WAHANA AKADEMIK

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Y.A.B. Dato' Seri Setia Di Raja Dato' Seri Syed Razak Syed Zain, Menteri Besar Kedah telah melakukan lawatan rasmi ke UiTM Cawangan Kedah pada 3 Julai 2003 yang lalu. Sempena lawatan beliau, Pengarah Kampus telah memberi taklimat mengenai kemajuan dan sumbangan UiTM Cawangan Kedah melalui penyelidikan dan perundingan terhadap negara khususnya negeri Kedah. Kata alu-aluan Y. Bhg. Dato' Naib Canselor UiTM dalam buku "UiTM Kedah Sepintas Lalu" sempena lawatan Menteri Besar Kedah telah menekankan peranan UiTM terhadap negara terutamanya dalam bidang penyelidikan dan perundingan untuk membantu kerajaan negeri bagi memajukan negeri masing-masing. Oleh itu, satu saluran perlu diwujudkan bagi mendokumentasikan hasilan penyelidikan dan perundingan supaya ianya boleh dijadikan sumber rujukan oleh semua pihak yang berminat.

Justeru itu, UiTM Kedah telah menerbitkan jurnal akademik bertajuk 'Wahana Akademik' untuk menampung keperluan penerbitan tersebut. Untuk itu, Jawatankuasa Jurnal Akademik, Universiti Teknologi MARA Cawangan Kedah amat mengalu-alukan hasilan penulisan akademik samaada hasil penyelidikan dan perundingan ataupun analisa *'literature'* untuk dimuatkan dalam penerbitannya.

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HOW CAN THREE DIMENSIONAL COMPUTING INFORM THE INDUSTRIAL DESIGN PROCESS

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ABSTRACT

The new millennium era has made the computer an indispensable tool for everyone from every walk of life. In Industrial Design specifically, 3D Computing / Three Dimensional Computing or better known as CAD/CAM (Computer Aided Design and Manufacturing) is still considered an infant but the demand for it has been increasingly encouraging. It has become reliant on computer technologies and is responding to every change and need of customers.

Key words : Millennium, Industrial Design, CAD / CAM (Computer Aided Design/Computer Aided Manufacturing), Technologies, Customers

INTRODUCTION

Over the last decade, 3D computing has transformed the way we perceive and approach the traditional industrial design process. The way time and investments are saved by uncountable amounts is proof that the future lies in this medium, working hand in hand with conventional styling and manufacturing techniques. I would like to present my main findings as follows:

1. My personal experiences with 3D computing, concentrating on Styling,
2. The available software for the design industry and the pros and cons,
3. The use of 3D computing in traditional clay modelling,
4. Future developments within the next decade and its impact on the design industry,
5. A simple case study

3D COMPUTING AND ME

I am quite proficient in 3D design ever since I became interested in industrial design. I would like to point out that I only had real hands on experience with 3D computing when I started working. Simple software such as Adobe PageMaker and Macromedia FreeHand became an indispensable tool for me to create 2D visuals representing 3D. From boxes, crates to forklifts, I slowly learned my way around by understanding vector curves and bezier splines. I must admit these applications really taught me a lot.

My earliest exposure to basic 3D application was with MetaCreation's Infini-D. It was easy and direct, with a simple but easy-to-relate interface. Its tools were crude but nevertheless building Industrial Design products was easier than ever before. But my biggest inspiration came when I saw the Alias sample works created by friends of mine. They were real eye openers because all of a sudden nothing was impossible anymore. Visualizing became easier and more realistic; thus designing became more fun!

EXPERIENCE

3D Computing is used to create 3D objects for designers in every field that includes graphics, industrial design and engineers. In my own experience, 3D Computing has much usage where it allows me to design any shape and surface preferred not to mention circle, rectangle, square, oval and triangle. There is not much difference between the conventional method and computing.

The only slight difference is only that designers are able to design in a clean way, meaning they do not require markers or pastels at the rendering stage. Everything is done on the computer by selecting the desired commands.

At the technical drawing stage, every point made is precise because 3D Computing has the required programme needed for this kind of work. I also found that 3D Computing saves tremendous amount of drawing work especially in repeating shapes or extruding shapes. I could then proceed with the colouring, and turn my design into the desired object.

For me, the best part in the usage of 3D Computing is the presentation stage. The final touch that is done by the computer cannot be achieved by hand rendering. The computer provides visual effects to suit the design and at the same time equips designers with instruments in making the design outstanding.

During a presentation, designers have many selections or ways to present their artworks. For example, they can make animation, wall projection or normal paper printouts. Animation and wall projection are considered as the most interesting and popular methods used by designers.

SOFTWARE

After doing simple research, I came to know that to actually succeed in Digital Industrial Design and Styling, there were only a handful of applications, which could really satisfy a designer's speed of thought and deftness.

