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Computer Technology and its Reflection on the Architecture and Internal Space

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Asmaa Abd Elgawad Elsebae

Computer Technology and its Reflection on the Architecture and Internal Space

Abstract

In *computer engineering*, micro-architecture, also called computer organization, is the way a given *instruction set architecture* (ISA) is implemented on a processor. A given ISA may be implemented with different micro-architectures. Implementations might vary due to different goals of a given design or due to shifts in technology. *Computer architecture* is the combination of micro-architecture and instruction set design. The interaction between computer architecture and technology is examined. To evaluate the attractiveness of particular technologies, computer designs are assessed primarily on the basis of performance and cost. The technology trends discussed concern memory size, design complexity and time, and design scaling. Opportunities and problems to be solved in the years ahead are identified.

Research content:

Architecture (computer science)	<ul style="list-style-type: none">• Definition of Architecture (computer science)• Design elements of the computer system• Processing architecture• Open and closed architectures	P2
Models of computer applications in architecture and interior design	<ul style="list-style-type: none">• Rapid prototyping• Digital Architecture	P 4
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Tab. 1

1. Architecture (computer science)

1.1 Definition of Architecture (computer science)

Architecture (computer science), a general term referring to the structure of all or part of a computer system. The term also covers the design of system software, such as the operating system (the program that controls the computer), as well as referring to the combination of hardware and basic software that links the machines on a computer network. Computer architecture refers to an entire structure and to the details needed to make it functional. Thus, computer architecture covers computer systems, microprocessors, circuits, and system programs. Typically the term does not refer to application programs, such as spreadsheets or word processing, which are required to perform a task but not to make the system run.

1.2 Design elements of the computer system

In designing a computer system, architects consider five major elements that make up the system's hardware:

- The arithmetic/logic unit, arithmetic performs and compares numerical values.
- Control unit, directs the operation of the computer by taking the user instructions and transforming them into electrical signals that the computer's circuitry can understand. The combination of the arithmetic/logic unit and the control unit is called the central processing unit (CPU).
- Memory, stores instructions and data.
- Input, and output. sections allow the computer to receive and send data, respectively.

Different hardware architectures are required because of the specialized needs of systems and users. One user may need a system to display graphics extremely fast, while another system may have to be optimized for searching a database or conserving battery power in a laptop computer.

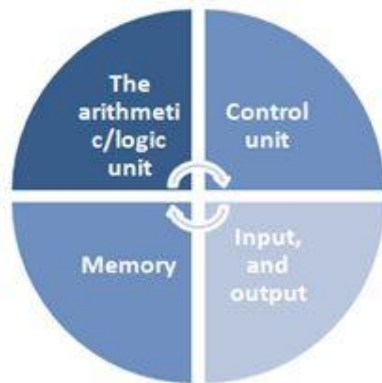


Fig. 1:
Design elements of the computer system

1.3 Processing Architecture

When a computer carries out an instruction, it proceeds through five steps:

- First, the control unit retrieves the instruction from memory—for example, an instruction to add two numbers.
- Second, the control unit decodes the instructions into electronic signals that control the computer.
- Third, the control unit fetches the data (the two numbers).
- Fourth, the arithmetic/logic unit performs the specific operation (the addition of the two numbers).
- Fifth, the control unit saves the result (the sum of the two numbers).

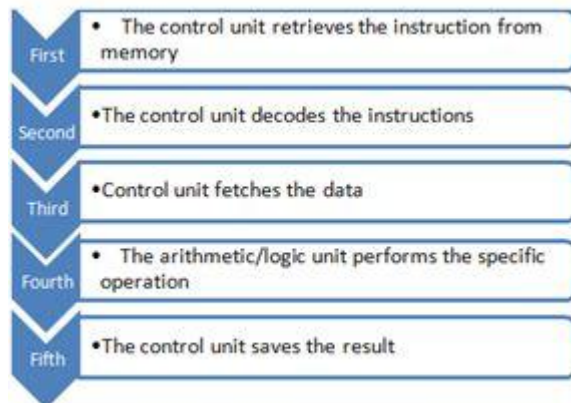


Fig. 2:
Processing steps of the computer system

1.4 Open and closed Architectures

The CPU of a computer is connected to memory and to the outside world by means of either an open or a closed architecture. An open architecture can be expanded after the system has been built, usually by adding extra circuitry, such as a new microprocessor computer chip connected to the main system.

