The introduction of early computer graphics procedures in the Architectural and Design fields in Latin America has been a complex and hard task due to different motives that can be summarized as educational prejudices, political instability and financial problems. The paper aims to summarize the origin of the “system approach” view in the region based in experiences of some leading institutions nowadays. A chronological development of the present curricular systems in some Faculties of Architecture and Design will also be included. It must be considered that the great majority of public universities in Latin America are free of charge for the students.

Keywords: Pedagogic Evolution; Educational Systems; Latin America; Curricular Differences; Prospective.

What I read, I forget.
What I see, I remember.
What I do, I learn.
(Old Chinese Proverb)

In the XVI century when somebody in Flanders discovered the movements of the earth around the sun, he became the father of modern astronomy. When somebody made similar observations in Latin America from Mexico to Patagonia, he was burned by the Spanish inquisition.

(Old Latin American Proverb).

Introduction
It can be assumed that during 1963 the first digital computer was installed in the Faculty of Science of the University of Buenos Aires.

In 1965 at the Faculty of Architecture of the same university it was launched the first idea of “automatic drafting” as a conceptual possibility based in a system approach. Due to political turmoil in 1966, it was further continued at the Architectural Association School of Architecture in London and at the Department of Building Science of the University of Manchester, Institute of Science and Technology during 1967-68.

In 1974 the Faculty of Architecture of the Central University of Venezuela in Caracas, Professor Gonzalo Velez Jahn set up the first computer laboratory for advanced design procedures. Also in 1981 Professor Leonardo Combes developed the system laboratory at the Faculty of Architecture of the State University of Tucuman in the North of Argentina.

Also in the 70’s in Chile, computers were first related to urban models of transport based on British developments.

At the end of 1983, Professor Montagu, at the Faculty of Architecture Design & Urbanism of the University of Buenos Aires and the National Research Council of Argentina, set up a research group concerning with the implementation of a pedagogical strategy to teach CAD systems to a massive number of architectural and design students, becoming simultaneously a challenge and a commitment.
Due to intensive financial and political breakdowns, each country have developed different approaches based mainly on individual actions more than in an integration policy inside the curricular system of the educational institutions.

This short introduction aims to provide an overview on the initial stages to establish a computer graphics policy in the educational environment in the region. Therefore, this paper will present the origin of a few research centers and groups and a variety of pedagogical strategies representing also the diversity of the environmental situation of each institution. Some examples from Argentina, Brazil and Chile are also included.

The Sixties
The mid sixties were the period where the “system approach”, originated mainly in Great Britain and some American institutions, were responsible to the major influence over the schools of architecture and design around the world. There were also some individual actions in Latin America due to the influence over the design process of “high level computer languages” as Fortran and Algol as an analogy with the system approach.

The Seventies
During this period, it was developed integrated computer graphics systems on minicomputers scale, which covered a wide spectrum during the entire decade. Systems as IGDS by Intergraph, Computer Vision, Calma and ARC of Cambridge, provided architects and designers the possibility to avoid oriented programming, mainly for automatic drafting. Instead for the first time in modern history, analogical design procedures can be interfaced directly with powerful graphics routines.

The Eighties
At the end of the 70’s and the beginning of the 80’s the graphic routines of the 70’s were transformed into a “sequence of commands”, therefore most of the design curriculum of digital procedures in Latin America was based in teaching with this methodology. In the mid eighties this concept was gradually substituted by teaching designed strategies based in an “organizational criteria of digital documents”.

At the end of the 80’s the fast evolution of software and hardware allowed the improvement of the concept of “organizational criteria of digital documents”, setting up new pedagogical and information procedures, based on integration of “oriented languages” and “customization” of CAD systems. The architectural and design studios at the faculties were reluctant to easily accept the integration of the design process using analog and digital documents. It was possible to observe just a few examples in our region.

The Nineties
Influenced by IT, the new topics of research in the process of “teaching/learning” digital procedures, created new areas of knowledge in the field of architectural education. Between 1994 and 1995, most architectural and design faculties in Latin America started to be related trough IP protocols. This possibility presented a new kind of relationship among them; as a product of these events, SIGraDi was organized as a relational and knowledge interchange tool.

Proposal, main hypothesis and breakdowns

Today is an era of “teaching-learning process” (Papert 1996)

As a kind of summarized vision of present times, our main pedagogical proposal has certain common points based on three relational parameters: Continuity, Integration and Strategies to reuse Digital Information produced by the students”.

