RAPID PROTOTYPING AND MULTIMEDIA DESIGN AT MMU

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Abstract. Although there have been reports worldwide where RP technology have been used outside the realms of the manufacturing sector, it is yet to be recorded, especially in South-East Asia, where RP technology is used in conjunction and to be integrated with multimedia design and content development. This paper will look at the integration of RP technology towards multimedia design at the Faculty of Creative Multimedia. This is especially fascinating where RP technology is used in a multi-disciplinary field as that of multimedia design for both academia and practice.

1. Introduction

Rapid prototyping (RP) technology has come a long way since the early inception of stereo-lithography (SL) in 1987 by the US-based company, 3D Systems Corp. Applications of such technology and its processes (Jacobs 1995; Horton & Radcliffe 1995) then only involved building mechanical part designs using liquid polymer as its build material. Nevertheless, early RP systems and its development have been implemented and used widely across the manufacturing sector. In addition, its application also contributed positively towards conceptualizing new product ideas and designs, and for creating mock-ups (Boon 1992).

There are indications of RP being integrated within a more creative, computer-aided design and manufacture (CADCAM) setting (Chiu *et. al.* 2001), but there is yet a note on it's integration towards multimedia

production design. As such, this paper will attempt to highlight the way in which RP is applied and integrated in the training and practice of multimedia design at the Faculty of Creative Multimedia (FCM), Multimedia University (MMU) Malaysia.

2. Towards Design and the MSC

Since the launch of the Multimedia Super-Corridor (MSC) in Malaysia, MMU is aimed to provide knowledge workers, expertise and research and development in areas related to multimedia, engineering, management and information and communication technology (ICT). On the whole, the MSC is poised to provide a high-tech infrastructure and environment, and to operate as a platform and catalyst for *Vision 2020* to be accomplished (Mohamad 1998). Hence, knowledge workers in areas providing and creating digital content and information design are critical to ensure the depth, breadth and innovative information towards multimedia design.

As multimedia design is fairly young with the Malaysian industry, its design and production processes have been, and is still on an exploratory basis. Although there has been a boom of *cyber-cafes* across the nation, online content and digital animation all seems too easy to apprehend at first sight by many locals. However, the required paradigm shifts in many aspects related to the success of the MSC on the whole needs greater knowledge and further insights than just being intrigued by the latest Flash technology [1] or digital special effects (SFX) used in movies.

As most academic institutions offering multimedia-based, content creation training is biased towards Information Technology (IT), the Faculty of Creative Multimedia at MMU is taking a different lead. The curriculum and direction of the faculty is design-based, and production-led (Khong 2001). As the faculty was established at the time when the nation was awakening to IT and the MSC, many local multimedia industries used MMU as a benchmark for best practice.

Nonetheless, like most design-based practice, be it a service or consumer industry, users and markets are invariably *human*. However, as multimedia design is a new concept and practice in the local context, there is not a specific design process that is adopted, but rather the process is an exploratory event both in academia and industry. Hence, there are many local adaptations of design and project management methods and techniques to suit the new digital medium of expression for *human* use and entertainment.

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[1] Flash technology here refers to products developed by Macromedia Flash™, a trademark of Macromedia Inc.

3. Multimedia Design at FCM

The term 'multimedia' has various meanings and expectations. For instance, the transfer of text-based data with added hyperlinks, motion graphics and audio onto a digital medium might constitute a simple production of a multimedia product. Although this is a very simplistic example, a multimedia product is expected to amalgamate textual data, audio or sound, video, graphics and animation.

