ARCHITECTUR, PRESENT AND FUTURE PREDICTIONS
ROBOTIZED ARCHITECTURE VISION
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ABSTRACT:
Future predictions; Speculates the features of the present thinking of architecture and the new media technologies, which changes the way of thinking and the design process.

Contents:
- Reality of the present: Globalization architecture for the information age and the new ways of thinking and processing architecture.
- Virtual Reality**:** as an architectural tool in our age of information and technology. "Virtual reality is an event or entity that is real in effect but not in fact". Virtual reality then is seen as the means by which we can experience the new or past without actually traveling there.
- New Horizons: Now we are immersed in virtual reality, as a new form of human experience. A concept often thought of as a metaphor. The influence of technology on how we see ourselves has fundamentally increased since the capacity to write and record was invented.
- Cyberspace and Virtual Reality: Cyberspace is the part of virtual reality, which creates places, it is described as 'world making' "World making is, in my estimation, the key metaphor of the new arts."
- Vision of the future: According to the present reality we had previously we could predict the nearest future situation we should be ready to build or speculate not to receive with some chokes.

Conclusion: My Vision of the future **"Robotized Architecture"** as a new architecture of the future, its design and construction process.

ARCHITECTUR, PRESENT AND FUTURE PREDICTIONS

The magic vision of Robotized Architecture
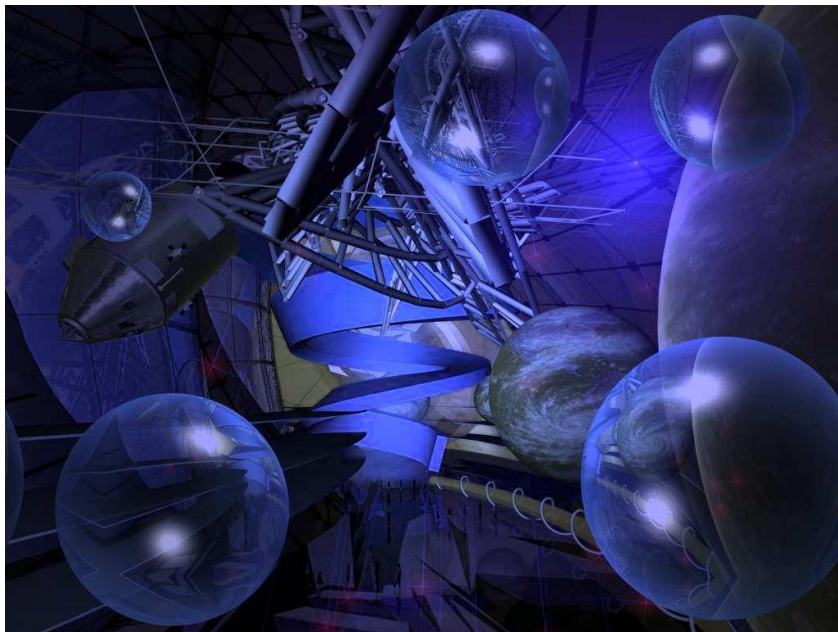
INTRODUCTION:

Once upon time Egyptians had built the pyramids, it was incredible at that time even in our time. We as Egyptians were the best in architecture and art, our grandfathers were the best talented people allover the world, it was a fact our brains, mind and talent is really special if you give the chance and facilities these brains can do more than any….
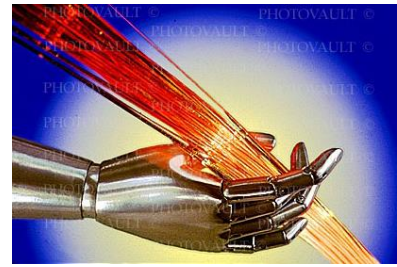
Many years were lost from us suffering the foreign and local occupation; many years went without any progress all over our culture. That leads us to export most of our requirements and most of science theories to apply, as we were the experts of culture, art and science. We were importing civilization to the whole world.

Many years ago we spent much time importing science and technology, although we have the brilliant brains that give us the chance to be the best, but it seems that we admire now our attitude of importing every thing from the west regions. Our grandfathers had been chocked when they saw the T.V machine, as our fathers chocked when they saw the colored one, so do we have chocked when we hired about a machine called Fax machine and it sends paper around the world , it was for us as magic. And then we spend most of the time living with many chocking fields.

The question is are we going to spend the future life with that chocks? Are we ready to approve that for our kid's life?
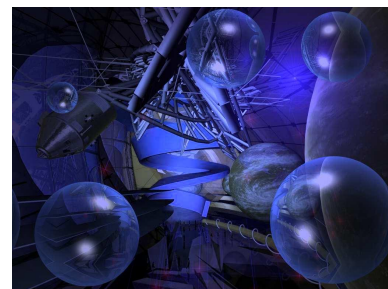
My answer of course not. We must now walk and run, even flit as the technical scientist global floods goes in order to be floating over that flood and slowly we can control our direction into the global culture we have now.

