The Design Aesthetics of Digital Cinematography

in a Period of Media Transition

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I certify that this thesis is my own original work.
It does not contain previously published or written material by others except when due reference is made in the text.

Kim Kwansoo
1 June 2009
To my family
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ABSTRACT

The digital switchover in film, TV production and distribution is causing a fundamental transition in telecommunications and broadcasting. This transition is not only changing media infrastructure. It is affecting creative areas as well. Furthermore, storytelling, genre, visual reality and design aesthetics are significantly influenced by the transition. The digital workflow affects visual reality and storytelling in both live action and animation. It provides the basis for the crossover of ideas, stories, styles and genres. It is no longer only for efficiency in the production of special-effects films. The data of digital workflow is created by various computer applications. The artists choose the most suitable elements from the diverse options provided by the applications and apply them to a modularized workflow. The aesthetics of this design paradigm is defined as the limitless combinations of various kinds of creative elements. The narrative, style and aesthetics of cinema were first developed with the appearance of cinematography. A century later, they are in another kind of renaissance because of the design aesthetics of digital cinematography.
CONTENTS

Chapter 1 – Introduction: Visual design in media transition..............................1

Chapter 2 – The change of media infrastructure...........................................7
Creative workflow and the media infrastructure...........................................7
Forming screen shape and the visual interface.............................................11
The hybrid cinematic process.................................................................15

Chapter 3 – Digital cinematography in live action........................................20
High definition 24 fps progressive picture and cinematography....................20
Hybrid workflow and digital cinematography.............................................26

Chapter 4 – Animation: Hybrid visuals and design aesthetic..........................37
Digital cinematography in animated film production....................................37
The creative pipeline and workflow in the production..................................39
Creative design and procedural system in production..................................43

Chapter 5 – The research of digital cinematography and
my independent film....................................................................................53
The story and design aesthetics of 3D animated shorts..................................56
The production process of The Wheel in the Wind.......................................57
1. Story........................................................................................................58
2. Character.................................................................................................59
3. Art direction.............................................................................................61
4. The variation of the visual continuity: digital storyboarding......................63
5. Immediate feedback of the continuity: story reel.....................................65
6. Modeling..................................................................................................66
7. Interactive feedback of the camera work: digital layout............................67
8. Easy adjustment of animation and character setup..................................68
9. Lighting and rendering............................................................................69
10. Instant checking of the look and tone: Compositing and colour grading......70
11. Variability of the visual style..................................................................71
12. Editing.....................................................................................................71

Chapter Six – Conclusion.............................................................................74
LIST OF FIGURES

Figure 1. The various shots of RESFEST are made by motion graphic designers using several applications in a laptop or desktop computer ..................3

Figure 2. *The Lord of the Rings: The Two Towers* ...........................................18

Figure 3. The conventional production of *Star Wars* (1977) ..................23

Figure 4. The digital production of *Star Wars-Episodes 2: Attack of the Clones* (2002) .............................................................24

Figure 5. The conventional compositing process of *Star Wars-Return of the JEDI* (1983) .................................................................24

Figure 6. The Computer Generated Image of *Star Wars-Episode 1* to 3 ........25

Figure 7. The Pre-visualization of *Star Wars-Episode 3* ..........................25

Figure 8. Visuals of crossover genre by digital cinematography ..................36

Figure 9. Digital Intermediate for the visual reality of traditional narrative: *Prida, the Painter’s story* ..................................................36

Figure 10. A variable field-of-view for the creative concept: “real cameras shooting real robots” in *Wall-E* .................................................42

Figure 11. Tree modeling method of *Bonsai* ..............................................46

Figure 12. Computer generated clouds from Clouds Primitives to final clouds production ..................................................48

Figure 13. The original animation, *Speed racer and the car simulation engine*, rFactor created realistic racing scene in the live action, *Speed racer* ....50

Figure 14. Although the shots come from different genre, the tone and texture is very similar in the universal form of animation ..................52

Figure 15. The drawing of main characters, Chul-soo and Sun-hee ................59

Figure 16. The scenes of the two main characters’ riding a bicycle or a motorcycle together show their love ..............................................60
Figure 17. A Korean cartoon, *Fantastic sketch*.................................60

Figure 18. The visual style of *The Wheel in the Wind*.............................61

Figure 19. Korean animations: ‘My beautiful girl Mari’, ‘Sky Blue’, and ‘Mangchi’.................................................................61

Figure 20. Drawing, modeling and the first visual concept of Chul-soo’s wheelchair racing...............................................................62

Figure 21. The second visual concept in cartoon style...............................62

Figure 22. The first color palette for the look and tone..............................63

Figure 23. The second color palette..........................................................63

Figure 24. The thumbnail storyboard to catch the visual idea ......................64

Figure 25. Painted layers can be easily combined for the picture composition...64

Figure 26. The final shot of the storyboard for scene 16............................65

Figure 27. The painted storyboard for detailed picture composition...............65

Figure 28. The show reel making for the continuity..................................66

Figure 29. The life-size model of wheelchair racer, Chul-soo.....................66

Figure 30. After binding skin the model’s leg was distorted, The correction of the model’s leg, Various angles for the picture composition..............68

Figure 31. ‘Graph editor’, ‘Trax editor’ and ‘Dope Sheet’ of the animation.......68

Figure 32. The Rendered shot with the selected camera and Lighting............69

Figure 33. The keying and color correction of the bicycle scene..................70

Figure 34. Korean Cartoon, mono tone style rendering and shading in Maya Hyper Shade..............................................................71
CHAPTER 1

Introduction: Visual design in media transition

The digital switchover in film, TV production and distribution is causing a fundamental transition in telecommunications and broadcasting. This transition is changing media infrastructure in various ways, such as digital TV sets, signal standards, media policy, and transmission facilities. It is also affecting creative areas as well, such as workflow, production pipeline and design process. Furthermore, storytelling, genre, visual culture and design aesthetics are significantly influenced by the transition. In the first phase of this study, changed media infrastructure and visual aesthetic in the media will be discussed to address influenced creative elements by the transition. This discussion will be developed in two industrial areas: large budget live action and animation, and an independent production, in order to examine the creative relationships among workflows, production pipelines and design aesthetics. The argument will establish the aesthetic characteristics of media transition through the visual design of digital cinematography.

In the study of ‘applied media aesthetics’, Zettl explored the relationship between creative elements and ‘aesthetic communication’1 on screen. He addressed the relationship as ‘the process of examining creative elements in media’2 and ‘the media

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2 Zettl, 4.
as a aesthetic communication system. This approach made it possible to examine aesthetic interaction in media communication. Although the focus was not on the interrelation between media infrastructure, the creative process and visual culture, Zettl’s concept extended the range of study of media aesthetics, and used a media paradigm to analyze the creative communication system in screen studies.

Ward argued that creative communication addresses the question of visual design as “the process of guiding attention of viewer, which is selection and control elements for the audience’s attention within the frame”. He examined plastic principles in creative communication in order to understand picture composition as a design interface between viewer’s perception and the aesthetic elements in the picture frame. Moreover, composition structure is connected with audience’s “visual deductions, evaluations and decision” in the media experience. Therefore, visual design in cinematography is not only an important aesthetic factor, but also part of human and cultural interaction in the process of creative communication.