The specifications of the circuitry are made public, allowing other companies to manufacture these expansion products.

Closed architectures are usually employed in specialized computers that will not require expansion—for example, computers that control microwave ovens.

2. Meta-design

There is no doubt that technology is integrated with our sensory and cognitive significantly, it means not only a particular type of communication methods, but also includes the way we perceive the environment in which we live. As the technology which depends on the transmission of information, and calculated to affect the patterns of production and working, knowledge, social relations and space vacuum.

All above lead to the transformation of traditional architectural design to meta-design with the exploration of combinations of time and place, as well as new applications that are represented in the architectural and interior design.

2.1. Definition

Meta-design (or meta-design) is an emerging conceptual framework aimed at defining and creating social, economic and technical infrastructures in which new forms of collaborative design can take place. It consists of a series of practical design-related tools for achieving this.

Architectural design intended to where the information associated with the installation of information and graphic description of the script and the spatial and dynamic shape to it, and my father also interface depends on the logic of computer technology and communication in communities connected by networks.

Beyond the design and deal with new senses, where it increases our knowledge and cognitive and affect significantly the awareness and emotional behavior and the meeting.¹

3. Models of computer applications in architecture and interior design

There are many computer applications in the field of architecture and interior design where there are a lot of programs that help the designer to clarify the

¹ Ola Mohamed Samir – smart architecture and its impact on the exterior and interior design – interior design department and furniture – Faculty of Applied Arts – Ph.D – 2006.

designs, also there are some programs that help to analyze the design, and a lot of other applications that were done manually and depends on the human factor and now it done by computer software.

3.1 Rapid prototyping

Rapid prototyping is the automatic construction of physical objects using additive manufacturing technology. The first techniques for rapid prototyping became available in the late 1980s and were used to produce models and prototype parts. Today, they are used for a much wider range of applications and are even used to manufacture production-quality parts in relatively small numbers. Some sculptors use the technology to produce complex shapes for fine arts exhibitions.

With additive manufacturing, the machine reads in data from a CAD drawing and lays down successive layers of liquid, powder, or sheet material, and in this way builds up the model from a series of cross sections. These layers, which correspond to the virtual cross section from the CAD model, are joined together or fused automatically to create the final shape. The primary advantage to additive fabrication is its ability to create almost any shape or geometric feature.

3.2 Digital Architecture

Digital Technology

Classified in the architecture of digital technology to several ideas, including the digital civilization, and digital techniques, digital facts, and digital design processes. Of digital technology's role in building and cyber visually or civilization based on the concept of optical cyber visual control through the realization re-encrypt of computer.

Using the mechanisms and many ideas associated with recoding perception machinery and computer, and adopted the techniques of virtual environments as mechanisms to re-encrypt the perception of civilization as a result of human exposure to information and digital intensively and face of the virtual environments that reflect the relationship between realization and performance of digital technology terminology.²

Building a Base for Digital Futures

Has ›the digital‹ been absorbed by the discipline or has ›the digital‹ absorbed the discipline? Architecture either continues to disintegrate or has reformed

² Akram Jassim, Ahmed Loay – the impact of digital technology in the ecological and biological formations in local architecture – Department of Architecture-University of Applied Sciences – Amman, Jordan-University of Technology-Baghdad, Iraq-UAE magazine Engineering Research 15/02/2010.

around a new definition of »the master builder«. Digital technology has opened a variety of new career opportunities for the digitally advanced architectural design. Some depictions of this trend have the discipline of architecture continuing to fragment into specialties. However, software has established platforms from which the activity surrounding a design project can be directed, managed, and built (BERMUDEZ/KLINGER 2003).