As a matter of fact, computers will not draw 3D objects as it is only a tool to assist us in drawing objects. A computer will make the drawing look better. As a tool, it becomes another medium we can use to create; just as with pencils, pastel renderings and etc. It offers choices and looks for our illustrations that could never have been achieved with a pencil or a brush.

Nowadays, there are many computer programs that can be used to design 3D objects and build a prototype. There are various types of software with different functions for designers.

In Industrial Design, from 2D to 3D, Computer Graphics and CAD tools are basically used in the designing and styling. There are also varieties of software for industrial designers to use nowadays. For a surface modeller, some examples of the more popular software packages are: Auto Studio (Alias/Wavefront), ICEMSurf (ICEM Tech), Pro-Designer (formerly CDRS owned by PTC) and 3D Max (Kinetix), Lightwave, FreeHand, Photoshop and Corel Draw.

Surface modelling is concerned with creating surface geometry for objects and not what is beneath the surface. It creates a surface or part that has no thickness at all, and even though it may look like it has some depth on the screen, it is just a shell.

For solid modelling, software packages that can be used are: Unigraphics (EDS), Pro-E (PTC), CADDS (CV), Master Series (SDRC), CATIA (Dassault). Solid modelling is creating objects which are not hollow, that is, they are completely solid (unless the designer makes them hollow and have material properties).

In Industrial Design, the easiest ways to sketch a car by using a computer are as follows:

- The basic way to do a drawing on a computer is by sketching the 3D object on paper and scanning it into the computer. After that designer can clean up lines, manipulate them or leave them alone and render it with colour or tones. Different finishes can be applied to each body surface.

- The other way is to use a pressure-sensitive digitised pad for example (Studio Paint) McIntosh. With this equipment, we can sketch a 3D object right on the screen by pressing styles on the pressure pad.

- Another way is to create a practical illustration using CAD. Designers can make a variety of effects. Using computer graphic software, designers can position the 3D object in any desired view they want (side, top, front or even perspective).

DIFFERENT SOFTWARE'S, DIFFERENT USES FOR BOTH 2D AND 3D

3D Studio Max (NT)
Though only available for NT, this application has one of the biggest following. This is probably due to its long presence in the market, by being the first to be launched in the PC environment, thus giving it a bigger share of the market. Its tools are adequate for basic modelling but if designer were to delve further in to its tool chest, they will discover more than a novice modeller can handle. Nurbs and splines are also available but control is difficult. The learning curve is steep but fortunately books are available in abundance.

LightWave (MacOS/Window95/NT)
Just like Max, LightWave started out small and unassuming but more exposure in the entertainment field gave it huge publicity. This application was most used in the Star Trek, Deep Space Nine and Babylon 5 TV series for its ease of use and low

cost per licence. Unfortunately, its learning curve is also steep, thanks to the poorly designed interface and the lack of available reference. The grey background has got to go! But this one has got its pluses; the tool that converts the skin to Nurbs comes quite handy when you need to create organic objects. And its rendering engine does a fine job when you tweak it right. Max and LightWave are good for generating non-manufacturable objects i.e. concept visuals and realistic renderings. To get more control you would have to move up a step to more accurate software.

Maya Unlimited (NT/SGI)
This suite is the latest product from Alias|Wavefront for the entertainment industry. Nevertheless, its tools mimic other Alias programs like AutoStudio and the quality comparable. Its interface is smooth, easy to use and customized with a lot of tools for animation purposes. As a Stylist/Industrial Designer, these sets of tools are merely pluses for an already powerful base. Modelling is easy with accurate 'handles' that can define tangents and angles, while at the same time give flexibility with new tools like the Claymate. Combined with Live, you can even present your products or vehicle in fine animations that relate to real life actors.

Alias Studio/StudioPaint/AutoStudio (NT/SGI)
These high end Alias products represent what I think are the best styling/concept design tools available today. They are fast, accurate enough to create models which can be milled and rapid prototyped, easy to learn, and definitely fabulous when rendering visuals! Its interactive tools are designed to bring you from concept to creation in record time. Everything from the interface to the way you can customize the Hot Keys is designed with the designer in mind. Its integration between 2D and 3D is seamless thanks to StudioPaint 3D. While 2D is normally flat, StudioPaint gives a whole new meaning to the word 'painting'!

3D COMPUTER MODELLING AND CLAY MODELLING
'Concurrent engineering' gives lower down time and allows both designers and modellers more time to do refinement, even under a tight schedule. The digital process in relation to traditional clay is basically *(1) Model the concept surface and design in Alias, then (2) Produce the design by milling or rapid prototype.* This process would probably go back and forth a few times (hence design refinement) but the greatest part is that we get engineering input at the earliest possible juncture. This will greatly improve the design both visually and mechanically.

My guess is that most clay modellers today are already being tuned to using digital media such as Alias. This helps all parties involved to understand the full process of getting good quality shapes, curves and surfaces both in the visual aspect as well as the engineering side of things.

