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TOWARDS THE 4TH DIMENSION

Introduction

> Fifteenth century Europeans 'knew' that the sky was made of closed concentric crystal spheres, rotating around a central earth and carrying the stars and planets. That 'knowledge' structured everything they did and thought, because it told them the truth. Then Galileo's telescope changed the truth. As a result, a hundred years later everybody 'knew' that the universe was open and infinite, working like a giant clock. Architecture, music, literature, science, economics, art, politics -everything - changed, mirroring the new view created by the change in the knowledge. [1]

> The medium by which perceptive intuition and the rigorous discipline of shaping became compatible was technology. Technelogos, the art of knowing how to make, fell naturally and historically into the realm of perceptive fundamentals... For the artist it verified scientilically what he had perceived emotionally, for the engineer it added the vast field of perceptive responses to the narrow limits of the laboratory experiment. [2]

In the 1930's, Moholy-Nagy first toyed with the idea of a Kinetic Architecture -dynamic movement through time and space as a principle of artistic creation. He based his notion of Kinetic Architecture on his interest of cinematography and photography. His elements were Light, Colour, Surface, Texture, Form and Mass;

and his techniques were Contrast, Position, Speed, Direction and Variation. Moholy-Nagy was not alone in his quest for a dynamic aesthetics. Indeed, the entire artistic community of his time was fascinated, one way or another, by the possibilities offered by the latest technology. [3] Nevertheless, although technology has moved on since, the energy and enthusiasm displayed by the pioneer were not continued.

However, those who have been monitoring the electronic world in the last few years would witness the beginning of a new technological revolution. Foremost of all the development is the availability of digital multimedia technology for an affordable price. Perhaps it is time to recapture the long forgotten vision of the early pioneers. This paper reports some experiments conducted by staff and students in The Electronic Atelier, School of Architectural Studies, University of Sheffield over the last two years.

The Electronic Design Atelier

With all these exciting development around us, perhaps instead of asking for better colours, faster hardware, more powerful software and nicer effects, we should be asking if we are prepared to master technology with an artistic insight. In other words, are we prepared to develop an artistic framework for the digital technology like the way Moholy-Nagy developed his Kinetic Architecture for the analogue technology.

Thanks to generous support from the University, The Electric Design Atelier was set up in 1991 to conduct experiments to seek for this framework - an aesthetic framework for the digital world. The grant allows us to purchase an Apple Macintosh based workstation complete with various input and output devices (see fig. 1). Availability and affordability is the main criteria behind choosing the setup. The cost of the equipment is well within one years salary of an architect.

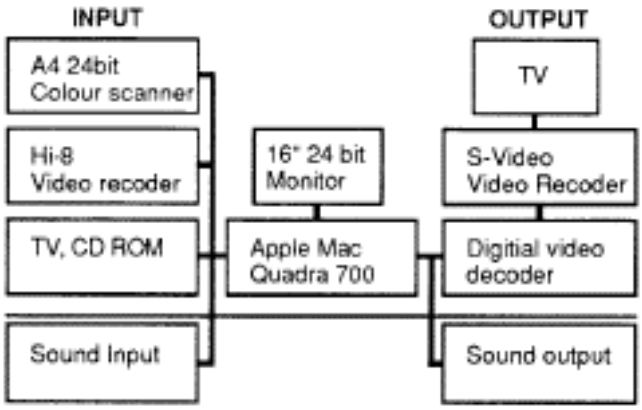

Fig. 1 System Set-up based on an Apple Macintosh workstation

With the equipment we conducted a number of experiments. We try to ask ourselves two questions: How should the existing technological framework (or CAD methodology) be changed to support our artistic pursue? [4] How far can the existing technology be pushed to support our artistic endeavour? [5] We do not try to actively pursue the first question for we believe that the answer can he found not by a systematic and intellectual search but by the on-going frustration we are going to experience in trying to answer the second question.

The Experiments

The Atelier is actively pursuing a number of themes relating to our search for an aesthetic paradigm. One of the themes is Time and Dynamism. There are two reasons for choosing this theme. Firstly, it is now possible for a desktop based computer to manipulate moving images. Secondly, it is always difficult to represent Time with traditional representation techniques and it is the most mysterious and misunderstood quality in architectural design. We asked one fundamental question when we try to unlock the nature and the role of Time and Dynamism in architecture, that is, if we regard Time as a 'tool', what can be done with it, for it and about it. To answer our question we constructed four semantic scenarios: re-interpretation, appreciation, understanding and illustration.

Scenario 1: A time based medium allows the re-interpretation of existing understanding of an aesthetic-form.

Five paintings by Moholy-Nagy were selected to form five sides of a cube. [6] An additional dimension was added to selected lines and planes by projecting lines to form planes and planes to form volumes. Through the use of a time based sequence, the painting were reinterpreted to form a matrix of three dimensional forms. However, at any one instance, the matrix was actually no more than and could be seen as another two dimensional painting by Moholy-Nagy. The experiment illustrated Moholy-Nagy's theory of Kinetic Architecture. It has been shown that by subjecting the two dimensional paintings to the notion of time, the 3rd dimensional spatial quality of the painting can be appreciated.

