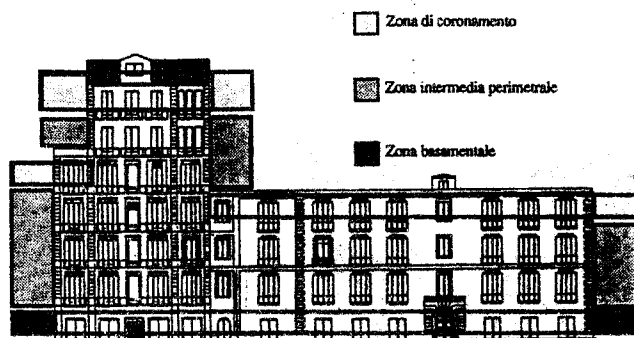
The first phase we described as *preliminary*, which was finalised to collect information on the building itself; and it is at this very stage that the teaching of the E S assumes a different form to that designed for professional architects. To simplify this operation we prepared a specific form which can be filled in, *in situ*, dealing with component materials, relevant dimensions, typologies and constructive techniques. At this stage a group of last-year undergraduates was guided through this system with the aim of creating a tutorial manual for access to the E S (Clementina Pugliese and Anna Gnazzo).

LOCALIZZAZIONE IN PIANTA



- Corte
- Edifici in adiacenza
- ▨ Pareti controterra

ZONA BASAMENTALE
 ZONA INTERMEDIA PERIMETRALE
 ZONA INTERMEDIA INTERNA
 ZONA DI CORONAMENTO.



- ▨ Zona di coronamento
- ▤ Zona intermedia perimetrale
- Zona basamentale

1. A page from the manual with localization scheme

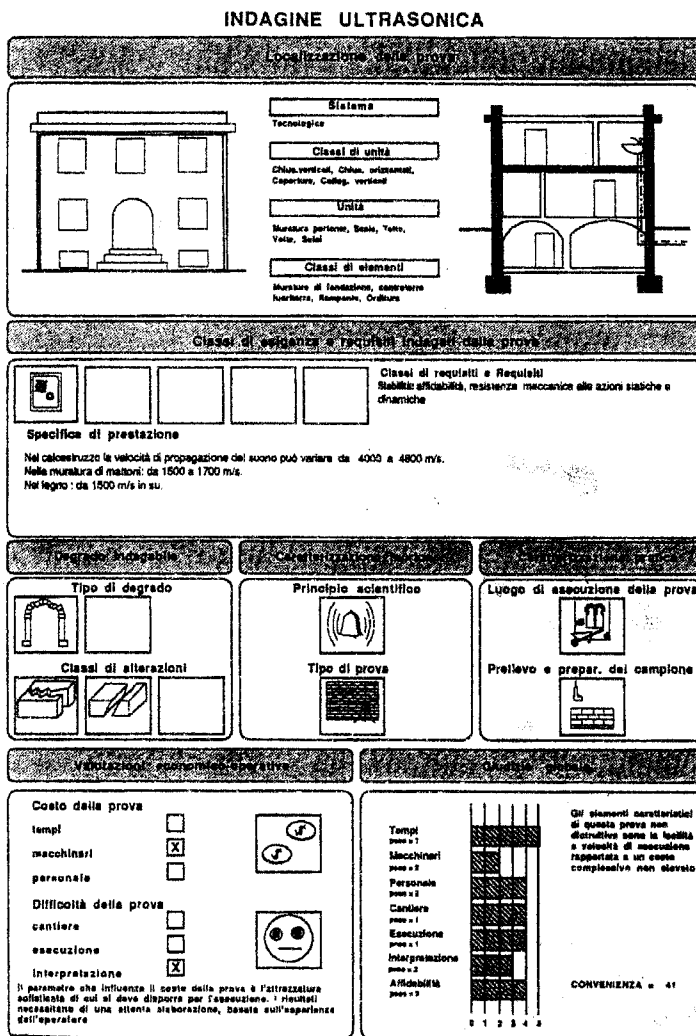
The second phase was based on the specific observation of phenomena. The different levels of ability of students at this stage created problems that led us to develop, together with the E S, consultative documents on conditions of degradation. In fact, in the E S "help" is foreseen but is very condensed not to complicate the system. Following this we saw the need for a data bank based on scientific concepts and on a visual library to connect to other E S elements.

The third phase was based on the correlation between cause and effect. During the application stage we verified two different possibilities: the first was to reach, at the end of the E S process, a satisfactory precision of dampness diagnosis. The second was

diagnosis of buildings.

The thesis was developed in two phases, the first mainly theoretical in character, and the second more experimental.