Defining Digital Architecture

Architecture is presently engaged in an impatient search for solutions to critical questions about the nature and the identity of the discipline, and digital technology is a key agent for prevailing innovations in architecture. Although, this is really nothing new, as new technology has always been a catalyst for new ideas in architecture. A positive digital future in architecture requires a clearer definition of principles and skills necessary to maintain a rigor in emerging digital projects.

What is digital architecture? Architectural ideas have found new forms of digital representations, as information reconfigures into digital visualizations, and projects evolve further as digital fabrications. However, using digital technology doesn't necessarily constitute creating digital architecture. Any new categorizations of architecture must connect equally with the critical as well as the technological skill base of the authors. Just as there is a difference between building and architecture, there is also a distinct difference between digitally generated projects and digital architecture.

The digital architecture projects still come to life through the lens of a familiar architectural process—as a critical problem solving activity that results in projects represented with a rigor and depth of idea and intention, albeit with a highly sophisticated digital tool skill set. Without new principles, many projects remain impenetrable and thus intimidating, or merely »interesting« (BERMUDEZ/KLINGER 2003).

Digital Tools

In the early stages of their engagement of computer technology, architects approached the technology as an assistive technology that would enhance the practice of architecture. The scope of the engagement was captured in the phrase »computer-aided architectural design.« In the four decades since, the role of computer technology in architecture has gained a marked significance. The scope has now been extended for architects to contemplate »totally computer-mediated architectural design.« The key in the development of digital tools to enhance the practice of architecture has been the facility with which the various tasks involved in the practice of architecture have been represented, enabled or enhanced using computer technology. The digital representation of architectural entities and the digital manipulation of those entities have provided alternate means to produce architecture. Drawing, modeling, performance simulation, design collaboration, construction management and

building fabrication are now routinely performed using computer based technology.

This success has revealed the untapped potential of the computational representation of architecture. Advances in computing based on the study of natural processes such as neural processing, genetic evolution and emergence now suggest that the elusive nature of creative architectural thought can be articulated enough to be applied in a technologically-mediated environment.

Digital tools may finally reveal what other architectural tools have hitherto concealed the architectonics of architecture. Therein lays promise. The future of digital tools rests on the extent to which architects can accept that exemplary architectural designs can be created in a computer mediated environment and that digital thinking is indeed architectural thinking.

Digital Design

Describing design as a sequence of steps cannot convey the complexity of social interactions that it embodies. Design is not merely a process, but a co-evolution of efforts and events in various places and times – both synchronous and asynchronous. Designers share their values, effort and expertise within design settings via artifacts that further the design process. Increasingly, these design settings in academia, research, and professional practice combine physical and virtual modalities such as immersion, projection, and a range of interaction technologies. The spaces described as cybrids: hybrids that integrate virtual and physical space.

In these settings, designers use overlapping physical and virtual artifacts and tools to arrive at a co-operative design resolution. Within collaborative design, these artifacts take on an additional role. As embodiments of design ideas and actions, they become media for communication. The technologies for this already exist in collaborative tools, networked computing, scanning and immersive media. However, it will take a creative vision to see how these disparate tools and devices can integrate within the ideal design setting.

Some of the projects which the computer helped in design.

Train station in Stuttgart – German

More striking and impressive actually in the building, it is the holes or eyes light, which is the most important architectural feature in the stunning design, making the building a symbol of the city as a whole. And other important attribute is that the ceiling will dock, to form a new arena Strasberg.

Regarding the sustainability criteria, is available in the project and sky-lights huge work to pump natural lighting on the tracks under the ground, with the use of photovoltaic panels on one of the nearby buildings, it be-

comes the entire complex city is consuming energy at all actually and all that by using computer technology.



Fig. 3:
Train station in Stuttgart

The Millennium Dome

The Body Zone project by Nigel Coates for the Millennium Dome is based on the assumption that the human body works like a miniature city, and the architecture in the city is represented by the bodies of a man and a woman. The human body is the most fascinating and complex object in the world. There has been no significant evolutionary transition in its shape, structure, composition or nature since Homo Erectus became Homo Sapiens between 100,000 and 150,000 years ago.