Gyorgy Kepes defined the visual language in creative communication as that which “reinforces the static verbal concept with the sensory vitality of dynamic imagery”. In terms of moving image composition in digital cinema, visual language’s sensory vitality is connected to not only plastic elements but also the mixture of production, creative processes, industry technology and visual culture. For instance, the ways in which tone, mood, cinematography, the creative pipeline and workflow in

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3 Zettl, 5.
5 Ward. Picture Composition for Film and Television, 55.
production are influenced by digitization, and its influence on alternative visual culture can be seen in a digital film festival such as RESFEST\textsuperscript{7}: the hybrid domain of visual culture. The majority of the participants in RESFEST come from various sectors such as motion graphic design that bring diverse styles from advertisement graphics to animation. Easy compatibility of digital video and computer applications is a critical factor for this kind of visual mixture.

\begin{figure}
\centering
\includegraphics[width=\textwidth]{Fig_1.png}
\end{figure}

In the creative process of film and TV production, the method of shooting, recording, editing and signal transmission is rapidly changing to digital. Digital cinema, from the industry’s point of view, was described as “the packaging, distribution, and exhibition of motion pictures in digital form” by Swartz\textsuperscript{8}. The main advantage of the process was said to be “copying without deterioration, easy transforming shape and colour, seamlessly compositing from original cinematography and computer graphics,

\textsuperscript{7} www.resfest.com
and effective delivering"\textsuperscript{9}. With these advantages, in digital production such as shooting, editing, visual effects, animation, composite, and colour grading, artists have more opportunities to integrate aesthetic perception and composition elements.

Lev Manovich defines the characteristic of digital cinema as being the capacity to "represent pre-cinematic practices, when images were hand-painted and hand-animated instead of open the shutter and to start the film rolling, recording whatever happens to be in front of the lens as a recording mechanism"\textsuperscript{10}. The digital transition of the media redefines film and design aesthetics based on the hybrid creative system. Lev Manovich pointed out the feature of "hybrid aesthetics"\textsuperscript{11}.

"This aesthetic exists in endless variations but its logic is the same: juxtaposition of previously distinct visual languages of different media within the same sequence and, quite often, within the same frame. Hand-drawn elements, photographic cutouts, video, type, 3D elements are not simply placed next to each other but interwoven."

This hybrid aesthetics in the creative communication of digital cinematography influenced not only the configuration of production process, signal standard, distribution systems, but also creative forms, media aesthetics and visual design. In this study, the relationship between media infrastructure, creative processes and design aesthetics focuses on workflow and the creative element of digital cinematography. These will be discussed to examine the creative and aesthetic influence of media transition in the film and TV industry.

\textsuperscript{10} Manovich Lev. Image furture. \textit{Animation: an interdisciplinary journal} 1, no 1 (2006), 25.
\textsuperscript{11} Manovich Lev, 26.
In the first stage, in chapter 2, I will discuss the change of media infrastructure and production workflow focusing on the change of picture resolution, frame and ratio in film and TV technology to address the creative meaning of the relationship between the aesthetic element and technology in media transition.

This discussion will be developed in both live action production in chapter 3 and 3D animation production in chapter 4. I will first discuss the creative influence of the industrial form of the correlativity between the media infrastructure and the creative process of digital cinematography. For instance, the integration of separate processes, random access, and pre-visualization are good examples of the correlativity in interactive working feedback of the workflow that maintains the original aesthetic elements through the process without loss. Moreover, this process can easily produce diverse forms for other production processes and distribution, which contributes to not only economic efficiency but also creative feedback which combines aesthetic elements for communication with viewer’s perception through the converging media window. And then the argument in terms of the phase of design aesthetics will be discussed to examine the aesthetic influence of media transition in both chapters 3 and 4.

Finally, in chapter 5, the discussion will be developed in the independent production of small budget animations. The production provides other creative possibilities like a one-person production system in animated shorts, and an alternative aesthetic such as poetic symbolism and a hybrid creative culture of film and design in online and broadcast media. This kind of independent system is very different from the
conventional cooperative working system in massive film and TV productions and it has other advantages such as aesthetic experimentation, independence from capital and conventional distribution systems. Especially, one-person production systems in digital short animation have another aesthetic possibility in poetic symbolism for its features: it involves concept-oriented short storytelling and visual impact of digital production.
CHAPTER 2

The change of media infrastructure

Creative workflow and media infrastructure

The media transition between telecommunications and the broadcasting industry is significantly influenced by digital technology. These changes influence cinema production in areas such as workflow, the creative process, aesthetics and genre in motion pictures. In this chapter, I will firstly discuss the change of media infrastructure to illustrate the creative influence in production workflow and then discuss the change of picture resolution, frame and ratio in the transition of film and TV technology to understand the relationship between the aesthetic element and technology. This discussion will address the hybrid creative process in digital cinema and high definition TV to understand its creative influence.

In its early stage, the phenomenon of media transition was mainly focused on technological services and its economic sector. The approach to media transition was described as “sharing of resources, competing in network, data casting or video-conference services and cross-ownership of broadcasting and telecommunication facilities”\(^\text{12}\). Furthermore, in the digital media infrastructure, the traditional role of media was significantly changed and the infrastructure produced a diverse mixture of

interfaces to connect human emotions from small mobile displays to PDP (Plasma Display Panel) high definition displays or digital cinema screens. For example, TV broadcasters expected new markets for digital TV, online applications and mobile delivery. Telecom companies also run broadcasting platforms such as IPTV (Internet Protocol Television) and DMB (Digital Multimedia Broadcasting). Due to the development of digital TV, high-speed broadband and digital cinema, the content distribution environment has been changed in different ways. In 2007, the OECD (Organization for Economic Co-operation and Development) report on distribution in a multi-platform environment argued that in the industry:

TV Broadcaster ABC (owned by Walt Disney Inc.) decided to make popular TV-shows like ‘Desperate Housewives’ and ‘Lost’ available for free via the world wide web. The TV-giant hopes to generate new sources of advertisement income and to find a way to make online TV-programme transmission profitable. (Source: Telegraaf, April 10 2006). In Korea the mobile operator SK Telecom has upgraded its network for a form of broadcasting so customers can use their cellular phones for watching TV. It is called DMB. (SK Telecom, 2004).

To an increasing extent, the broadcast and telecommunication sectors are converging and digital production is compatible in both delivery systems. At the same time, newly created means of interface and production workflow have increased the creative experience. For instance, if FOX studio films a project in 24 progressive high definition digital video, they can have lossless mastering and archiving, reducing the budget for multi-distribution to terrestrial, satellite and cable television, as well as movie theaters. In addition, easy streaming to the internet and interactive feed-back in the production process can be easily available. All this can eliminate the processes and
budget for celluloid film developing, printing and mastering. Furthermore, FOXTEL viewers can directly enjoy the movie of loss-less 24 frame, 16:9 picture ratio that has the same quality as pictures in studio filming through their high definition TV display which is similar to 24 frame, 1.85:1 ratio screening in movie theater. This kind of advantage is a motive for this change in the media.