Continuity
The pedagogical strategy should be a continuous process where architectural studio (traditional or virtual) should be the central issue. All other technical and cultural disciplines or “summum”, converge to form the corpus of the architectural knowledge. (Breakdown 1: human factor, mainly by architecture professor’s who have preserved the traditional tutorial
system, could be a problem). (Breakdown 2: It is still difficult to integrate the technical and cultural disciplines into the “summun” not because they are behind the system approach, just because the “architectural studio” is not prepared, digitally speaking, to receive the information. It’s a kind of slow down in the process of continuity and further).

Integration I
The organization and development of IP protocols in the mid 90’s around Latin American educational institutions acted as a “turning point” for pedagogical procedures. Communication among institutions with the extended use of WEB sites as an alternative source of information has improved the richness and the amount of information used in the design field. (Breakdown 3: again the vast amount of information could produce a syndrome of data overload, therefore the present pedagogical strategy should be “how data and information can be fragmented and transformed into knowledge”).

A combination of Intranet-Internet system could be an appropriate tool for the convergence of the complementary disciplines using free hostings available in the virtual environment.

Integration II
Integration could be the creative part of the process because the final result will depend on how data shall be assembled. There are well-known examples in the architectural field: in one side the complex forms of the Guggenheim Museum at Bilbao-Spain by F. Ghery originated from an analog-digital procedure. In the other side of the design process spectrum there is the work of Oscar Niemeyer, the Brazilian master architect who has an intuitive system view but always “designed by hand” like the Museum in Niterói, Brazil.

Reuse of digital information produced by the students - The development of a digital library
The final-end product (analog or digital) produced by students could be the initial effort to start a digital library, assuming that there are appropriate tools (servers, backbone, etc.) to support the system. During the design process there is a set of digital documents, including those who are coming from the technical and cultural disciplines that can be selected and organized in a set of files.

These files should be analyzed with different criteria of evaluation procedures. A comparative strategy should be used in order to select the original features from each student work. Afterwards those features can be transferred to a working paper in three different types of support: working document, or a CD or a set of WEB pages.

(Breakdown 4: again, human factors could be an impediment to develop the idea. The first one came from the librarian, the second one came from the professor who doesn’t want to deploy his teaching strategy, the third one is the student who wants to show his own ideas).

Conclusions
Improving the Digital Culture
Taking in consideration the graphic environment, where today there are more than 30 different types of Architectural and Design fields oriented software including IT, it will be necessary to “develop a new field” concern with a new way of integrating the students with the digital culture.

Finally one of our proposal is oriented to organize several “Linux study groups” in order to find “software alternatives” taking in consideration that it is impossible (financially speaking) for Latin American universities, to follow the present trends of the software companies.

The Linux system is a well known GPL (General Public License) and present’s a great variety of alternatives, also can be used on any type of personal computer. It has a friendly graphic interphase as Gnome (http://www.gnome.org: May 2001). There is also modeling systems as blender (http://www.blender.nl: May 2001) and vector systems as CAD linuxCad (http://www.linuxcad.com: May 2001). The low cost characteristics of these systems are special features in our region because it makes affordable for everybody.
The Argentinean case
Faculty of Architecture, Design & Urbanism - University of Buenos Aires

The introduction of CAD systems started in January 1984 in a Faculty with 15,000 students. From the very beginning it was assumed the organization of a complex strategy to deal with the introduction of digital technology into six careers: Architecture & Urbanism, Industrial Design, Graphic Design, Garment and Textile Design, Image and Sound Design and Landscape Design. By means of an important foreign grant during 1989, the CAO Center was organized. The Faculty has currently 24,000 students.

The CAO Center has been gradually transformed in order to adapt hardware and software to this critical situation. There are approximately 1400 students/semester. There is also a research group, which through different types of granted projects tries to adapt this complex reality to an acceptable degree of educational possibilities. The idea of organizing a “Linux group” is consequence of the particular circumstances of this Faculty.

The CAO Center organized in 1997 a Latin American seminar of Digital Culture related to Architecture, Design and Urbanism. With more than 900 assistants from all over America and contributions from USA and Europe, it was organized the SiGraDi.

Faculty of Architecture Design & Urbanism - State University of Litoral (Province of Santa Fe)

The Faculty started in 1985 in Santa Fe city, as any public education is free and unrestricted, thus, it is massive.