The Body Zone is designed to amaze, with the world's biggest physical representation of the human form, a rich and intellectually accessible exploration. Visitors are taken into the world of human biology and medical science. They explore the dramatic impact of lifestyle choices on the way our bodies appear and perform, not just illness but athletic prowess, reproduction, cosmetic alterations to the body and the future of fitness. This will consist of a sitting human figure taller than the Statue of Liberty. Visitors will enter on a walkway through the back into »an empty, cathedral-like space« through which they will travel upwards in a lift to a 360-degree observation platform in the head. From here, they will be able to look out over the whole area of the Dome.

The Body Zone project offered the opportunity for extensive experimentation with use of digital technologies in architecture to create volumes and forms, but also for the study of the structure, after Coates presented his initial clay prototype.

Also played a form of digital technology in many different styles of water movement and music with the lighting in the diversification formation and synchronization of compatible.



Fig. 4:
The Millennium Dom

Digital form by computer design

Definition

Through the adoption of CAD coding elements design and computer-generated formal relations of the model codes and digital codes reflect on how to install components with each other in sequence through a series of operations to a default, and stored in the program code is considered as a source to generate the Body Plan format.

The concept of body schema is that the generation of digital formats are stripped the configuration of the vertebral body to the abstract design elements and stored them in a virtual genetic code also for the production of new and exciting forms modified from the original and distinct from. The computer is trying to simulate human thought as far as possible to zoom in as close as possible to the human origin.

The operations to create and configure the types of architecture structures generated by itself in nature and it's dependent on the concept of using technology Pneumatics systems air in digital architectural design through the work of the similarity between the building design and composition of the organism body as a principle Self Organization, and this through by the software in turn derive structures formalism using Genetic algorithm to produce the most efficient use of materials and shapes in design.

And the impact of digital design began to appear where the generation of free forms of digital technology has affected the architectural formations, so as to achieve models of digital design through the design assis-

tant to create virtual spaces incorporate organic forms of natural and engineering, and benefit from them in the design.³

How to create a digital form by computer

Three ways to generate physical forms that link the shape and materials tectonic and spaces represented, first by using the appropriate structural elements through recycling generative line, second by using the line-born elements, that line of free movement within the space in three dimensions to create exciting forms, finally, the work points of the retina and then moved in space.

The user involved also in the development of generating process of digital format in the design of interior space, where it is to extract user data behavior by building models as a prototype form of virtual access to the patterns of formal initial design based on the use of Humanization of space and the use of a Virtual reality helmet, through the use of system virtual light system is for the purpose of recording the user responses data, which represent the reactions on the internal space and turn it in digital data

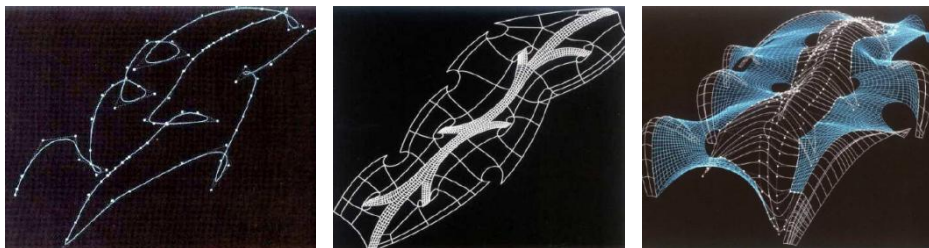


Fig. 5:
Methods of generating the physical shapes

The use of computer applications in architecture and design

The main aim of the use of computer-aided in architectural design is to know the needs of the user and show the interaction between environmental and internal space, and classified the form of internal space digital through digital technology into two types, the internal space of the digital method is considered as a way of thinking and design, or as a manufacturing. The axes of the application of technology are represented as:

- Digital architecture through information management.
- The connection speed and breadth of architecture participation through the international network of contact information for the teams design.
- Computer use in the design and production of architectural plans.

³ Akram Jassim, Ahmed Loay – the impact of digital technology in the ecological and biological formations in local architecture – Department of Architecture – University of Applied Sciences - Amman, Jordan - University of Technology – Baghdad, Iraq – UAE magazine Engineering Research 15 /02/2010.