The media transition influences not only the digitalization of the industry infrastructure, but also creative process and artists’ inspiration. *Star Wars, Attack of the Clones* (Lucas, 2002) has been shot in an all-digital format and shown digitally (in selected cinemas).\(^{13}\) The film had significance for the method of digital production and distribution and its creative possibility based on new workflow as well. According to George Lucas, digital cinematography has changed the production workflow to provide non-linear working process allowing more opportunities to check the creative direction in the production. He mentioned the non-linear approach of new workflow for his filmmaking in an interview with *American Cinematographer*.

I’ve refined the process of working more visually; I shoot for a period of time, about 60 days or so, and then I stop and work on the film for a while. Then I come back and shoot for another 10 days or so, and then I stop and go back and work on the film, rewrite and change things, and then I come back and shoot for another week. I do it in pieces rather than in one long shoot. That way I can actually look at what I’m doing, cut it and study it.\(^{14}\)

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Unlike the conventional linear shooting processes such as “one long shoot”, the non-linear workflow of digital cinematography provides more opportunities to check the contrast, gamma, hue of the shooting for the tone and mood of the picture in location. Furthermore, this workflow provides interactive working feedback including pre-visualization. It simulates the scene before location so that artist can check the creative element for the shooting. For instance, George Lucas introduced the pre-visualization process and it showed the non-linear approach in the production.

The pre-visualization process allows me to put scenes together without having to shoot them, see how they fit in the movie and then, if they work, I can cut them in and actually go out and shoot them.  

The non-linear workflow based on the digital cinematography contributes to the creative aspects for production. In a conventional production process, the artist cannot perceive what is going on inside the camera magazine before developing the film. Moreover, there are complicated factors that affect the printed look: emulsion, exposure, lighting characteristic, colour timing, and lab process. However, in the new workflow, the artist can assume and check the creative aspects before or during the shooting. George Lucas mentioned the production advantage.

There’s a lot of freedom and malleability that didn’t exist before. It’s easy to move things around in the frame, to change various visual aspects of the film, which just wasn’t possible before. It’s the same kind of thing that you find in still photography if you use Photoshop.  

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15 Ron Magid, “Exploring a New Universe”
16 Ron Magid,
Although digital cinema and high definition TV were developed for commercial and technological advantage, the media environment influences filmmaking workflow and creative feedback as well. Simultaneously, digitalization influences film artist's creative working style and the complicated filmmaking process is being changed for creative efficiency, as illustrated by the reference to Photoshop, the popular application for image processing. The film making process as recording reality is changing into making reality by manipulating image layers. Lev Manovich defined the image layer of film making as:

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\text{Digital film} = \text{live action material} + \text{painting} + \text{image processing} + \text{compositing} + \text{2D computer animation} + \text{3D computer animation}\]

The manipulation of the image layer in filmmaking provides interactive random access, pre-visualization and integration of the process.

**Forming screen shape and visual interface**

Diverse creative decisions in the filmmaking process are finally presented in a particular picture frame, which also depends on commercial and technological aspects. In contrast to conventional video and film, digital cinema produces various picture frames and ratios in both the TV and the film area. Therefore, a cinematic artist can extend creative opportunities and decision making in the diverse visual interface which is provided through the media technology and policy based on commercial needs.

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In terms of the technical aspects, a captured picture of some fixed frame shape and rate in a video or motion picture camera is converted to an electronic signal or chemical film grain and then passes through diverse processes and facilities and finally presents a commercial and technological form on the screen. Peter Ward described the importance of frame shape in the commercial and technological form of the media process. “Many images created in the past such as cave paintings, wall painting and frescoes had no frame, but film and TV images are watched on a display screen with a specific shape. The shape of the screen is vitally important to directors and cameramen.”

Screen shape was developed with commercial and technological purposes and the shape also influences media infrastructure and aesthetics as well. For example, in the analogue broadcasting, PAL (Phase Alternating Line), SECAM (Séquentiel couleur à mémoire, French for Sequential Color with Memory) have 625 line (the standard of National Television System Committee is 525 vertical line), interlaced scanning and 4:3 picture ratios that is the same as early motion picture film ratios, which was mainly designed for effective transmission, familiar viewing habits and effective production. At the same time, television content was developed for TV oriented genre, style and aesthetics based on the format. Subsequently, in the competition with television, the film industry lost its competitiveness so that they developed wide-screen formats such as Vista Screen, Panavision, and Cinemascope to attract viewers. They established a unique film aesthetic based on the wide-screen shape for viewers who can enjoy the

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imagery in the movie theater. Screen shape is a critical interface to connect human, commercial, technological and artistic factors in the race between film and TV industry.

In the competition with film industry, TV also needed wide-screen and high definition to improve viewing environment. “The first experimental high definition TV was Hi-Vision system (1125 vertical line, 5:3 aspect ratio) by NHK, Japan in 1979.” Influenced by Japanese ‘Hi-Vision’, “European HD-MAC (1250 vertical line, 16:9 ratio) system also tried the big screen by EUREKA EU-95 consortium” to improve viewing quality. However, this kind of high definition TV screen was an analogue-based system. As a result, the transmission data was very heavy, which was not effective for broadcasting transmission so they adopted interlaced scanning. There was no technical connection with the film industry and it was commercially unsuccessful because it had limited viewers.

The approach of developing a high definition screen in the USA was totally different from the Japanese Hi-vision system. The Advisory Committee for Advanced Television Service (ACATS) conducted various experiments for advanced television from 1991 to 1995 to meet the diverse needs of industries including film, computer and communication. Finally the Federal Communications Commission (FCC) approved


digital transmission based on ATSC (Advanced Television Standard Committee) in 1996."\(^{21}\) It is primarily simulcast with analogue NTSC (National Television System Committee) 6MHz bandwidth, wanting to adopt digital compression like MPEG-2 and digital transmission technology. The digital High Definition system opened a creative possibility for digital motion picture as well. For instance, ATSC includes standard (640x480), enhanced (720x576 and more), high definition (1920x1080 or 1280x720) and 60 fps (frame per second) interlaced, 60 fps progressive, 30 fps progressive, 24 fps progressive scan picture rate\(^{22}\), presents the opportunity to creatively cooperate with the film and the communication industries.

In developing screen shape for the viewing reality, the approach to digital wide-screen and high definition TV in the USA led to a significant creative possibility to make integrated workflow for the creators of film and TV content because they achieved diverse industries' cooperation and associated technology such as computer and telecommunication and adopted two key technical factors: digital high definition format of 24 progressive scanning and simulcast with analog format during the transition period.

Especially, in film and TV industry, the digital high definition format (24 progressive scanning) contributes significantly to production workflow. The progressive format has been established as an international production and distribution standard.

\(^{21}\) Michel Dupagne and Peter B. Seel, 293.

because of similar frame-rate, resolution and picture ratios. For example, the digital wide-screen shape in TV can distribute more films, and it is integrated in development because it adopted common data compression and digital transmission so that they can cooperate with diverse media and creative groups in the film area as well. Hence, picture resolution and ratio in film and TV are getting similar. For instance, digital high definition of ATSC (Advanced Television Standard Committee) broadcasting standard can deliver 1920 pixel by 1080 vertical line and progressive scanning picture that is very similar to printed 2K(2048×1080) motion picture film, which is an important factor in product delivery through multiple platforms and a significant influence in filmmaking workflow and the creative process.