In architecture 20 years ago we heard about computers and that technology and also we have the usual chock, then after we walked up many years after we had another and others.

We should believe that the world had been changed in all branches of thinking for example music, literature, art and architecture. It is another world needs new ways of thinking.

Reality of the present:

Our present in Architecture is passing through a very critical period; it's a fitting, hesitated, confused and unstable. Few architects and young professors of architecture as am I are insisting to do and educate the recent waves of architecture as a vision for the future, but most of architects are working and educating the same language of our fathers architectural language, that we call it the traditional way of thinking. It's the 2D. Architectural process

which is simply started by plans, sections, elevations and then perspectives. Now we call it the past architectural way of thinking.

In our real present, it's the time of computer intelligent, internet, 3D.programs, cyber space, virtual reality, information technology and robots…etc.

This is the present we are living and every day have one or two chocks of new tools, new programs, new media, new IT and etc.

We should believe in our present to prepare us for the future era that will be much more incredible.

Now I will go direct to our global architectural case and the recent architectural ways of thinking and design process.

Virtual Reality

When analyzing the term's **virtual** and **reality** in a lexicological fashion, several ideas about the definition are exposed. Firstly the word reality, which implies "all that exists", a term applied to existence, here the wide ranging implications or ramifications for virtual reality are hinted at. It is here that the emphasis is directed towards the word virtual, to resolve its relationship with reality. The word virtual, is defined as "being such in power, force, or effect, although not actually or expressly such"[1]. It is linked with virtuality, which has synonyms of almost, absent, theoretical, invisible, abstract, unhistorical, and metepirics. These synonyms hint at the relationship of the word virtual to reality [2]. To simply extract from the dictionary definition, it is defined as something that effects or is about reality, but not as we commonly think. Virtual reality as the dictionary would indicate is about some reality, but not the 'reality', it is about almost reality, absent reality, theoretical reality, invisible reality, abstract reality or even unhistorical reality. All of which is true, but it still doesn't point to a
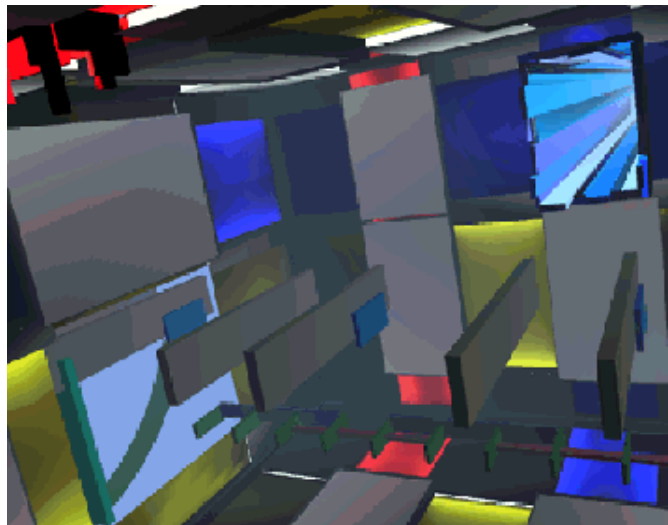

virtual reality, which uses it and for what purposes. It does, however shed some light and

Fig. 2 Dace Campbell, design of hall, where priority is to give organization to abstract space.

provide some direction enabling a search for answers, with some ideas about what to look for.

When investigating specific articles written by theoreticians and professionals within the field of virtual reality, it is discussed along with testing, experimenting or generally improving our life or real reality. The common thread for all research within virtual reality is that they remove reality from their

equations or experiments. This is done so they are better able to understand the idea they are exploring singularly, which in turn is re-applied to our uses in reality and subsequently in the improvement of man's interaction with reality. As Michael Heim suggests ***"the ultimate promise of virtual reality may be to transform, to redeem our awareness of reality."*** [3]