- Control of operational systems in buildings.
- The role of digital technology in the control of the spaces and smart environments.
- Listen
- Read phonetically
- Dictionary - View detailed dictionary

How to design and produce digital form






There are many methods to create a digital form, we explain three of them:

- The generation process:
 - It is the production of shape using computer. Generating it is depend on a pacific reference to formal or non-specific (randomly j), since the beginning of to the final form.
- Modification process:
 - It is the production format using computer adoption by the amendment, addition, deletion, and manipulation elements and relations of the forms of formal or reference the specified pre-existing to the final form.
- Production figure by combining the two processes: (generation & modification)
- That the final form mixed between both of the generation and modification process.

In the following paragraph the methods and tools of digital technology:

- Generative line:
 - Rotate the line of free movement within a certain space in three dimensions to create forms.
- Tectonic element method (structural method):-
 - The adoption of appropriate architectural elements or a part of special architectural elements and use them to make a new forms.
- Point method retina: -
 - Adoption of the points to the specific Web relations and move it in space, for the production of new forms.
- Liquid-crystal state mechanism case:
 - Switch between steel and fluid, through the introduction of forces on the design and to make it in a state of permanent change.
- Formal abstraction mechanism (abstract the natural form):
 - Forms of snails, crustaceans, vertebrates, plant and biological structures bubble and gatherings.
- Formal mechanism simulation (simulation of natural shapes and organic).
- Genetic code and digital default:

- Absorb the forms or references and formal representation in mathematical relations, functions, and (genetic code) as coding elements and formal relations of the model codes and digital codes express how to install the elements and forms with each sequence and stored within the computer program code to be ready as models can be modified.

Process	Natural Form	Final Design
Stripped the structure of the form of pinion		
Draw the shape is derived from the stripped pinion and storage genetic code line for adoption profile generator		
Lifting and moving part is derived from the pinion to build one side of the new construction system		
Stripped the form of living water (lagoon) wavy.		
Draw the shape is derived from the living water Stripped and storage (genetic code) for adoption as a path . morphing path of formation for the generation and construction of the formation of organic		

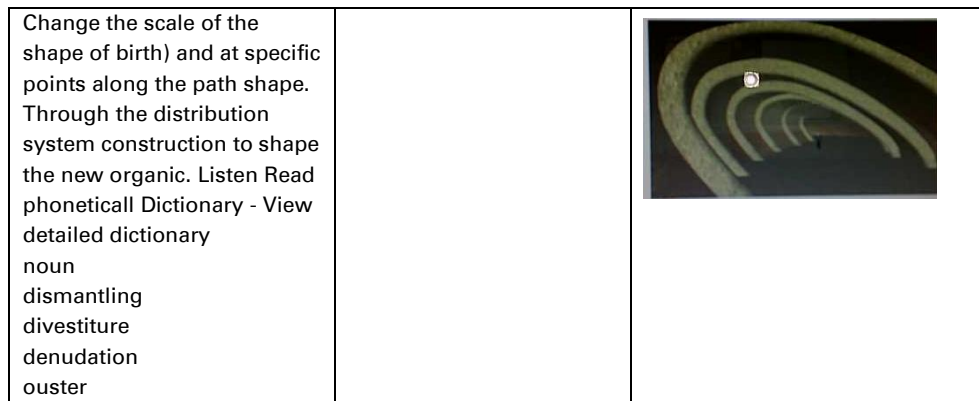


Fig. 6:
Some of the method and tools of digital technology to create forms⁴

The application of computer technology in Galleries of modern art

›As a proposed project‹

Read phonetically

noun

1. utilization
2. employment

Galleries and museums of fine and decorative art increasingly deploy computer-based interpretation devices such as Personal Digital Assistants and information. Museum managers hope that such new technology will help raise visitor numbers, attract new audiences and enhance visitors' experience of exhibits.

The findings are used to assess the deployment of new technology in exhibitions, to provide practical information to managers and designers who plan and develop such technologies for art museums and to show how ethnographic and video-based methods can contribute to current practice in museum accounting.