**Hybrid cinematic process**

Digital compression and transmission technologies change not only the picture frame rate, resolution ratios and workflow in production but also influence the creative process through the visual interface, making alternative processes and aesthetics possible based on the hybrid creative layer.

Digital high definition camera, non-linear editing, DI (Digital Intermediate), digital mastering, delivery and projection system are replacing motion picture film facilities and are influencing the creative process in the industry. Indeed the basic creative nature of filmmaking is significantly changing. Lev Manovich pointed out how the digital cinema influences creative process.
1. Rather than filming physical reality, it is now possible to generate film-like scenes directly in a computer with the help of 3D computer animation.

2. Once live-action footage is digitized (or directly recorded in a digital format), it loses its privileged indexical relationship to pro-filmic reality.

3. If live-action footage was left intact in traditional filmmaking, now it functions as raw material for further compositing, animating, and morphing.

4. The manipulation of individual images via a paint program or algorithmic image processing becomes as easy as arranging sequences of images in time.²³

This kind of creative process is also established in digital video production for broadcasting. Therefore, many broadcasters who have a production facility can effectively distribute to satellite, cable, terrestrial, online and mobile channels.

Digital formats in production and the means of transmission are rapidly changing working methods and environments. For instance, one of the popular digital high definition cameras in the film industry, the Sony HDW-F900 series, can produce 1080 vertical lines of 16:9 picture ratio or five different pictures and three progressive scan formats as well²⁴. Other digital high definition cameras also have similar functions. 1080 vertical lines at a 16:9 picture ratio can make a 1920×1080 pixel resolution that is similar to 2K (2048 pixels by 1080 vertical line), normal projection resolution in the film industry. Furthermore, this kind of camera has variable frame rate like a motion picture camera, which is an important function for creative filming for variable speed rate.


The broadcasting industry in analogue NTSC, PAL, SECAM mostly uses 4:3 picture ratio. A 16:9 picture ratio in digital high definition TV brings the creative possibility of visual composition for film picture as well as data exchange with other windows and platforms. Higher resolution needs special lighting, colour temperature, gamma and contrast for a film look in video shooting and post-production. Therefore, professionals in the industry need new artistry based on digital cinematography. For example, film emulsion, exposure, lighting characteristic, colour timing, lab process and print stock are important elements to make the look of dailies or the finished film of celluloid based production. However, in the changed workflow, they may need skills of manipulation for the computer application to calibrate those creative elements to make ‘the look’. Leon Silverman mentioned the process and the artistry of professionals.

In a digital process such as a telecine transfer, a colorist has the ability to alter the look of the digital transfer almost infinitely. Displaying the digitally transferred image on a digital projector can create an unnerving array of variables for a cinematographer whose expectations and career have relied on understanding his or her work in a film system, where the lab’s film printer lights can impart valuable information about exposure and validate that the cinematographer accomplished what he or she set out to do.  

In the mixed production and post-production environment between the film, television and video industries, there are main three ways to proceed from the image to post-production: film shoot to film finish, film shoot to video finish and video shoot to video or film finish. Technically, the silver-halide grain structure, density and

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26 Barbara Clark and Susan J. Spohr. Guide to Postproduction for TV and Film. (Oxford: Focal Press,
sensitivity to light are key factors in film production compared with the video signal of luminance, chrominance and hue. DI (Digital Intermediate) is a key area of this kind of changing workflow to increase creativity and reduce the production budget.

Fig. 2. The Lord of the Rings: The Two Towers. The original shots are digitally processed (film scanning, digital effects, compositing, color grading, editing). In this shots, the shooting cinematographer Andrew Lesnie and colorist Peter Doyle cooperated to make the landscape of Middle-Earth. The DI process contributed to their creative decision such as colour, gamma, and contrast for the final tone of the shots. Courtesy of American Society of Cinematographers 2003.

Digital Intermediate includes film scanning, digital effects, compositing, color grading, editing and film recording process. From a creative point of view, Digital Intermediate provides interactive working feedback during the process, and maintains original resolution without loss. Moreover, Digital Intermediate can easily produce diverse cut and print outputs for different purposes without printing rushes, which contributes to creative feedback through the visual interface, and an economic benefit without rushes and intermediate film.


The digital cinematic process influenced by media technology is changing creative elements such as frame rate, picture resolution and ratios, providing unlimited working layers through the multiple visual interfaces, which creates hybrid workflow and alternative aesthetics as well. The process incubates hybrid interfaces to connect human, commercial, technological and artistic factors, and the interface influences creative inspiration for media artists and ultimately changes the nature of filmmaking and removes the border between live action and animation.
CHAPTER THREE

Digital cinematography in live action

High definition 24 fps progressive picture and cinematography

In the last chapter, in order to understand the ultimate element of the aesthetic form which is transformed by the media transition, I discussed the development of the diverse picture resolution, ratio, frame rate and the footprint of the high definition video format. This establishes a new workflow in television and film production. In particular, I argued that 24P(24 frames per second progressive scan) picture format has been set up as a universal creative factor for film and TV production during the media transition. In this chapter, I will discuss the relation between 24 fps progressive format as a key aesthetic factor in the media transition and the hybrid production workflow to understand the artists' interaction in the media transition. This discussion will be based on the artist's experience which reflects changed workflow and a new creative system. Therefore, We can understand how creative factors effectively contribute to the production and artistic inspiration in the media transition.

In the study of digital cinema, Charles S. Swartz pointed out the main advantages of digital technology:

1. Copying: In the digital domain, we can copy without deterioration, because every copy is a perfect clone of the original.
2. Changing: We can easily transform shape and colour, with more precision than in the photochemical world of film. And we can seamlessly composite elements from both original cinematography and computer generated imagery (CGI)
3. Controlling. Digital technology enables us to make the motion picture much more secure from pirates, allowing us to encrypt the digital file and then decrypt it the theatre-by validated users only-with the appropriate keys.

4. Delivering: Digital permits non-physical delivery to the viewer, e.g., Digital Cinema and Video-on-Demand. There is no need to manufacture copies unless desire.

In the early stage of digital production, the advantage of digital technology in the motion picture industry comes mainly from the high definition TV area because of a similar video aesthetic and workflow. Many TV programs such as drama series, sitcoms and documentaries are still made by using motion picture cameras, celluloid film and telecine processes for broadcasting, while news pictures directly come from the video format of the ENG (Electronic New Gathering) camera. In the broadcast production area, high definition TV production was introduced to reduce the budget for celluloid film and maintain the programs’ film look using a high definition video format instead of motion picture film.