Scenario 2: A time based medium allows a sequence to be predetermined in the creation of an aesthetic experience.

The Danteum project by G. Terragni was chosen to be the subject of this experiment. Terragni's design is a narrated and architectural version of Dante's notion of life and death through hell and purgatory. Despite the availability of some plans and sections, the nature of the project is often inadequately perceived. However, by carefully reconstructing its context, the Atelier has managed to demonstrate some of its hidden dimensions. Advanced rendering and animation techniques were used to heighten the experience of the spaces. This was done not literally but Phenomenally. [7] An abstract sequence at the end of the presentation highlights the “non realistic” aspect of CAD based representation technique. In short, the real is synthesized with the unreal, the literal is combined with the virtual, and reason augmented with romance.

Scenario 3: A time based medium allows a juxtaposition of design issues into a single aesthetic experience.

The social aspect of British High Tech architecture and Sheffield, a city of steel, were the subjects of this investigation. The experiment intended to find ways where various aesthetic components could be read concurrently. Through the

juxtaposition of sounds and images, the power of the mind to bring forward its sublime appreciation can be facilitated. The experience takes the audience through the history of Sheffield, the industrial steel town in the UK. Its birth, it death and its rebirth are illustrated with the people and architecture which comes to make up the story. The hardness of steel as a material is soften by the hands casting, moulding, shaping and making it. In addition, the experience, through association, gives some indication to the nature of British High Tech Architecture and illustrates its not so High Tech faces. It comes to a conclusion that High Tech to some is also Soft Tech to others.

Scenario 4: A time medium allows the experimentation of the architectonics of a Light-Space synthesis.

Ando Tadao's Koshino House is the subject of this investigation. Instead of modelling and realistically representing the building with a computer model, or analysing it according to certain geometric principles, the experiment intended to illustrate the building non-realistically but contextually. In other words, what it is not as important as what it perceives to be. The reading of the House is based on our understanding of Tadao's design philosophy. In particular his concept of Ma (the place in between) and 'Temporariness'. [8] It has been demonstrated that the calm and static images so often depicted in architectural magazines are not representative of what the house is really trying to mean. Instead, the Atelier has illustrated a more dynamic reading of the House and how the concepts of Ma and 'Temporariness' are used to achieve a notion of pseudo-static-dynamism.

Conclusion

> This is not a school but a laboratory in which not the fact but the process leading to the fact is considered important. Your brains as well as your hands, your emotions and your health, all this is part of the process. Don't think that you can neglect one to perfect the other... Your combined strength will surpass in its results any technical school with the finest equipment. [9]

All the experiments were composed digitally. Although it has been suggested that a analogue-digital format would yield better graphics and give better effects, the team

tried its best to resist such a temptation. We believe that the value of these experiment is not based on the quality of the resulting product. Instead, it is based on a constant dialogue between man and machine - what can, what cannot, in what way, how and why - and the artistic torturing one undergoes in expressing himself with technology. Therefore, the yardstick for judging the result is keyed on how close the final result resembles the intuitive urge which made it happen in the first place.

Today, driven by the business world and market economy, technology is no longer a problem, humanising it is. The way we define technology is changing. The ability to go faster, better, cheaper and cleaner is no longer what the realm of technology is all about. Our ability to capture, to understand, to melt and to synthesize new technology into the 20th century culture and humanity is becoming a more fundamental issue in our practice and education. The digital revolution is coined by some as the Third Industrial Revolution. If we accept that its significance, for better or for worse, can be equated to what had been happening in the First Machine Age a century ago, we would have to accept that a new set of artistic, aesthetic, philosophic and social framework has to be formulated to guide us trough this technological labyrinth.

This takes us to the core of our problem. Nowadays, most of us are still talking about problems related to the man-machine interface, and a lot of papers have been written to advance our understanding of the subject. However, there is another equally important questions waiting to be answered: What is our understanding of the developer-user interface? How much of our effort is user orientated? What is 'user'? These questions are asked to address an apparent mis-match between the 'model' developer is moulding and the 'model' user is facing. We are closing that gap through our efforts to improve the man-machine interface. But we are only approaching the problem from a predominantly developer biased point of view. However, architectural design and education uses not 'knowledge for action' but 'knowledge in action'. [10] That is to say, we do not talk about design, we just design, and through it we reveal the nature of our philosophy, method and techniques.

The experiments conducted in the Atelier is a first step towards a user-informed development environment. The limited experiments we have conducted point to the following observations: Firstly, The users do not normally follow a well defined path when trying to achieve something. No two users achieve the same task by following the 'well defined' procedures. When two identical tasks are performed by the same user, we observed some fussiness in the ways the tasks are conducted. This seems to confirm our hypothesis that: although the structure of doing things is the same, the intent of doing things and the content of things to be done affect the way one goes about doing it. In other words 'procedures are context sensitive'. Secondly, although what can be achieved is largely conditioned by the available technology, the user is able to find other ways of achieving their task. This is due largely to our emphasis on the semantic rather than the realistic nature of the task. Inadequacy of the hard and soft wares also led to the use of a concept known as 'association' in some of our experiments. [11] Thirdly, by substituting 'formal analysis' with 'formal expression', and by asking the question Let's make it speak' in lieu of Let's see how it speaks', we come closer to the age old problem of trying to distinguish an object from 'what it is' and 'what it is perceived to be'. This give us some understanding of our own role in the making of the aesthetic-digital framework.