Use the PDAs with portable devices with a small screen that display information and can be used to make selections by virtue of a touch-screen interface. They can deliver multimedia content, text and images as well as sound and video-files. The visual content appears on the screen whilst the audio-information is delivered via headphones. The PDA gives information about a painting. It describes certain features of the artwork highlighted by an image on the PDAs screen. The information is designed to encourage the viewer to look at those specific exhibit features.

⁴ Akram Jassim, Ahmed Loay – the impact of digital technology in the ecological and biological formations in local architecture – Department of Architecture – University of Applied Sciences – Amman, Jordan – University of Technology – Baghdad, Iraq – UAE magazine Engineering Research 15 /02/2010.

Concept of the design of the Gallery of Modern Art

Adopt the idea for the design of the proposed Gallery of Modern Art on the application and use of modern computer technology in all elements of the exterior and interior styling, as it turns from the room of the exhibition hall contains technical seminars on all audio-visual equipment should be available for this purpose.

1. Design idea is based on stripping the form of the fetus in the womb, where the researcher try to make a link between the fetus , where it is the basis and beginning of life, and the galleries of art, where it is the source continece of art also. The design center of the hall is the focus of the pulse design, such as the heart is the pulse of life.



Fig. 7:
Design idea from abstraction of fetus

2. The use of computer technology in the work of the main idea of the proposed design, such like Auto-Cad, 3D Cad, Photoshop programs. And also using of computer technology in the operation room.

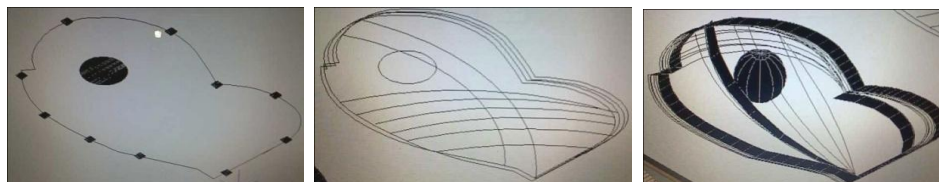


Fig. 8:
Design by computer programs

3. The application of sustainable design feature: All components of the Hall removable and re-installation and cooled by walls and floors and ceilings are all removable and installation.
4. The application of property of the natural environment in Architecture: Through the using of the inner courtyard in the interior architectural design of the hall and to provide natural lighting of the building.
5. Idea design of the project deepened on be the hall removable and installation of walls, ceilings and floors to be re-design and modify the design according to function in a vacuum. The Hall contain structure consists metallic component of metallic stripe and the corner of metal is

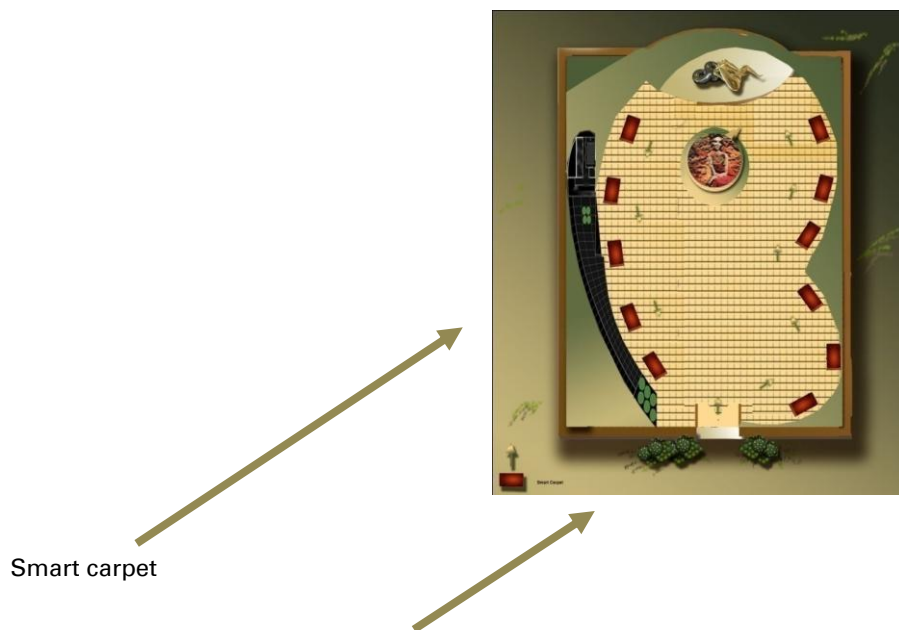
installed with each other, and the floor consists of a metal structure corner of the form, covered with sheets and materials inside. The isolation of walls are designed through standard size frame structure made of metal is coated poley Plexiglas.