On the other side, high definition studio and transmission facilities have been rapidly installed in broadcasting so that high definition video changes the workflow and creative aspect of broadcasting content. In terms of the creative aspect in the high definition production, directors, artists and technicians in the production have made alternative creative efforts because of basic technological differences between film

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(exposure index, picture sharpness, tonal reproduction, colour reproduction, exposure latitude, frame capture rate, gain, mechanical shutter) and video (sensitivity, resolution, contrast, colour gamut, frame/field rate, noise, electronic shutter). The high definition picture does not exactly look like motion picture film even though it is shot carefully in a film production environment. The high definition video image still has excessive transparency and clearness so that high definition production was not established for feature filmmaking. However, there is an alternative aesthetics in the high definition picture in film production. A cinematographer Paul Wheeler pointed out the creativity of the digital high definition cinematography.

To my eyes HDCAM shown on a high-grade 1080-line television gives a wonderful picture. It is far superior to any standard-definition picture. It still looks like television but, if the images are skillfully shot, the picture can be every bit as appealing as if it had been originated on film and displayed the same way. It does not look exactly like an image originated on film. I find the HDCAM image very exciting. It's neither film nor conventional television having a peculiar clarity and vividness that, though a little unfamiliar, is bright and engaging, and engaging my audience is something I love to achieve.  

Although there are some basic differences in picture components between film and video, cinematographers can create an alternative aesthetic in the high definition camera system and find a solution through industry cooperation. Initially, the difference between motion picture film and high definition video mainly came from camera optics and frame rate because they used different camera lenses and frame rates. The second

creative wave in the digital production process was developed to overcome this obstacle to obtain a film look in high definition camera. Industry cooperation by George Lucas contributed to the introduction of 24 progressive picture high definition cameras and diverse cinema lenses for the cameras through the making the feature film *Star Wars Episode 2*. In an interview with *American Cinematographer*, George Lucas talked about the cooperation.

I've always said, "This is like the film industry in 1902," so the advances are going to be huge, because what we did on *Episode II*, we did in essence by ourselves. We had to talk Sony into it, [but] they built the cameras and they tried really hard to make this work; we also had to talk Panavision into committing a lot of money to build those lenses. Both companies really went out on a limb. This was a giant experiment for everybody, and nobody knew if it was going to work or if they were pouring money down a rat hole.30

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Fig. 4. The conventional production of *Star Wars* (1977) A: Ralph McQuarrie’s production illustration, Courtesy of American Society of Cinematographers 1977.
B: Grant McCune making the X-wing fighter, C: The miniature of the trench on the Death Star. D: Blue screen shooting, E: Suschitzky operating the Panavision R-200 camera, F: Eldon Rickman operating the optical printer, G: Artist outlines the X-wing fighters to make the matte, H: The final shot of X-wing fighters

Fig. 5. The conventional compositing process of *Star Wars-Return of the JEDI* (1983)
Courtesy of American Society of Cinematographers 1983.
A: The blue-screen shooting, B: The bonfires were composited with a painted background, C: The large part of matte was scraped away for the replacement by rear projection composites (Image D), E: Craig Barron, Chris Evans and matte painting, F: The final shot
Fig. 6. A: The Computer Generated Image of *Star Wars-Episode 1*, B: Computer Graphic is effective for this kind of complicated scenes. Courtesy of American Society of Cinematographers 1999.

Fig. 7. The Pre-visualization of *Star Wars-Episode 3*. Pre-visualization contributes to the creative decision such as camera angle, picture composition and acting of the complicated scenes. Courtesy of American Society of Cinematographers 2005.

The cooperation of George Lucas, Sony and Panavision was significant to establish a new workflow and creative system. The lens and the 24 progressive high definition image provided by both companies' technology contributed to artists' creativity to capture a video image which is closest to motion picture film. The two industry giants developed seamless configuration of film and video mechanism and different camera components. Paul Wheeler mentioned the significant configuration of film and video mechanism.
The camera has all the 24P, 25P, 30P, 60i and 50i recording capabilities of original camera and records in exactly the same way. It has, in Panavision’s words, been ‘panavised’ and ‘ruggedized’. The ‘Panavization’ of the camera consists of making it completely compatible with Panavision film accessories. The base plate allows standard Panavision focus controls, matte boxes and lens control accessories all to be fitted directly onto the camera. Lenses supplied by Panavision with the camera will all have the focus control brought back to just in front of the camera, as is now found on all Panavision film cameras.31

Hybrid workflow and digital cinematography

The configuration of the high definition video and 24P (24 frames per second progressive scan) picture format in production significantly influences the creative workflow, feedback and inspiration for artists with high definition monitoring of shooting, digital dailies, visual effects shooting and DI (Digital Intermediate). First, there is an advantage of monitoring in the shooting process. The high definition production can use a high definition 24 fps progressive monitor so the staff can check lighting, exposure, hue and contrast directly in the studio or on location. In motion picture film shooting, visual composition and camera angle can be checked through the standard definition monitor. The high definition system is helpful for rapid and accurate decision making in the creative process. For example, the staff can have creative feedback directly about the actors’ acting, make-up, costume, lighting, exposure, hue, contrast and style through the display which is similar to the audiences’ TV. In conventional film shooting, staffs have to wait until the rushes are produced after the film developing process. If re-shooting is needed, one or two days have to be spent for the shooting in conventional motion picture production.

Second, digital dailies contribute to rapid creative response and feedback. The rush or dailies are critical to check the creative process for further decisions. Leon Silverman describes the typical dailies of motion picture production and its celluloid film consumption.

Dailies screenings typically are a collaborative and communal event, with the various departments watching them to judge how yesterday’s footage compared with expectations or, in the case of the editor, how it might cut with other footage.  

Dailies are a critical process for creative decision making and cooperation. However, the main problem of dailies is the cost of film and time consumption. Several alternatives are tried in digital dailies; “transferring a cut film work picture to a digital master, current version of the cut directly from the edit system, up-converting the film assembles of the standard initial telecine.” Although these digital dailies were economically successful in terms of fast delivery and reducing cost, the picture quality is not enough for motion picture artists because the high definition picture mainly comes from up-converting of the standard definition in the post-process, which is not a real high definition resolution picture. According to industry’s opinion, “MGM senior vice president of feature postproduction, Bruce Markoe estimated savings of $125,000

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33 Leon Silverman, 42.
per picture through digital dailies. However, the digital dailies are still not suitable for cinematographer’s aesthetics and the creative workflow. In the interview with *American Cinematographer*, Kramer Morgenthau discussed the creative matter of the digital dailies.

As a cinematographer, you have to assume the role of being a guardian of the art form. That’s why I’m willing to fight for film dailies. You’re making a movie for a canvas that’s 40 feet wide or larger, and the reality is that with digital images you can’t see nuances on actors’ faces or in colors, how a costume works with the production design, or how grain structure and contrast will play on the big screen. You also can’t see critical focus or how diffusion is affecting light.