Or alternatively, if virtual reality is considered not as a research tool, but as an alternative to reality, then as Zeltzer suggests ***"true virtual reality may not be attaina ble with any technology we create. Virtual reality serves as the holy grail of research,"*** [4] which would indicate that it is a mythical image to be searched for and explored as part of a quest for a better world. Then there is the idea that virtual reality is ***"a way for humans to visualize, manipulate and interact with computers and extremely complex data,"*** [5] which tends to limit the application of the ideas. Another way of looking at virtual reality is to imagine it as ***"a cartoon world you can get into,"*** [6] which suggests that you would be more at home visiting Bugs Bunny or shooting spaceships in virtual reality. The ideas put forward should be considered in regards to what makes virtual reality possible, which is computers and their function. Whilst computer can simulate cyclones, provide micro or macroscopic views and create virtual spaces, the broader concept of computing is *"Computer isn't about computer, but about living".* [7] As Michael Heim would suggest "***virtual reality can be applied to any human endeavor,"*** [8] but it is about the human endeavor and human benefit, not the computers as an end in them.
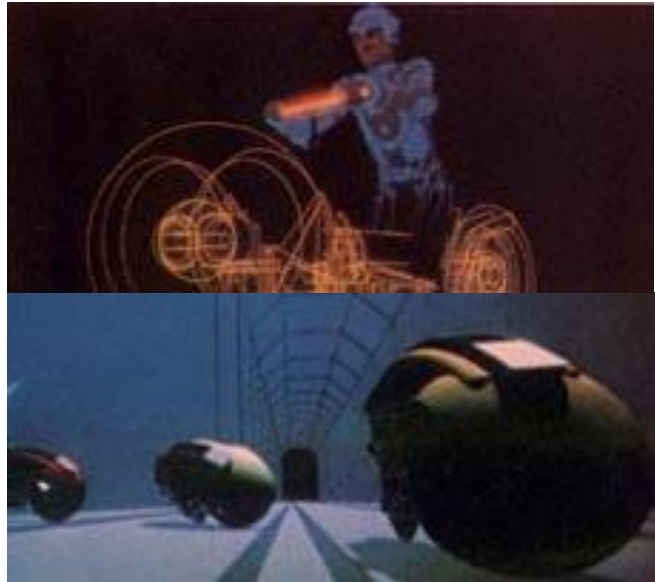

Image 3 & 4 Tron, Futuristic motorcycles, a human morph from man to machine and machine back to man as desired. A movie where people are placed in a virtual environment, shortly forgetting the virtual aspect of the space and treating their 'world' as being reality.

The most commonly understood example of virtual reality is the ***flight simulator.*** Today most airlines employ them as training devices for pilots and cockpit crew. Flight simulators can place any crew member in any situation encountered in reality, with some situations being created that haven't existed or can not exist. "Examples used can give pilots more experience than reality, posing all sorts of problems". [9] This experience is gained with no loss of craft, life, crew, cargo or materials, which demonstrates the effectiveness in creating virtual conditions for teaching. Pilots or crew can experience reality through virtual reality, enabling a better understanding of reality by being removed from it. In this instance, virtual reality is a means to, as Rheingold suggests, *"to*

expand human perception". Virtual reality is broadly used within the realm of enhancing any experience or exploration. ***"Virtual reality can make the artificial as realistic, as and even more realistic than, the real".***[10]

The aero planes cockpit machine demonstrates some of the key characteristics within virtual reality, demonstrating the ability of virtual reality programmers to examine and reproduce reality accurately, able to give users experience without actually doing a task in reality. This can give users new experiences altogether and is able to create particular conditions that provide opportunities for experience whilst removing the danger normally associated with those real life experiences. Virtual reality is now able to demonstrate that by creating simulations where the user passes the barrier of animation and moves into full user interaction, virtual spaces become 'real'. Further investigation of virtual reality within this idea, demonstrates the notion of ideas that in effect, the experience of man within existence is affected without interaction with it. ***"Virtual reality is an event or entity that is real in effect but not in fact".***[11] Virtual reality then is seen as the means by which we can experience the new or past without actually traveling there.

Further exploration exposes virtual reality as existing within most people's daily life, for example, computers 'mouse', used daily is a virtual reality tool. Here we see some type of pointing device represented on a computer screen, which doesn't actually exist. Although an actual 'mouse', on a 'mouse-mat' does exist in the palm of your hand. When the real mouse is moved, the virtual one corresponds in the same direction in proportion on the computer screen. Understanding this simple concept is greatly explanatory, people who first encounter the mouse struggle first to find **fluid motion** and the range of pointing, then the use of the buttons. The user having found some control sets about using the tool for operations. The virtual has been comprehended and is now acting as an extension of the real, some call these ***"mind amplifiers"***[12] to the extent that users forget the mouse exists at all, only the virtual representation exists on the computer screen.

New Horizons

Science uses virtual reality to explore the ideas of micro and macro environments, here the use of virtual reality is to expand human experience and assist for example in the performance of operations on people and to the processes of combining molecules for experimentation. Virtual surgeons' travel through blood vessels seeking an infected tumor, the tumor is then removed via virtual laser technologies. The doctor, ten thousand kilometers away from the patient has performed another successful operation.[13] The science student is exploring the method by which molecules are fused together, but rather than by analyzing text, the student is actually pushing the molecules around by hand. Feeling the pressures of molecular biology at a micro-level, to understand by exploration the complexities of forcing together molecules and their trajectory of

intersection. Here these mind amplifiers work to enhance the work performed and the future performances of work by inexperienced professionals.