6. Achieve interactive design: Where the interaction between environmental conditions and with the functional requirements of the user through the use of technology sensors, where sensors are used through the following:

a) Occupant Sensors: It is used to increase the lighting industrial works of art when that segment by the visitors, and thus reduce the lighting When there is no people in the room, and the use of such technology are reducing the energy consumed in the process of lighting.

Temperature Sensors: It works to adjust the temperature of the room through the compilation of information by sensors and sent to the console, which in turn gives a signal to the electronic systems modify the internal environmental conditions of the room to fit the ideal environmental conditions that have been seized⁵

b) use Smart carpet where they interact with the visitor when standing in front of each work of art show a screen where the data about the artist then the data for classification and painting artwork.



At the beginning there is an entry mark on the floor moving with visitor matched with him the direction and until he reach to inside.

Fig. 9:
Plan for purposed design

⁵ Ola Mohamed Samir – smart architecture and its impact on the exterior and interior design - interior design department and furniture – Faculty of Applied Arts – Ph.D - 2006.



Fig. 10:
Section for purposed design

- c) Make a room that when a visitor might select a particular work because of its color or style. Information is displayed on one wall highlighting the relationships between the selected work and other pieces from the collection. Another wall provides detailed information about the piece, while a third wall identifies the gallery housing the selected piece. Multiple users can explore within many works at one time.

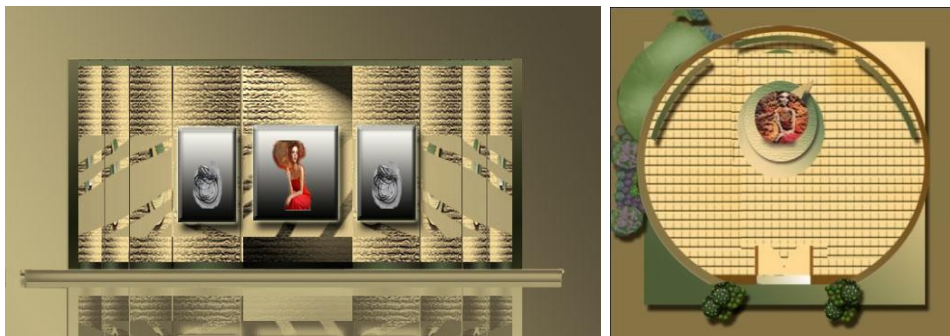


Fig. 11:
Design of show room.

- d) Furthermore, social networking sites such as Facebook and Twitter can serve as marketing or communication tools to access the public in a more personalized or casual manner than traditional museum advertisements or publications.

Results and recommendations

- The growing sophistication in the field of software and digital is growing, therefore reflected the architecture and interior design, which could be classified under the name of access to new digital architecture is to be followed by a group of foundations and which they can build upon this new concept of design.

- In order to prepare for the future composition of architecture and design continues with the present and face the future to serve the community, consistent with the digital life of contemporary societies.
- Spreading the culture of digital architecture and activate the role of a digital, through activities, information and visual aids, which specializes in digital express.
- Emphasis on the role of visual digital design and activating the role of digital formats in design and architecture processors.
- Integration of visual and forms with the architecture, design and the surrounding environment in a manner dependent on the philosophical emphasis on the configurations and digital analysis .
- Emphasis on the role of advanced digital technology as the main alternative to activate the relationship between designer, construction materials and sites, also use new advanced technologies building materials in order to contribute to the implementation of projects.

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