The main problem of digital dailies is the picture quality, caused by the up-converted picture of the standard resolution and small size screen needed to present the work. Cinematographers need more than 2K screen environment that is the same quality of viewer’s screen in cinemas to check the creative details such as what was achieved in the shooting and what kind of picture the audience could see in the movie theater. With the development of digital projectors, 24P(24 frames per second progressive scan) high definition format could be suggested as an alternative method for digital dailies to overcome the up-converted picture quality of the digital dailies. Leon Silverman mentioned the possibility.

a process whereby the film negative is transferred directly to 24P high-definition digital videotape as dailies. This method also yields efficiency in subsequent preview screenings, featuring images significantly more pristine than can be

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34 Bob Fisher “The Case for Film Dailies” *American Cinematographer*, April 2004
35 Bob Fisher *American Cinematographer*, April 2004
derived from a cut film work-picture. Using this method, dailies can be screened in high-definition on a variety of devices including CRT monitors, plasma flat panel displays (FPDs), or with high-quality digital projectors.\(^{36}\)

The 24 fps progressive high definition image, transferred directly from film negative or high definition video provides 2K film resolution and screen size through the digital projector. This is suitable to check the nuances in acting, costume, production design, colours, contrast and diffusion of light. The 24 fps progressive high definition format contributes to rapid pre-visualization and creative feedback during shooting. Especially, in terms of visual effects shooting, 24 fps progressive high definition format gives critical creative advantage. Carl Miler, the cinematographer of Back to the Future2, Terminator2 and Deep Impact mentioned the creative aspect.

"We could see an effects shot immediately at full resolution on the big, high-resolution monitors that were kept inside a black tent on stage."

"That allowed us to more accurately assess whether our shots were working, so we didn't have to keep tweaking them to death. Also, rather than pulling out a light meter and reading values of exposure, you can actually look at the model you're shooting digitally and build the shot until it feels right.\(^{37}\)

Additionally, one of the 24 fps progressive high definition video's strong advantages is the compositing workflow of visual effects shooting. Motion picture film needs developing and film scanning for visual effects. However, the HD format directly inputs the image signal into the process of visual effects. It supports not only the artist's needs for rapid creative response and feedback but also seamless connection for further


composite workflow or interactive on-stage shooting for visual effects. Carl Miler said about the merits.

"We could also do more accurate onstage composites because the images from the HD signal were better-registered and clearer, compared to the normal video tape images we're used to getting with film," "If we had to add someone into a miniature shot, we could make sure his feet were tracking perfectly to the floor of the background we were shooting. And we didn't need to shoot wedges. For example, in lighting our model spaceships in the past, we had to shoot wedges to determine whether the exposure for the model's practical lights looked good with the lighting on the model. With HD we can actually see how it all looks together on the monitor."38

Especially, in motion control camera work for visual effects, high definition has significant advantages for interactive feedback in the shooting process. high definition provides real time feedback for creative decisions about colour, lighting and art direction. Star Wars Episode 2 cinematographer Rosenberg noted the advantage.

Shooting motion control in HD and merging frames meant that the cameramen were viewing moves on the HD monitors that were considerably longer than they would be in the film. "A 100-frame motion-control move of a spaceship flying by at 1 fps translates into approximately four seconds of screen time," "But on the monitors on stage, we saw exactly what we shot in real time; in one instance, we were watching a move that was traveling eight times slower than it was meant to be. We used the HD monitors to judge color, lighting and art direction, and we used our digital disk recorders, which record a single image for a single motion-control frame, to judge pace."39

In high definition shooting for visual effects, there are significant differences to motion picture film production. High definition video signal’s sensitivity, resolution, contrast, colour gamut and dynamic range are different from the film’s exposure index, sharpness, latitude, tonal and colour reproduction. Hence, colour reproduction, blue screen shooting and lightings are carefully approached. Cinematographer Marty Rosenberg mentioned the colour reproduction.

the cinematographers often found that "when going from stage monitors to the DLP projector in the dailies theater, certain colors shifted slightly. We attempted to calibrate the digital cameras and monitors to a certain standard, but we learned that every color responds differently, just like with film. I photographed elements of the 'droid factory sequence, which had a lot of red, and red is a color that 'pops' a little too much in digital, just like it does with certain film stocks. I had to be very careful to step on it a little bit, otherwise I'd get images that were too red – not just redder than I wanted, but redder than it actually was. But we quickly learned the nuances of the medium and adjusted to them."\(^{40}\)

24 fps progressive high definition video’s sensitivity to colour is different from that of film. Therefore, in blue screen shooting, high definition video uses different exposure and lighting method. Carl Miler noted the blue screen shooting in high definition video.

"The HD cameras didn’t record as much of the information in the blues as some of the other channels, which created little halos around objects,"...

"Those obviously had to be eliminated, so we added a little bit of white light to our bluescreens. We also found it difficult to get an even exposure throughout the whole bluescreen. It was actually easier to shoot many models with

backlight/frontlight, meaning we had a white background behind the model with the beauty lights switched off so the model would go black, and we then adjusted the gamma to give less detail to the whites. That flattened out the screen’s exposure without requiring a lot of additional light manipulation, which saved us some time.”

Although there are different creative factors such as depth of field, color and sharpness in visual effect shooting of high definition video, artists have developed adaptable lighting and shooting methods to overcome the differences and high definition video has provided rapid creative response, feedback and seamless connection for further composite workflow such as interactive on-stage shooting.

Also, the 24 fps progressive high definition format is directly connected to the Digital Intermediate process with high definition daily information. The process provides another creative advantage for post-production process with high definition daily information about colour correction. According to a study about Digital Intermediate, the process was defined as below.

The digital intermediate is often defined as a digital replacement for a photochemical “intermediate”—a stage in processing in which a strip of film (either a “inter-positive” or a “inter-negative”) is used to reorganize and makes changes to the original source footage prior to output.

Digital Intermediate was originally developed to replace the inter-negative and inter-positive process in post-production. However, many artists have more interest in the diverse colour palette of the process to improve their creative

vision and that is the main reason Digital Intermediate is rapidly established in post-production. 24 fps progressive high definition format in shooting and digital dailies can be integrated effectively with the Digital Intermediate process, maintaining the look, style and feeling in the picture from shooting to printing. *The Departed* (2006) is a good example of the integration of production and post-production process for an overall effect. Cinematographer Ballhaus had the colour standard through the HD dailies and then he maintained the look and style for Digital Intermediate’s colour. In the interview with *American Cinematographer*, he mentioned the integration.

During production, the filmmakers screened HD dailies at 1920x1080 on a 2K projector set up at Marcy Stage in New York. “I was a little worried [about discrepancies] in the beginning, so I watched the first few days of dailies on film,” “I was very happy with the HD dailies. It works well if you have a good projector and an excellent dailies colorist, as we did with Sam Daley at Technicolor in New York.” The HD dailies became an important point of reference for Ballhaus as *The Departed* moved into its DI.43

A definite advantage of Digital Intermediate is the adjustment of the finishing look and style through the colour correction before printing. Through the Digital Intermediate’s colour correction, filmmakers can adjust each scene’s colour for whole feature’s look and style. In the Digital Intermediate process of *The Departed*, some shots were re-graded for a more realistic look.

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Recalling a scene he pregraded, Nakamura describes a sequence set in the Boston police headquarters, with Martin Sheen and Mark Wahlberg standing in front of a large window. (This scene, like others set in the police department, was shot onstage, with a TransLite providing the view outside the window.) “Rob Legato and I looked at that particular shot because Marty wanted to make it flow a little better and give it a bit more realism,” he says. “I pulled a luminance key and brightened the background and defocused the window. Then I brightened each actor at different levels. Those were things that helped the shot look more realistic.”