There are four multimedia-based groups sharing the multimedia design process practiced and disseminated at FCM. They are :
1) digital media (compact disk (CD) medium),
2) film and animation (3-D animation),
3) media innovation (print and Internet medium), and
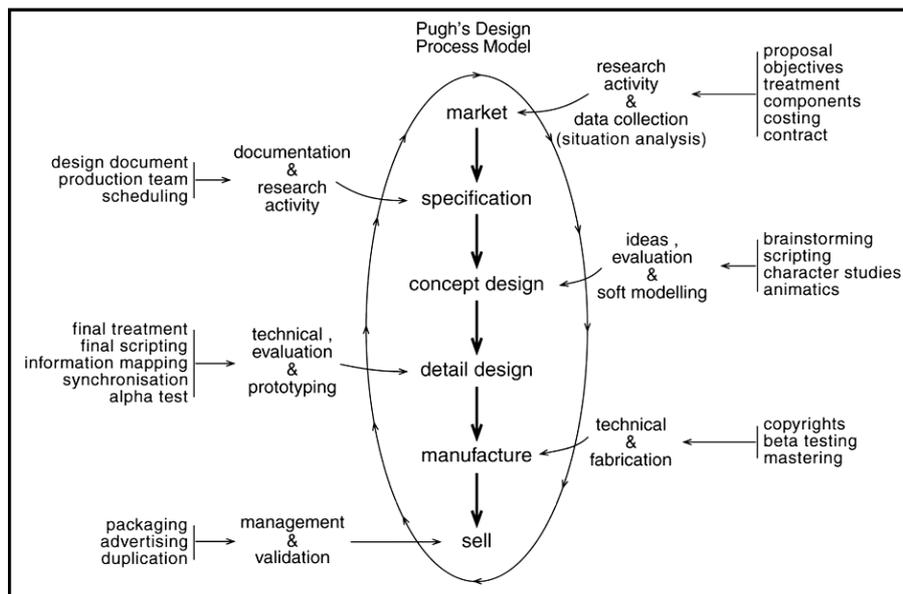4) interface design (product-based).

Figure 1. Multimedia design components against Pugh's design process model.

There are many references highlighting generic models of the multimedia design processes, both in practice and academia (MacMillan 1990; Olsen 1997), where related industries and organizations each practice their respective styles and interpretation of the process. However, for all intended purposes, a more generic design process model will be used in this paper as described by Pugh (1991) for ease of reference. As Pugh's model depicts an engineering design perspective towards the design process, Figure 1 highlights Pugh's design process together with related multimedia

components as practiced and disseminated at FCM. Certain specialized treatment (which varies from one production to another) and methods used in the multimedia production process are also included in figure.

4. RP and Multimedia Design

The use of rapid prototyping in the design industry has been widely highlighted and researched, e.g. its role and function in the design of consumer products (Evans 1997) and manufacturing (Chua & Leong 2000). However, RP technology is still not widely accepted and used in the local manufacturing context, let alone in the design process. On the other hand, RP can provide useful human factors information during the conventional product design process (Khong 2000), but its application has not been explored in the area of multimedia design.

With reference to Figure 1, RP technology is currently adopted by FCM in the stages of :
1) character studies – studying character pose and stance,
2) animatics – aiding cinematography and composition,
3) scripting – aiding visual scripting and storyboarding,
4) brainstorming – aiding computer simulations,
5) final treatment/scripting – physical reference,
6) alpha/beta testing – on/off-stage comparative model,
7) packaging – physical, visual reference,
8) advertising – physical negatives for production of models for gifts/sale.

The purpose of RP technology in multimedia design process is found useful when considering :
1) visual communication,
2) anthropomorphic evaluations,
3) alternative concepts,
4) visualising character composition, and
5) relative body-size evaluations.

The idea of visual and physical models in production design has a long history since the making of cartoon characters (Canemaker 1999) and SFX in films. This paper does not intend to address RP as a technology capable of replacing skilled expertise in model making for production purposes, but rather as a convenient avenue for producing quick references in this new multimedia-based domain. However, the advancement of IT and RP technology have made certain design situations where once complex and over-hanging parts were tedious to model, replicate and build, are now easily produced at an affordable price.