The first phase was oriented towards the creation of instrumental tests which can be used for the diagnosis of ancient buildings to be rehabilitated. The cataloguing and evaluation of tests has been organised specifically by the students through indexing on computer (using the information data-base on the File-maker programme by Claris on the Macintosh System). This was done with the aim of comparing, up-dating and correcting after the second phase, particularly for the evaluation of their congruence and economy, for which a Multicriteria Analysis was applied. In the experimental phase the method of evaluation of tests was applied to certain real cases, particularly regarding the problems of installation on site, the choice of areas



3. An example of indexing test (ultrasonic analysis) on wall

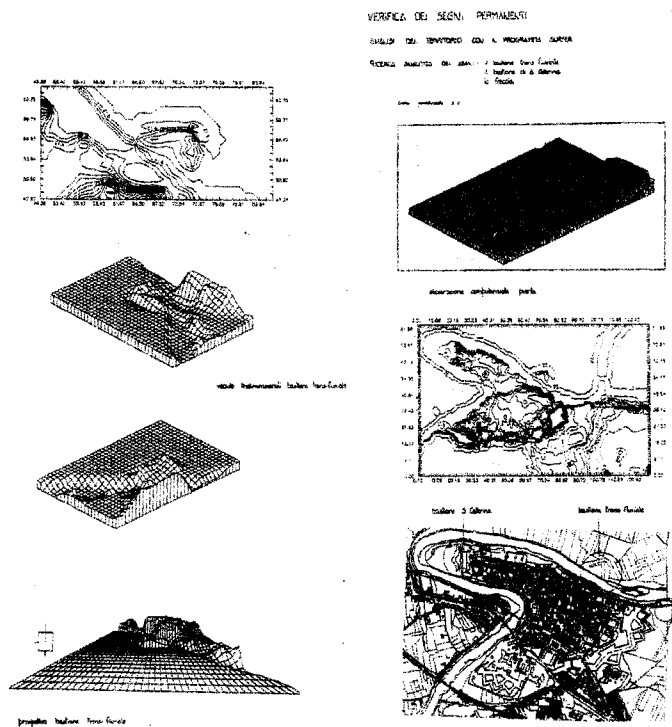
to be tested and the phases of executing tests. Another problem was the legibility and application of the data regarding the condition and performance of the single components of the building under examination. On the teaching front the use of the information index has permitted a notable acceleration of time devoted to work and revision and has improved the quality of the final result, despite some time lost due to the problems of the students' first experience on computer.

On the productive and ITSS front this approach has demonstrated some possibilities of development and extension, such as:

- the definition of norms procedure in the carrying out of tests to render them less destructive for ancient buildings, and to improve the reliability of final data;
- the need to provide a graphic representation of tests data on the building, using the Autocad system;
- the organisation of a continuous monitoring programme of the condition and performance of the building connected to a central monitoring network.

The use of three-dimensional programmes to survey and visualize the territory

The last-year undergraduate thesis about "Knowing and recovering Capuan fortifications", carried out by Antonio Maio, with the help of Isabella di Resta, expert in History of Architecture, has pointed out the problem of the environmental recovery of the edge areas of urban fortifications which encircle ancient Capua and the immediate surroundings.



4. Synthesis of three-dimensional programme results

It is a very unusual area which, being at the intersection between the city and the countryside, cannot be defined as a really "urban" place, nor as a "rural" one. At the beginning of the century, having lost its primary defensive function, the area was progressively abandoned, improperly used or heavily transformed, according to its relationship with changing urban demands. This is a very complex context, with great conditions of degradation affecting the defensive masonry structures - which appear completely covered with infesting vegetation - and the defensive earth foreparts - reaching the Volturno river, which runs around the city. Nowadays these elements appear unrecognizable because of their different uses, these being agricultural activities, quarries, rural streets, etc.. As a result the application of a computerized analysis has revealed itself to be an indispensable instrument in comprehending all the reciprocal relationships among the different parts of the territory.


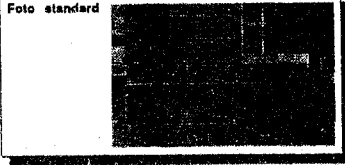
After having found the up-to-date planimetries, - and with the aid of a geometrical grid - the portion of territory which was the object of the study has been defined over them. Then, the main altimetrical altitudes have been drawn. The Surfer System Programme (three-dimensional graphic output from alpha-numerical data on a MS-DOS system) by interpolating and elaborating the altitudes over a grid, has given back a new highly defined map of the area. Moreover, the versatility of the programme used allowed us to examine each single part of the territory, giving all kinds of graphic representations of it from many points of view.

The high definition in the representation of the places examined, allowed us to reconstruct their anamnesis and to define clearly some elements otherwise not perceptible, such as the "arrows" on the ground near the quarries and on both sides of the river, and the outline of the walls, going beyond their actual conditions of illegibility.