Digital workflow influences not only visual reality but also storytelling. In the changed workflow, artists can integrate separate processes, random access, interactive correction to get visual reality for effective storytelling. For example, Carl Miler, the cinematographer of Terminator2 and Deep Impact could grab the visual reality in a different way from that of celluloid film.

Unlike film, where we have to calculate the exposure and trust our intuition, with HD we can actually open or close the lens, then look at and ‘feel’ the image, so we can now be much more aesthetic about it.

Many artists at each stage of the workflow can embody their imagination in visual reality more effectively. For example, the director can simulate action for more perfect continuity, the compositor can manipulate diverse layers for complicated scenes, and the colorist can adjust the tone of whole scenes of the film. In this way, the visual reality

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contributes to crossover stories or styles: for example game graphics in live action (Final Fantasy: The Spirits Within), the combination of cartoon characters and kung-fu live action in animation (Kung-Fu Panda), hybrid visuals of animation and games in live action (Speed racer), Marvel heroes in live action (Spiderman, Batman, Hulk, X-man, Fantastic 4, Iron man), the combination of a Japanese animation, The Ghost in the Shall and martial art in live action (The Matrix). Without the digital production workflow, those kinds of ideas, stories and genres would be impossible. Digital workflow was introduced for efficiency in production of special effects film. However, it affects visual reality and storytelling. It provides the basis for the crossover of genres and new styles. It even affects visual storytelling in the traditional narrative genre. Film narrative and genre were developed with the appearance of cinematography, but currently, they are in another kind of renaissance because of the influence of media transition.
Fig. 8. Visuals of crossover genre by digital cinematography

**Left and Middle:** the influence of animation and game in live action (*Speed racer*. Courtesy of Warner Brothers Pictures 2008)

**Right:** the influence of game graphics in live action (*Final Fantasy: The Spirit Within*. Courtesy of Columbia Pictures 2001)

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Fig. 9. Digital Intermediate for the visual reality of traditional narrative: *Prida*, the painter’s story. Courtesy of American Society of Cinematographers 2003.

**Left:** The original footage shot by cinematographer Rodrigo Prieto, **Middle:** DI processed footage made by colorist Steve Brown at Efilm. They created the image close to Frida Kahlo’s original painting (**Right**).
Chapter Four
Animation: Hybrid Visuals and Design Aesthetic

Digital cinematography in animated film production

In the last chapter, I explored the relationship between 24P (24 frames per second progressive scan) picture format of digital cinematography and digitalized workflow to understand how workflow might contributes to the artists’ inspiration and creative process. The high definition monitoring of shooting, digital dailies, visual effects shooting and Digital Intermediate in live action filmmaking enhance creativity through interactive feedback, intuitive tools, the integration of separate workflows, random access, and pre-visualized working processes. In this chapter, I will discuss the relationship between the workflow of digital cinematography and the creative process in animated film to understand how effectively digital cinematography might contribute to creative works, design aesthetics and visual culture. The discussion will be developed based on the creative system which reflects changed workflows in animated film. Therefore, I can examine the common creative factors in both animation and live action, and how the creative factors effectively contribute to the design aesthetic and artistic inspiration in digital cinema.

Compared with other film genres, animation has been developed to have a unique style of production workflow, and studio system that is not a shooting-oriented environment. Traditional animation workflow and visual styles are clearly different from live action film. However, in digital cinematography, there is no border between
live action and animation. The storytelling, camera working, visual style and aesthetics are very similar in both animation and live action. Some animations and live actions have similar kinds of aesthetics and technology of 3D animation. In the study of digital cinema, Lev Manovich referred to the universal nature of animation in digital cinematography.

I think it is not worth asking if this or that visual style or method for creating moving images that emerged after computerization is 'animation' or not. It is more constructive to say that most of these methods were born from animation and have animation DNA – mixed with DNA from other media. I think that such a perspective that considers 'animation in an extended field' is a more productive way to think about animation today, especially if we want our reflections to be relevant for everybody concerned with contemporary visual and media cultures.  

The universal form of animation is produced in a similar production process to that of live action and animated film. In the following section, I will discuss the workflow and creative pipeline in 3D animation, focused on digital cinematography to highlight the common creative factors of the both live action and animated film and its creative influence in the production by the media transition.

The creative pipeline and workflow in the production

In 3D Animation, there is no limit of adjustment for the design aesthetic and pre-visualization for creative decision making and communication because the creative factors are generated in virtual space. The artists can easily overcome physical limitations and obstacles. The software embedded camera has the same kind of aperture, F-Stops, depth of field, lenses and focal length system of camera in physical space. Moreover, the advantage of digital technology changes not only the single work unit but also the whole workflow and creative pipeline. The creative system influences artists’ inspiration and creative range. For example, animation has limits in selecting a story, character expression and camera work because the creative factors are connected to the workflow of hand drawing and painting. However, the digitalized workflow and creative pipeline gives opportunity for a wider range of story telling and creative expression.

For instance, *Kung Fu Panda* (John Stevenson & Mark Osborne, DreamWorks Animation, 2008) tried realistic martial art action and complicated camera work in the fighting scenes that were essential for the story. In the production of *Kung Fu Panda*, the limitless adjustment of camera work, action and visual design of the digital cinematography contributes to new genre and aesthetics. Young-Duk Jhun, the head of layout for the *Kung Fu Panda* project in DreamWorks studio, mentioned the advantage of digital cinematography for the creative process.
Layout of digital cinematography connects pre-production and production in animation. The production of animation starts with the decision of camera position, angle and visual composition in the layout works for the efficiency of the further animation process. In the layout of digital cinematography, the great advantage is that there is no limit of adjustment for the camera work and visual design in the shots. After the first shooting in the project, the shots and sequences are adjusted many times for the creative concept. And then, the sequences are edited and transformed to the answer print and distribution print for the screening to meet viewers. Compared with traditional process, limitless adjustment is great advantage for the action and the camera works.47

The limitless adjustment of digital cinematography in the animation production is similar to the adjustment in the live action shooting through the process of HD monitoring and digital dailies. In the digital cinematography of animation, the software embedded camera and virtual process do a similar role to the creative feedback in the shooting, monitoring and dailies of live action. The process helps creative decision making for the visual story and continuity. Furthermore, digital cinematography in both live action and animation has the similar process of pre-visualization which makes a significant contribution to the creative process. Young-Duk Jhun explained the role of pre-visualization in the production.

Pre-visualization is one of the creative processes, which is established in the production pipeline of Dreamworks Animation to accomplish dynamic action for the storytelling. The camera work and character action should maintain the creative concept and the cooperation of each pipeline so that the director and each team leaders have many meetings to discuss the better shots for the whole balance of the storytelling. The supervisor and artists have meetings to discuss the camera work and layout

47 Interview by author, Kwansoo Kim with Young-Duk Jhun, the head of layout for Kung Fu Panda at SIGGRAPH 2008
in the shots every day. The director and supervisor meet once per week for the sequence approval. If there is correction of the camera work and layout in the sequence, each team leaders check the team's job about the correction at the meeting. Pre-visualization is established as an important communication method between each team and artists, which is significant for the exchange of the point of view and making the creative decision.48

Through the pre-visualization process, the production staff can check the action, camera angle and continuity during the production like pre-view monitoring in live action. Especially, the pre-visualization process is essential for the rapid and accurate decision for timing works for the dynamic martial art scene in *Kung Fu Panda*.