Now we are immersed in virtual reality, as a new form of human experience. A concept often thought of as a metaphor. The influence of technology on how we see ourselves has fundamentally increased since the capacity to write and record was invented. Expanding knowledge over lifetimes is often forgotten. New discoveries made within the virtual reality medium allow it to be seen as an open place where ideas are formed, tested and practiced. It provides a base of knowledge and experience, for new ways of arranging molecules into a new order for users to experience. Virtual reality is about evolving, testing, designing, exploring new processes, means, methods, for new results or outcomes which will transform the way in which we appreciate the universe. Here virtual reality is being used to scientifically "***craft the world out of programming code***," [14] where the world is tomorrow.

Here we can see how virtual reality does two primary things of significance, firstly it introduces technology to help us achieve our existing goals faster with a greater understanding of them and the processes used to achieve them. Secondly it helps people work toward new goals altogether, by opening new ways to experience the same problems, new solutions or methods of analysis and practice may be identified. For example new virtual communities are combining to create within "often obscure fascinations," endeavoring to extend experience to "***the full potential of possible lives***"[15], to experience the whole

Fig. 5 Marcos Novak, Archimusic composition of 'liquid architecture' and 'navigable music'.

as Marshall Mcluhan would suggest. In these communities details considered private to some, are discussed and explored with other inhabitants of these specific interest groups, providing new opportunities for the solutions to unsolved problems.

People such as Bill Mitchell, Nicholas Negroponte, Kevin Kelly and Howard Rheingold, suggest that all disciplines including architecture will be transformed into a new order, which will in turn transform society from how we currently perceive it. They suggest virtual reality will change all facets of existence, from those who design, to those who use the designed things. A new movement has been born, and pioneers already exist on the new frontier, waiting for settlers to arrive. Given that there seems to be no new place where the pioneers have traveled to, it appears have they re-invented their own cities and the

communities. Those who are left in them have become displaced, now having to search for, understand, re-locate and re-settle in this new frontier which might have existed all this time in their front garden. It also suggests that there may be more to this frontier, has it now arrived, or does it keep moving, evolving or pushing the boundary directing society from ten paces ahead.

There are two common methods of analysis within science, from small to big or from big to small. Traditional science has started from the universe, and then broken into small to analyze; computers can also work that way. At the same time a computer can also analyze by providing large examples which demonstrate the whole. Scientists are confronted with the ability to view all that happens in our universe simultaneously or any universe in virtual reality for the purposes of research, enjoyment, communication etc. Viewing

Fig. 6 Novak image of one 'cyberspace' design.

large models within computers opens the way for users to view the whole library, from which they can find the answer which already exists, waiting to be realized. Now it is demonstrated that the possible new worlds already exist in potentiality, but not in actuality. This is the virtual reality definition, and it demonstrates that cyberspace for architects exists in the mind, not as random fleeting ideas, but a scientific means of idea making and problem solving.
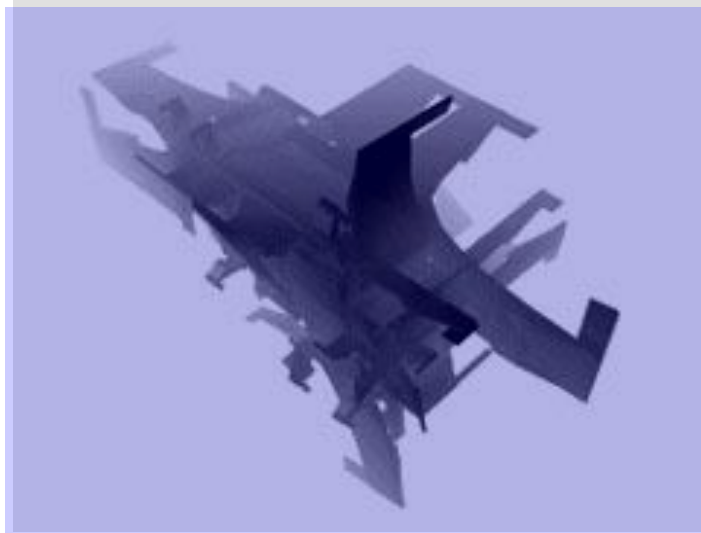
Cyberspace and Virtual Reality