An example of a quick and mobile *3D printer* is the US-based, Z-Corp's

range of RP equipment. As the production of ideas and concepts move from the traditional, paper-based medium towards a digital environment, design concepts can be easily and cheaply produced by RP technology. As an example highlighting a portion of the multimedia design process involving RP technology, Figure 2A shows the development of an animated character's *head* using Alias|Wavefront Maya™ software, and its transfer to an RP machine, Z-Corp.'s Z402™ 3D printer (Fig. 2B) for immediate building of the part (Fig. 2C). The process involved part processing on the same workstation following the conventional method of document printing for the RP building – also including conventional *print queue* and *page setup* formats. This allows flexibility, is user-friendly and greatly improves efficiency to the production process.
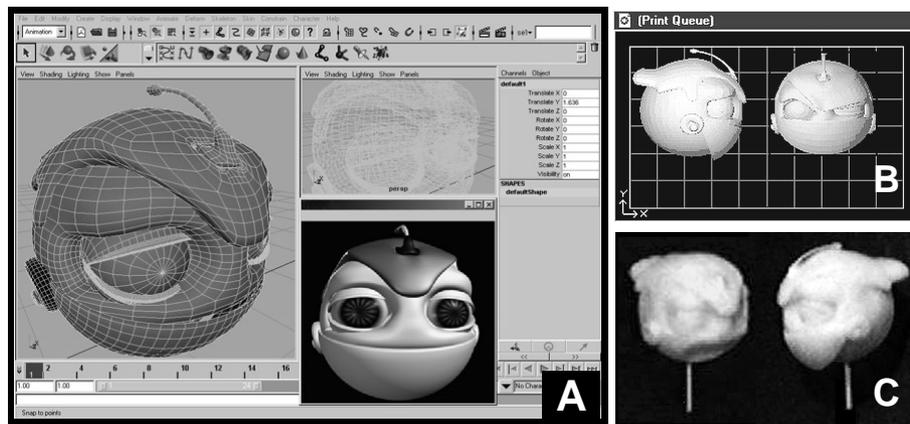

Figure 2. Development of an animated character (**A**); two components ready to build on RP (**B**); two components built using an RP machine (**C**) (courtesy of Faculty of Creative Multimedia, Multimedia University, Malaysia).

5.   Integrated R&D at FCM

The training programmes at MMU share an integrated learning resource as multimedia design is considered a collaborative design (co-design) discipline. Hence, research and development (R&D) centers are also integrated in nature, where existing projects have shared interests.

The use of RP technology as an aid towards human factors and design issues in the multimedia design process is better enhanced when combined with other tools and techniques. Figure 3 shows the network of R&D setup

at FCM, comprising of four related interests of motion capture, RP, human-computer interaction (HCI) and virtual reality. These research-based interests are aimed at providing R&D opportunities in respective areas of multimedia design. However, the same setup of facilities can also provide opportunities for studies into design interactions and simulation within multimedia design.

For example, studying and mapping possible character movement using the motion capture facility can enhance design concepts in character animation for a digital game design. The completed character proposal can then be transferred to the RP laboratory for immediate parts building, while usability studies on HCI can be conducted on the proposed games console and its controls (if required, parts of the console design can be *printed* for physical prototype evaluations). Alternatively, the game design can be simulated in a virtual environment.
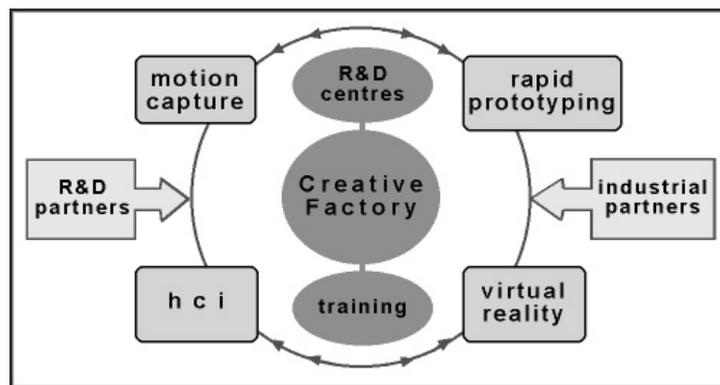

Figure 3. Schematic of FCM with its four related interests supported by research and industrial partners.