The “Centro de Informática y Diseño” (CID) was created in 1992. During 1994 the implementation of the International Program of Academic Exchange with the Graduate School of Architecture of University of Utah, provided to some students and professors an extensive view of the international context, so the first project was the Digital Lab “Design of Architectonics Experiences”.

Another noteworthy project was the Postgraduate Program for students and professors (1995/97). It takes a year of courses an seminars that analyze and develop a new view and performance of Digital Media (DM). The origins of the first Digital-Analog Design Post-graduate course show us the improvement reached by media integrated to idealization and generation process, as on the project development. Nowadays, basic information modules are given by real presence or by remote procedures through satellite lessons (2000/1) and Digital media and new technologies labs (2001/2), will take place related to a Master Program in Arts.

Digital media stimulation opens up new questions about evaluating teaching methods in relation to Digital laboratories’ process and products. The Curricular Reform Program is modifying the Studio Plan, focused on flexibility of subjects, to allow movements between different disciplines. That is the way the Introduction to Digital Media (2001) subject was created as the first obligatory course for the first year on Graphic Design, Visual Communication, Architecture and Urbanism careers, as a challenge that will be complemented by elective courses for specialization provided by each discipline.

Faculty of Architecture, Urbanism and Design - State University of Mar del Plata (Province of Buenos Aires)

The Faculty of Architecture, Urbanism and Design of Mar del Plata has similar characteristics of the one in Santa Fe, regarding dates (1995) and environmental difficulties to set up a CAD laboratory. The school created the CEAC (Centro de Estudios Asistidos por Computadora) and developed an interesting strategy regarding the implementation of several types of elective courses. Since 2000 the CEAC have organized a series of obligatory courses into the curricular system. Under the concept of “Digital Media Workshop” it’s planned the “MeDia Arq” system as a set of five levels of computer courses including: parametric CAD, modeling, image processing, VRML, IT and network technology. In the last years the CEAC obtained a wide recognition, which allowed it to obtain up-to-date computer equipment. In 1998 the school organized the second international SiGraDi conference.
The Brazilian case
Faculty of Architecture and Urbanism -
Federal University of Rio de Janeiro

Although the Faculty of Architecture and Urbanism of the Federal University of Rio de Janeiro cannot be taken as a paradigm of the Brazilians Schools of Architecture, it has similar characteristics and limitations of all public universities in the country. A great majority of the best schools of Architecture in Brazil are part of the public university system, which has a continuous pressure from the national government to increase their number of students. The Federal University in Rio de Janeiro has near 1500 undergraduate students and a major shortage is how to provide equipment for IT education to all students. The postgraduate programs have fewer students, more resources and autonomy. Research groups in postgraduate programs usually can be financed with grants and have much better condition than the rest of the school.

Before planning a change in the curriculum to introduce IT for all undergraduate students, two major steps have to be taken by the schools: a financial program that would allow them to acquire, maintain and frequently upgrade a great number of workstations and peripherals; an IT training program for the educators and more opening positions for both faculty and staff IT experts.

For the implementation of IT teaching in Brazilian Architecture schools, it's critical to accomplish the conditions related to the personnel and material mentioned. A few proposals for that implementation are: Introduction to programming language that would provide skills to post project on websites and understand and configure CAD software; Introduction of 3D modeling and drafting that would prepare the students to learn while practicing with various software, without preparing for specific tools; Media courses that would introduce techniques to edit different type of files; Advanced courses on programming languages; Advanced courses on 3D modeling, rendering and animation; Advanced courses on media.

The Chilean case
Department of Architecture University of Bio-Bio (City of Concepción)

The case of Chile is interesting because it's the only country in Latin America who has 33 Schools of Architecture with small number of students – an average between 300 to 1000 students. Also, it's the only country in the region where state universities are not free.

The evolution of CAD technologies applications has followed similar characteristics of other Latin American countries, with a few distinctive features. These features are mostly related to an intense interaction with American and British universities. Since the 70's there were several architects introduced and developed CAD systems in Chilean universities.

The pioneering institutions in Chile are: University of Chile in the 80’s (early version of customized AutoCad). The prestigious Catholic University also in the 80’s developing software for structural calculation. University of Valparaiso began computer courses in the 80’s. And important experience is conducted at the University of Santiago, Department of Architecture where CAD courses are obligatory towards the course, it's noted that Microstation system is extensively used in this Department. UNIACC is another university devoted mainly to communication technologies and carry on virtual studios. Last but not least, the Department of Architecture of the University of BioBio is the leading group in the region developing Virtual Reality procedures for the architectural field.

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