According to most, the method by which virtual reality is experienced is through cyberspace. The term 'Cyberspace' was first coined by William Gibson in the movie Neuromancer, as "a consensual hallucination experienced daily by billions of legitimate operators, in every nation, by children being taught mathematical concepts... A graphical representation of data abstracted from the banks of every computer in the human system in unthinkable complexity. Lines of light ranged in the non-space of the mind, clusters and constellations of data. Like city lights, receding..." If virtual reality is a set of ideas that can be used to enhance our experiences through immersion, then cyberspace is one manifestation of that idea. Cyberspace is the content, whilst virtual reality is the enabling technology.[16] Cyberspace is the part of virtual reality, which creates places, it is described as 'world making' "World making is, in my estimation, the

key metaphor of the new arts."[17] World making describes vividly the potential of cyberspace, which includes the possibility that there may even be multiple worlds all existing simultaneously, created by various cyber architects. Cyberspace is the idea that we create worlds that are inhabited virtually, for any purpose at any time, even simultaneously. "At the far end of the continuum (Virtual Reality) are the worlds of cyberspace. These are the 'possible worlds,' the worlds of our invention. For now, envisioning these worlds is enough; we are at the beginning of a long journey, and these spaces are to what will come as biplanes are to space stations."[18]

Marcos Novak, who is considered one of the leaders in architecture and cyberspace, presents his ideas about Cyberspace in an untraditional fashion, describing the end of 'urbanism', 'Vitruvius' and 'Learning from Las Vegas'[19] as already an event from the past. He suggests cyberspace introduces a new dimension of thought to the minds of architects; ones interested in the future interaction of society and technology. The introduction of cyberspace is instrumental in re-appreciation of music and architecture.

Novak envisages cyberspace as a place where time and movement are important factors in the experience of space. This idea then develops into one where the time and movement or music that generate cyberspace are seen not a merely linear, but choreographed like a piece of ballet. Then the environment changes moves and transforms as *"archimusic is cast into the wind not like a stone, but like a bird."*[20]

Fig. 7 Marcos Novak, Architectures Beyond Inscription, where the architecture is erasable and in a flux.

The idea "library of forms" by Jorge Luis Borges and the idea of "liquid architecture of perpetual change" by Marcos Novak are linked in a theoretical diversion. Consideration may be given to a synthesis of these ideas where you have formulae for perpetual change that doesn't necessarily erase its past entirely. These ideas then move from one being without pre-text or context, to one that is still orientated towards the design of the new with a context of historical prediction. If all the forms that could be manifest from Novak's architectural formulae exist within the library of forms and are viewable via a statistical problem, could a method of erasing random generations from formulae be applied, one which would increase the means by which liquid architecture could be produced? Could the desired forms of the users be clarified prior to a user beginning, to prevent them from creating unusable places or spaces, in other words by removing the jumbled text leaving only readable words you can refine the design before it is designed? This would
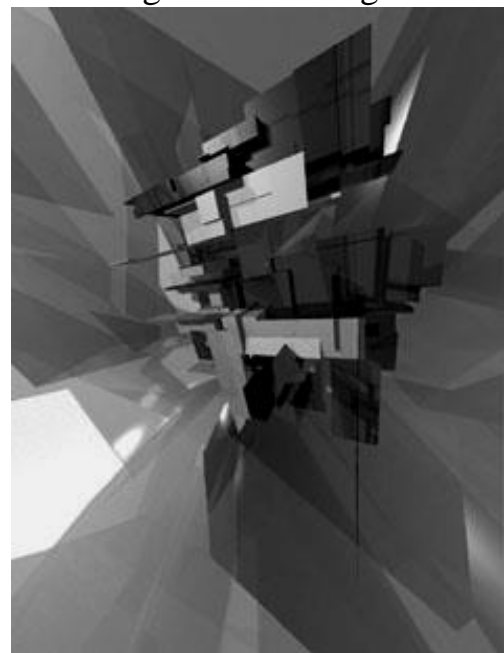
take the idea of liquid and introduce rigor to outcomes and hence increase the ability of the user to utilize the potentiality of the formulae.

Cyberspace introduces various future possibilities for architects and architecture and whilst the movement is steadfastly orientated towards the future it seems to constantly references the past. This historical reference is however not traditional, with the references used not literal and not necessarily applied laterally. Historical references seem restricted to the use of types, which are then re-assessed before being applied into Cyberspace.

Vision of the future:

According to the present reality we had previously we could predict the nearest future situation we should be ready to build or speculate not to receive with some chokes.

The creation of "virtual worlds" has emerged as a new design field, a rapidly expanding area of study, and possibly even a new profession. As these worlds become increasingly important in our living environment, architectural practitioners and students need to rise to the challenge. But until now "living in the virtual realm" has raised more attention among philosophers and social scientists than among architects. To stimulate a needed debate, I asked:

Fig. 8, 9 compute rendering of satellite and future city.

what are the implications of architectural design in virtual worlds?