In creating models, both 3D Computer Modelling and clay modelling have similarities. For example, in making a surface or curve, 3D Computing uses tools that is curve and clay-modelling uses scrapped or rake. In order to get a complete form, both have to undergo a process, part by part, by using tools.

As for the differences, with 3D Computing designers can only see the images on the screen. Even though in 3 dimensions, it is like watching with one eye and looking at the object without having the opportunity or chance to touch the designed object. It is totally opposite of clay modelling. Designers are able to touch and feel the object in front of them. Thus, they are able to evaluate or judge their artwork as to whether it has quality or meets their desired needs.

It is important to learn and to do design using 3D Computing. 3D Computing is a precious and useful tool and it has improved the conventional method of designing and rendering. The implementation of 3D Computing process can help to give a complete work of the overall design.

3D COMPUTING IN THE NEXT DECADE AND BEYOND

The technology of computer is ever changing from year to year. In the next 10 years there will be never and better software invented for computers and the search should be continued until the best one is found. The cycle will be continuous. As an intelligent machine, 3D Computing is the best friend of designers at all times.

In the future, there will be many different types of programmes just for designers. This will help designers in making their artwork interesting ones. However, this will also create confusion for them as they might have difficulty in choosing a suitable programme.

Even though 3D Computing has evoked the conventional method, designers should continue using the conventional method in their designing process, as this will prevent them from losing their skill to create. Historically, sketching on papers has long been carried out by mankind and it shall remain as it is. The integration of new technology and the conventional will create the perfect product.

It is undeniable that the future of design lies together with developments in the digital medium. Huge advancements in arts, science and technology have made it possible to integrate a multitude of work to be done in record time while saving costs and material. Relentless pursuits of perfection for the seamless co-operation between users and the applications have made it easier to learn and share information.

I believe 3D design will progress along the lines of the Internet and virtual reality (VR) applications. Industrial design too cannot afford to be left out. With the advent of faster online data transfer rates and more dependable fibre optic cables, more and more people will share and move information through the Net. This will really be exciting because all designers and engineers around the globe will be able to share ideas and come up with solutions through a cohesive way of thinking. Information dissemination will definitely be faster. This coupled with virtual reality will be decisive in helping a management committee arrive to a decision. VR is the logical next step to digital design. It enables us to interact with the 3D model in real time while giving a clearer picture of human perceptions and design proportions. The only tough thing to develop now is the replication of sensory perception of feel and touch.

In the not so distant future we will be able to visit a secure web site, log in and be totally emerged in an artificial environment while we scrutinize a design developed by our counterpart on the other side of the globe. We would be able to pinpoint flaws and imperfections through online chat and telephony, generate reports that contain lively visuals and stimulating animations, and modify shapes quicker than ever before. All in the comfort of your favourite reading chair, drinking your favourite coffee while spending quality time with your family. At the speed technology and computers are developing, I foresee this will definitely be the new lifestyle for designers the world over. It will happen before you know it. In fact, the revolution is already well under way.

CASE STUDY:
RENAULT CARS

The use of 3D Computing by Renault cars is well known. They use the Alias Graphics. Car designs are modelled in Alias and using a series of animation tools and photo realistic reflection and rendering packages, virtual movies of the vehicle are created and shown to management, press, and the public for reaction. Some examples include the Raccoon and City Vehicle. In this film, a computer-generated model of the car can be seen zooming around Paris or the countryside. By composting real footage (i.e. a man zooms around with a video camera) with CAD models, a realistic movie can be made in no time. Doors can be opened as people enter and leave the car etc. The CAD data is also used in a DMU system, allowing designers and management to interact with the car, enter the vehicle and 'play' around with the controls. Development of the models and creation of the movies and DMUs from the data are now at the second stage in the design cycle at Renault, which produces over 4 hours of photo-realistic animations per year, which considering Jurassic Park only had a couple of minutes of CGI in it, is quite impressive.

Within the 20-minute animation presentation, observers were unable to differentiate whether the picture seen was computer generated or an actual situation. The mixture of car animation and the environment put together created a real situation. With no doubt, the public who had seen this show found it amazing and impressive. They could not tell the difference and thought that the images of the cars were actually real and on the roads.

CONCLUSION

In conclusion, we can see that there are many advantages of 3D Computing for Industrial Design and Industry. With 3D Computing, time can be saved as the techniques of making prototypes become shorter, and one is able to deliver an almost perfect product. I am sure the programme has been designed in such a way that it will be able to achieve global competence.

The conventional method however should not be forgotten or neglected as the two should move in tandem in producing the best artwork. 3D Computing has been found to contribute tremendously to the design industry and create productivity. Even though there will always be changes, new methods and inventions in the hi-tech industry from time to time, it is human nature to be uncertain when it comes to prototyping. They would prefer to see and feel the 3D object in front of them rather than the 3D animation on a screen.

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