It is just the redefinition of these last elements which has revealed one of the bases in the projectual hypothesis of environmental requalification of the Capuan walls complex, based on the redefinition of their role in the actual urban and environmental context.

Rapid analysis of degradation in the maintenance of urban façades.

The last-year undergraduate thesis on the rapid analysis of façades of Corso Vittorio Emanuele in Naples, carried out by Daniela Ingallina, came about following detailed research conducted by A.Bosco, U.Caturano and S.Rinaldi, researchers in our Department. Their research, entitled "Technological Analysis and Pre-diagnosis of the façade base area" on an urban scale, was aimed at the recognition of alterations to the surface of façades through signs visible to the naked eye, without the use of sophisticated instruments. The field of analysis was restricted to the façade base area, considered a 'critical zone', and to signal general conditions of the entire façade. Daniela Ingallina concentrated her research on the extension of the previous methodology adopted for the façade base area to all the façade, evolving a system of indexing in which the façades, the materials and the context were portrayed in model form; the road analysed is situated in the west of Naples, halfway up a hill with a fine view, and was built in the middle of the nineteenth century with the intention of protecting this view. The buildings under examination follow the formal rules of neoclassical architecture, demonstrating the relationship between established technical and administrative regulations and successive building techniques. Rapid analysis has been organized under four categories: the first comprises the general data of the building and its environment, the second the façade base area,

| SCHEDE SPEDITIVA DI RILIEVO DEL DEGRADO DEI BASAMENTI | |
|--|---|
| Collocazione dell'alterazione  | Foto standard  |
| INDIVIDUAZIONE DELLA FACCIATA Indirizzo Via Partenope, 48 Facciata su Via Partenope Quartiere S. Ferdinando Insula n. 81 | Giudizi |
| COLLOCAZIONE Collocazione in facciata <input checked="" type="checkbox"/> Base <input type="checkbox"/> Mediana <input type="checkbox"/> Coronamento <input type="checkbox"/> Cantonale sx <input type="checkbox"/> Zone centrale <input checked="" type="checkbox"/> Cantonale dx Collocazione nel basamento <input type="checkbox"/> Contatto calpestio <input type="checkbox"/> Zoccolo <input type="checkbox"/> Cimasa | Collocazione A rischio 1 |
| TIPOLOGIA COSTRUTTIVA Strato 0 a.2 muratura tessuta in pietra Strato 2 b.1 blocchi spessi di pietra Strato 1 b.1 grappe metalliche Strato 3 | Tipologia costruttiva Favorevole -1 |
| CONTESTO AMBIENTALE Esposizione esposta Trafico veicolare <input type="checkbox"/> scarso <input type="checkbox"/> medio <input checked="" type="checkbox"/> Intenso Flussi d'acqua sotterranei falsa Orientamento sud Sosta auto <input checked="" type="checkbox"/> si <input type="checkbox"/> no Pendenza terr. d'impianto <input checked="" type="checkbox"/> favorevole <input type="checkbox"/> sfavorevole <input type="checkbox"/> indifferente Tipologia climatica marino, urbano Azione antropica Indifferente | Aggressività amb. Clima A rischio 1 traffico/azione antrop. A rischio 1 terreno impianto A rischio 1 |
| CONTESTO TECNOLOGICO Elemento applicato <input type="checkbox"/> si <input checked="" type="checkbox"/> no Elemento collaborante <input checked="" type="checkbox"/> si <input type="checkbox"/> no Chiusura verso terra cantinato | Contesto tecnologico Favorevole -1 |
| ALTERAZIONI Aumento di materia Deformazione Interruzione di continuità Modificazione cromatica Perdita di materia Variazione di grana | Grado di alterazione Assente -1 |
| GIUDIZIO GLOBALE | Rischiosità = 1 |

5. A sheet for the rapid analysis of a basement

the third the central area of the façades, and the fourth the crown. This has been done to facilitate the selection and collection of the various elements in order to form an opinion of the state of degradation of the façades. For the recording of data acquired through field-research software filing was used (File-maker programme by Claris on the Macintosh System), which permits access to various options through computer.

This type of research - on the developmental stage of the control techniques on land use - demonstrates the possibility of a relationship between the research institutions of the University and the local administrative institutions, and in the creation of permanent checks of the character of the landscape and any changes therein by the observers assisted by ITSS.

At the end of these short notes on my experience at the University of Naples, I can maintain that the didactic application of ITSS can have double results in the development production stage. The first is tied to the increase of tutorial programmes

designed for University use. The second, the increment of professional application of ITSS is related to the confidence of the new generation of architects with this system, which is implemented in their work and which can be expanded to apply to various building and environmental processes.

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