The expanding virtual world and the ever-increasing intensity of online activities is having a significant impact on our social and cultural environment, hence affecting the built environment and potentially altering lifestyles. As the effect of online activities gradually penetrates our daily life, architects will be presented with more complicated design problems that require a multidimensional view and cross-disciplinary approach. In three-dimensional virtual places, we are increasingly confronted with higher-degree spatial organization, including descriptions and the relationship between content and space. As we try to go beyond casual social activity and do more complex and demanding tasks we find we need a few interconnected rooms with different functional objects to differentiate tasks. This is when the concept of spatial design and organization comes into play. Because architects are traditionally trained to manipulate spaces to provide functionality, they may well be suited to design online places. [21]

For the profession, the increasing globalization of design teams has fueled the demand for better online design and communication environments. A virtual
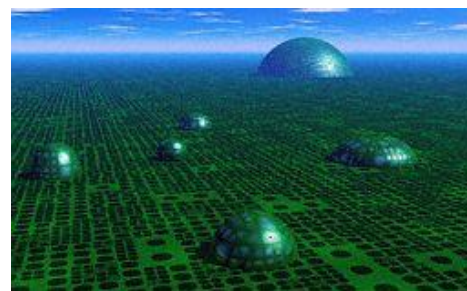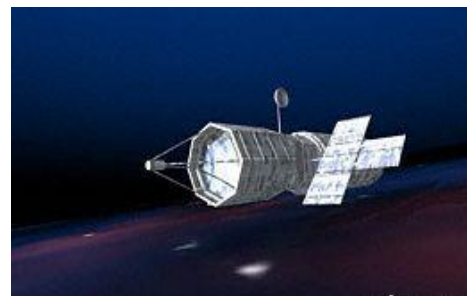
design office enables architects to better utilize human resources and minimize cost and time spent on traveling and maintaining an office. The design of these environments can take many forms; Figures 10, 11, and 12 illustrate three different approaches. These developments have the potential to change the way architects work and also to change the designs they create.

Architects and educators should respond to these new conditions and start addressing various issues directly related to the profession. Architecture schools should consider incorporating the study of virtual architecture in the curriculum. They should try to cultivate a theoretical and philosophical understanding of virtual worlds including the social and technological effects on the built environment caused by an increase in online activities.

At a more practical level, they should teach computing technologies needed to design digital spaces, just as they teach the construction technologies needed to design real buildings. This will not only provide students with a sound knowledge of virtual architecture but also some basic skills to explore and shape the electronic frontier.

Despite the accepted practicality of distant collaborative design, locating a design studio in virtual places remains an illusive idea. Research is needed to work out the feasibility of how collaboration in a virtual place can facilitate design

The representation of 3D immersive virtual buildings and environments within virtual worlds also needs to be developed further. 'Representation' refers to not just the appearance but also to the appropriateness of chosen geometry and function. An unsuitable choice will result in an environment that is unfamiliar or unrecognizable.

On the other extreme, blindly imitating physical forms without questioning their meaning and function gets in the way of developing a functionally sustainable virtual environment. We must seek a design language suitable for online activities. This will probably result in a form that may not look like its physical counterpart but still remain a recognizable and navigable space. There may be many design languages that are suitable for building virtual worlds. [22]

Central to the usefulness of a virtual environment is its intended function and behavior. Without these, any virtual place is merely a 3D geometry that people can walk through and observe. A

Fig. 10 A private meeting room designed to look like a physical meeting. Image courtesy Mary Lou Maher
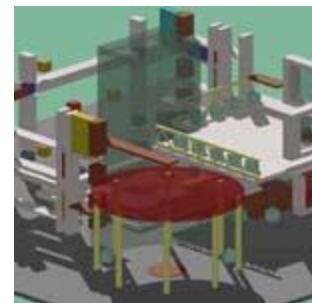

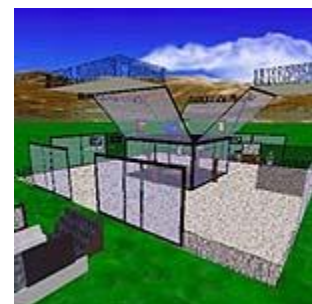Fig.11 A virtual office designed as a virtual place. Image courtesy Mary Lou Maher

Fig 12 A virtual office on the virtual building site. Image courtesy Mary Lou Maher

virtual architect needs to conceive a structure and form with required function and behavior so that people can do constructive things there. Precisely imitating reality may seem to be an obvious choice but it is not necessarily the best one.

A truly functional virtual environment needs to be habitable and navigable. To effectively orient people within a virtual environment requires a detailed study of environmental cognition. Principles of way-finding are important design issues especially in a large and complicated virtual environment. Representation is related to this because it determines how we experience the virtual space. Understanding exactly how cognitive principles can be applied to the design of virtual worlds requires more experiments and demonstrations.