6. Conclusion

At present, MMU is the only organization in the country that provides an integrated set of laboratories and facilities for multimedia design R&D purposes. In addition, it is the first organization to house an RP facility within the MSC for the purpose of multimedia design and content development.

As the nation is awakening to multimedia design and the World Wide Web (WWW), it has to be said that the local multimedia industry lacks the R&D and production experience in designing and authoring CD-ROMs and

software for training purposes. Hence, local approaches to designing such products are, at present, exploratory and do not conform to specific methodologies and standards. However, the explicit use of certain tools and techniques to aid in the multimedia design process and its production is evident.

Whether producing an animated digital host, the architecture of an online shopping outlet, concepts for a hand-held personal digital assistant (PDA) or even an animated character for film, RP technology is ideal for producing rapid visual representations and physical references for multimedia designers.

Issues pertaining to the role of RP in multimedia, and its rationale as a human factors aid have been observed as being much more explicit compared to the design process itself. The use of RP technology as a means of addressing human factor's issues during the multimedia design process will also have implications towards the design of virtual environment.

This paper highlighted the use of RP within the multimedia production contexts, and has attempted to portray the current training and practice setting at FCM. On the whole, the RP technology implemented is towards its usage for design production purposes.

Currently, many local companies and the manufacturing sector are shying away from RP technology mainly because of its cost and maintenance factors. However, as RP technology is poised to improve with the advancement of materials technology and IT technology, issues on costing and the ease of producing parts will hopefully diminish in years to come.

Acknowledgements

References

Boon, L.H.; et.al. (1992) Using computer-based tools and technology to improve jewellery design and manufacturing. *International Journal of Computer Applications Technology.* v5, 1; 72-80.

Canemaker, J (1999). Paper dreams: the art and artists of Disney storyboards. Hyperion, New York.

Chiu, ML; Lin, YM; Lee, CH; Tsai, PH (2001). Teaching rapid prototyping in CAD studios for creative design, in Gero, J; Chase, S; Roseman, M (eds.). *Preprints of the 6th International Conference of the Association for Computer-Aided Architectural Design Research in Asia (CAADRIA2001 19-21 April 2001).* University of Sydney, Sydney, 307-310.

Chua, CK, and Leong, KF (2000). Rapid prototyping: principles and applications in manufacturing. World Scientific Pub, Singapore.

Evans, M. The application of rapid prototyping technologies for industrial design and ergonomic evaluation, in: Robertson, SA (ed.). Contemporary Ergonomics 1997. *Proceedings of the Annual Conference of the Ergonomics Society* (April 1997). Taylor & Francis: London, 370-375.

Horton, G.I.; Radcliffe, D.F. (1995) Nature of proof-of-concept prototyping, *Journal of Engineering Design*. v6, 1, 3-16.

Jacobs, PF (1995). Stereolithography and other RP&M technologies: from rapid prototyping to rapid tooling. ASME Press, Dearborn MI.

Khong, CW (2000). A review of applied ergonomics techniques as adopted by product designers, in Lim, KY (et.al.). *Proceedings of the joint conference of APCHI/ASEAN Ergonomics 2000* (November 2000). Elsevier, Singapore, 317-322.

Khong, CW (2001). FCM @ MMU: content creation and multimedia design, in Norman, EW, and Roberts, PH (eds.) *Proceedings of IDATER2001* (August 2001). Loughborough University, 64-69.

McMillan, T. (1990) Multimedia and education, *Computer Graphics World*. v13, 10, 68-72.

Mohamad, M (1998). Excerpts from the speeches of Mahathir Mohamad on the Multimedia Super Corridor. Pelanduk, Malaysia.

Olsen, G (1997). Multimedia design. North Light Books, Cincinnati OH.

Pugh, S (1991). Total design: integrated methods for successful product engineering. Addison-Wesley, Wokingham.