Towards a user defined interface

Heidegger defined 'tools' as tools 'ready at hand'. That is to say a tool only acquire usefulness and meaning when put into the context of actually using it. Furthermore, in his Essay on Technology, tools are there to 'reveal' the intent of the user. [12] The users define their tools, sometimes literally and sometimes semantically. The problem with a developer led user interface is that tools are developed non-contextually and they are defined with the lowerest common denominator. If a framework is to be developed for CAD, the value of it will depend on its ability to accommodate fussiness and what is beyond. Therefore, it is suggested here that developers do not dictate what the tools are and what they are for. This is best left to the user who will provide 'meanings' beyond the original intention of the tools. [13]

Postscript

Thanks are due to those second year students who put up with many sleepless nights to keep the machine going. Finally, it is important to stress that this paper should be read in parallel with the digital demonstration. It is precisely the ways new concepts are expressed in our demonstration that the title of- our paper comes by. A Hypercard version of this paper together with all the demonstrations are available to anybody with 600 MB of hard disk to spare.

[1] J. Burke, The Day the Universe Changed, Little, Brown and Co., Boston, 1986, p.9.

[2] For general reference, see Sibyl Moholy-Nagy, Moholy-Nagy - experiment in totality, MIT Press, 1969, xiii. For Kinetic Architecture, see László Moholy-Nagy, The New Vision, New York, 1947. Also see László Moholy-Nagy, Vision in Motion, Chicago, 1947.

[3] The most notable contributions were the Futurist Movement in Italy and the Constructivist Movement in Russia. In addition, among others, works by Paul Scheerbart and Bruno Taut should also be noted. See Reyner Banham, Theory and Design in the First Machine Age, London, 1960. See also, Paul Scheerbart's Glass Architecture and Bruno Taut's Alpine Architecture, both in Dennis Sharp, Glass Architecture and Alpine Architecture, Praeger Publishers, New York, 1972.

[4] This question of CAD methodologies has been raised repeatedly in the development of CAD. Notable areas of research are data structure, shape geometry, design method, human computer interface and artificial intelligence. The most recent contribution to what I termed Formal and Structural CAD research is William J. Mitchell et al, The Electric Studio, MIT Press, 1988. See also his The Logic of Architecture, The MIT Press, 1990.

[5] This school of thought argues that the art of CAD is not to do with how best thoughts and perceptions can be represented, it is to do with how best thoughts and perceptions and be generated when technologies are subjected to test. This theme of injecting sensibility, intention, thoughts and emotion by experimentation and a more artistic intervention has been pioneered by the School of Architecture, Cambridge University in the late 80s. See Francois Penz et al, 'Tools for Design: A Controlled Experiment Comparing Computer Work with Traditional Hand Drawings', Computer in Architecture, Longman, 1992.

[6] They are: Collage in red, yellow, and black on black paper, 1921; The Great Aluminium Picture, 1926; K XVIII, 1923; Construction 1932, See Krisztina Passuth, Moholy-Nagy, Thames and Hudson, 1985.

[7] See Colin Rowe, 'Transparency: Literal and Phenomenal', The Mathematics of the ideal villa and other essays, The MIT Press, 1982.

[8] For more information on Ma, see John Sergent, 'The Ma of the Site Plan', Scroope, Issue 3, June 1991. Also see G. Nitschke, 'Ma: the Japanese Sense of Space', Architectural Design, March 1966. For the concept of 'Temporariness', see Edward Ng, 'The Poetics of the House', Scroope, Issue 3, June 1991.

[9] An opening address by Moholy-Nagy to students in his Chicago based School of Design. See Sibyl Moholy-Nagy, Moholy-Nagy - experiment in totality, MIT Press, 1969, p.170.

[10] See Donald Schon, The Reflective Practitioner, Temple Smith, London, 1983.

[11] 'Association' is a very old concept dated back to Longinus' concept of Sublime. It was revived in the early 18th century by theorists like Joseph Addison and Edmund Burke. See J.A.Arieti and J.M.Crosselt, Longinus - On the Sublime, New York, 1985. Also see Edmund Burke, A Philosophical Enquiry into the origin of our Ideas of the Sublime and Beautiful, ed. by J.T.Boulton, London, 1958. Also see J.Addison, The Spectator, no.412, June 23-July 3, 1712, vol. 11, p.212.

[12] Martin Heidegger, The Question Concerning Technology, Harper Torchbooks, London, 1977, p. 11.

[13] The concept of a user defined interface is the current theme of our ARCUK funded research project Active Studio.