CONCLUSION:

My Vision to the future of architectural process:

The architecture of the future is easier for non-designers, but it's complicated for the real talented designers. Its architecture of robotic systems that we could call it as: "**Robotized Architecture**"

Fig. 13 Computer art Image. , Image courtesy Mary Lou Maher

This architecture is deeply depends on information and computers technology ICT Architects start there conceptual sketches as the way the used to do, but automatically the computer software translate that sketches into the screen as its properties as Do's prototype and more intelligent

Our computers will be upgraded to mini-robots which could talk and discuss with you many points of your sketches and designs. Our offices will be empty only the architect he could do every thing by just talking and discussing with his robot friend to do jobs as he needs. It's a different world; every thing is calculated and has some sort of criteria by a huge incredible information network all over the world. This kind of architecture will go through a different design process I will speculate it as:

Main tool of the Robotized Architecture of the future: "Agent Robot"

This is a personal vision for the nearest future of computers technological progress and architectural design process. It's a vision of the relationship between robot as an architect's agent and the architect himself.

Agent Robot (AR): is a computer system, in another way he is a technical robot, he has no Keyboard or Mouse; he has a very sensitive sensors that gives

him the ability to talk as friends or professional to his architect. AR is a helpful instructor besides he is much more intelligent to recognize every line you sketch or every text you write, even every word you talk about.

AR could be in many shapes and colors according to his

job with his friend (the designer) he has a hidden monitor which can use it instead of screens, multimedia system, satellites connection to the whole world (data network, TV, video…etc.), he has a connection to another intelligent machine called the modeling printer instead of our paper printers. AR has the ability to transform the architect's studio or room to Virtual Reality lab. Any time he needs to introduce something virtually.
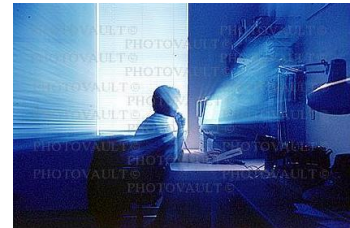
Fig. 14 Computer art Image. , Robots and Architect.

AR accessories are very small but highly intelligent, modeling printer is the most important machine architect should have. It's a simple machine such our printers today but instead of ink cartilage it is some new liquid materials that has a high performance to solidity when exposed to air. AR could print some physical models which are ordered by architect to overview the buildings form

in order to upgrade and develop (one colored material or specific colored materials). AR is going to be the most common machine in the nearest future. Architect doesn't need developer architects in his lab.

Design process of robotized architecture:

Design process will change according to the technical intelligent progress of computers and information as the changes of architectural and design tools. I will speculate simply how we will solve our design problems by new design process such as:

Design phase:

1- Architect talk about his philosophical vision of his project after inputting program data to his AR. He would hear some comments from his agent robot AR about the program and his ideas of design according to billions of information data which he gains through

Fig. 15, 16 Science museum competitions, Cairo- Egypt 2001. Interior virtual visions. Design proposed by the author.

the world information network (WIN). Then some discussions will be held between the designer and his agent robot (AR) which will be briefed on the next discussion or session.
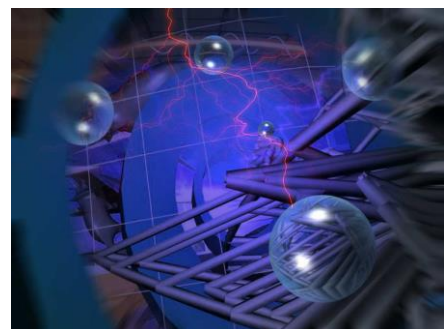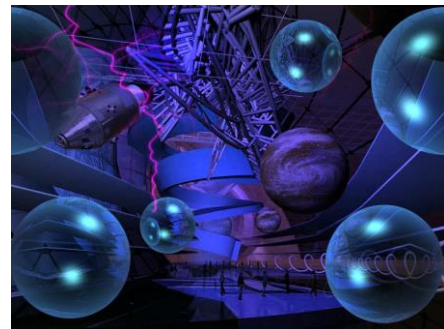
2- AR will start working on collecting all recent and historical data about this kind of projects, and at the same time collecting all data concerning the previous discussion of the concept approach. That will be done from AR in no time before his friend finishes his coffee.

3- AR will start reviewing his investigation around WIN on the wall screen by video, sound, VR and data show with a very specific report about his conceptual idea.

4- Architect will spend some time to think about his project according to AR data show, after he starts to sketch his idea by some freehand drawings and text, AR never interrupts him but after the architect finishes his draft sketches which don't match with his needs, AR collects each piece of paper and download it into his data system.

5- Next when the architect starts to work in that project, AR starts reporting a conclusion of the previous talks and preview his new data shows for the project. Architect spends some time watching movies and VR of some similar examples and the historical technical recent information about those types of projects. Then he starts to finally sketch the concept of his project, whatever it was a section or some 3D sketches or plans…any type of sketch he made, AR could translate and transform to a simple 3D digital model that you can see on the wall screen, then you shout to AR "it's a dirty work", I need it much more higher or longer or complicated or I need 3 spaces in the first layer, or I need that space to be reshaped or recolor…etc. you do could design your spaces as simple as I explained. You can test your spaces from outside and

Fig. 17, 18 Science museum competition, Cairo, Egypt 2001.Form virtual visions. Design proposed by the author.

inside in the same time. You can follow transformation process of your comments to your designs on the screen. And you can even redraw on the screen and immediately AR will transform his lines, planes or forms to what you do.

6- Many times of design developments with AR, many trials from AR to get the meaning of spaces needed from his architect, after designing each space of the building using the needed effects by form, colors, materials, technical solutions, lighting, air-condition, sound effects, structures and furniture with every details of the exterior form, and finishing materials and colors. Architect could start to test his project by using new techniques of active virtual reality, which lead the architect to resolve or retransform any object or element while walking or sitting inside the spaces. Architect could spend
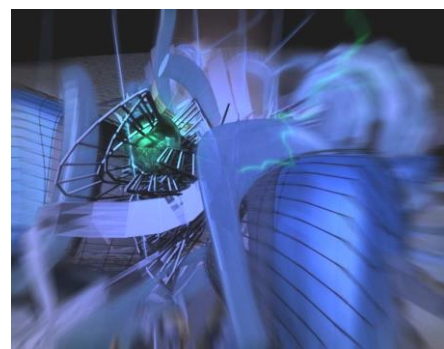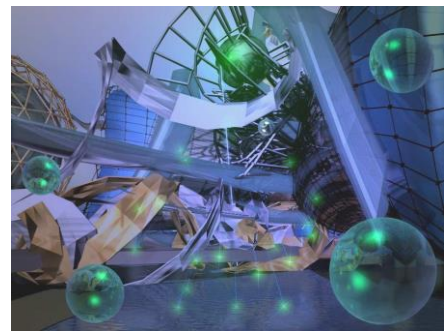
days living in his cyber space and cyber forms. He could switch the lights off, he could test his liquid kinetic spaces he designed by sitting inside spaces, switching the system on to change the spaces features, specifications and even forms....etc. He could be connected with the owner online to share walking through spaces, listening to the client comments.

7- New materials, structures, techniques and new spaces will be produced from the new age of information and technology, new ways of thinking and behaving, new intelligent life style and new kinds of information networks production. This is the world we are going to face after a while.

8- Architect ends his testing, developing and redesigning of his virtual building and orders his AR to print a model with transparent blue material, saying "god bye" to him.

9- Next day architect goes to his lab to investigate his project's physical model, with some comments for AR to resolve and represent, then he sends the project to his client through the satellites information network to be approved and to start the second phase – construction phase.

Construction phase:

1. This phase starts while the owner approval and it starts by transforming the project to construction format that can be done by AR also.

2. AR starts to transform project data to construction format using different programs including (structure, infrastructure, specifications, …etc)

3. Architect can share AR selecting the suitable systems and its impacts to architecture.

4. AR send the project to the suitable construction firms through the satellite network (hyper channels) around the world, to chose the right firm for that project even it's a firm in the end of the world.

5. The construction firm starts to sends its robots machines to the site. They start to collect and piling up the element of the structure as they programmed (project program)), starting by the base and infrastructure of the building, ended with the spotlights installation.

6. Construction site looks as an automobile factory, Trucks are controlled as the robots. It is one program which organized the whole project.

You, as a designer or owner could see every period of construction by your computer monitor through the computer network.
It is the future rate of life, procedures of architecture and construction, the most exciting and successful building measured by high techniques and clarity of meaning.

Document Quotations

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Figures:

- Fig. 1 - Studio AEM, Architecture at the End of Metaphysics http://www.columbia.edu/~sp43/Igor1.html.
- Fig 2 - Campbell, cyberspace design using architectural metaphor (design of a digital library). http://www.hitl.washington.edu/people/dace/portfoli/thesis/
- Fig 3 - Image of man morphing into a motorcycle. Interacting with the virtual environment. Tron, the movie. http://kzsu.stanford.edu/uwi/br/
- Fig 4 - Image motorcycles moving within virtual reality.Tron, the movie. http://kzsu.stanford.edu/uwi/br/
- Fig 5 - Novak, archimusic composition, Dancing with the Virtual Dervish: Worlds In Progress. Banff Centre for the Arts. http://www01.ix.de/tp/arch/6069/fhome.htm
- Fig 6- Novak, Cyberspace design, TransTerraFirma: After Territory. http://www01.ix.de/tp/arch/6069/fhome.htm
- Fig 7 - Marcos Novak, Architectures Beyond Inscription, where the architecture is erasable and in a flux. http://www01.ix.de/tp/arch/6069/fhome.htm.
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