Additionally, another significant advantage of digital cinematography in 3D animation is the reality of camera work and the creative feedback by the software embedded system. The virtual camera not only overcomes the physical limitation and provides the same camera parameters but also translates the camera reality to visual design in the interactive feedback. In this way, 3D animation creates unique aesthetics which presents a virtual world based on the reality from live action. As well as the clone of camera parameters in motion picture, the creative elements are transformed to another kind of reality and design aesthetic in the virtual space. For instance, in the production of *Wall-E* (Andrew Stanton, PIXAR & Walt Disney, 2008), the camera team could achieve a sense of reality from this kind of process. *Wall-E* camera team in PIXAR mentioned the process.

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48 Interview by author, Kwansoo Kim with Young-Duk Jhun
An early mantra on Wall•E was “real cameras shooting real robots.” In order to accomplish this, our Camera Department researched live-action camera kits: lenses, dollies, booms, cranes, heads, and steadicams. A critical analysis was performed using a Panavision 35mm camera (with both spherical and anamorphic prime lenses) in our Studio’s atrium. We explored the following camera parameters: focal lengths, distances, and apertures using physical mockups of our main characters to learn how the filmed image responds to these variables. As a result, Wall•E’s camera model was endowed with a number of the physical attributes seen in our tests: a nonproportional circle-of-confusion created via a new option in Renderman; a variable field-of-view based on focal distance and focal length (so-called “lens breathing”); and barrel distortion.49

Fig. 10. A variable field-of-view for the creative concept: “real cameras shooting real robots” in Wall•E
Courtesy of Pixar Animation Studios at SIGGRAPH 2008

Moreover, this kind of cinematography process also influences other creative processes in the animation production and the workflow is getting similar to shooting process in live-action filmmaking. In the virtual shooting for 3D animation, the process has the significant advantage of interactive feedback in the shooting process. The virtual shooting has real-time feedback of creative decisions for lighting design and art direction. The Wall•E camera team in PIXAR pointed out the creative feedback of the process.

We employed physically-inspired camera movement: non-nodal camera head; camera jitter; and dolly/track-style controls. While our camera work typically happens prior to animation, on *Wall·E*, we operated our cameras after animation, so we could truly follow the action as a camera operator would in live-action. To ensure the aesthetic application of these characteristics, we improved our interactive hardware rendering to give our camera department improved feedback of their camera work (including the ability to respond to preliminary lighting designs—something that traditionally happens much later in the Pixar pipeline).  

### Creative design and procedural system in production

There is significant integration between the workflow and creative resources in 3D animation. The creative resources of the character, action, camera and background works are generated in virtual space and managed in the integrated workflow and the control system. The integration deals with massive data and complicated art works. Hence, artists can try a high degree of difficulty in creative expression. For instance, in the shooting of layout workflow, 3D animation sequences are getting complex to make a more convincing reality, and the layout artists are fighting with the increasing complexity of shots. A ‘managing tool’ for the complex layout workflow is helpful to control each shot. The layout artist Kevin Thomson in Blue Sky Studios mentioned the control tool in the layout workflow.

The central “hub” tool that enabled layout artists to plan and manage their shots for *Horton Hears a Who!* was the Bss Layout Tool (“BLT”). With it they had the advantage of comprehensively shooting entire multi-shot sequences within one scene planning file. All principal and secondary characters, props, and set pieces for the sequence lived in the file, ready to be choreographed for each shot in one centralized environment.

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50 John Warren, Jeremy Lasky and Danielle Feinberg, *The Cinematography of Wall·E*
The BLT enabled the 3-D work environment to adapt quickly to the evolving plan by managing these changing concerns in one central location. This method bypassed the issues of a fractured creative workflow inherent in other filmmaking pipelines, where artists must plan each shot of an interrelated sequence separately in its own file.\footnote{Kevin Thomason (Blue Sky Studios), “The BLT: A Digital Cinematographer’s Control Center” in SIGGRAPH 2008, Los Angeles, California, August 2008, 11–15.}

Similar to live action, in the workflow of animation it is extremely complex to handle the creative factors in the shooting. For example, in live action, cinematographers check colour and contrast of actors’ faces and the production design such as costumes, props, set and background in the action for the picture composition. For the same creative reason, the layout artist in animation shooting also checks the virtual actors’ faces, costumes, props, set and background in the action for the visual composition of the each shot. The continuity of the layout style and the look should be maintained through whole sequences. The “BLT (Bss Layout Tool)” system is helpful to control enormous data and it manages workflow effectively: some changes in the individual shot are automatically updated in the related shots in other sequences so that the layout artists can easily update and control the changed camera angle and position throughout all of the shots. Through the creative management of the “BLT” system, creating, adjustment, reviewing layouts, and trying alternative shots, are integrated into one system.

Enhancements were added to the BLT throughout production to further streamline the layout process. Setup time was greatly reduced by functionality that interfaced with the film’s database tracker to automatically set up cameras with their corresponding frame ranges and track readings. Within minutes of starting even a complex 100+ shot sequence, a layout artist could have all that was needed to begin roughing out camera compositions.

Experimentation with alternate shots, adjusting of the film’s cut order, automatic creation
of “same-as” shots, quick playback reviewing of all shots, etc., were all available from easily accessed menus, essentially enabling the artist to edit the sequence cut within the 3-D environment. The BLT was particularly critical for disseminating up-to-the minute

Furthermore, this kind of control system for the layout process is integrated with lighting and matte painting works as well in the creative pipeline.

In the production of animation, the virtual props and background are made and managed in the procedural process such as tree modeling tool, the cloud system and the sod system. This kind of tool in the procedural process is very helpful for the effective creation and management of the resource and production time. For example, in the production of *Madagascar2: Escape to Africa*, DreamWorks Studio developed the procedural creation system of vegetation. Jeffrey Budsberg and Scott Peterson discussed the system.

![Fig. 11. Tree modeling method of Bonsai: A simple branch(A) with growth points (B) and user controlled instancing (C), results in a complex structure (D). Courtesy of PDI/DreamWorks Studios at SIGGRAPH 2008](image)

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52 Kevin Thomason (Blue Sky Studios), "The BLT: A Digital Cinematographer's Control Center"
Bonsai, our tree modeling tool for Madagascar 2, yields dramatic improvement in stylistic control over previous methods. Modelers use familiar modeling tools to create and connect small branch parts to form more complex networks, which can be connected or dynamically grown into a large hierarchical system of branches. More importantly, this allows the user to put shape language into every branch. Bonsai facilitates duplicating and manipulating thousands of branch surfaces to help artists create trees efficiently.\(^5\)

The procedural creation system of vegetation ‘Bonsai’ also provides flexibility of creative decision making in art direction because in the system it is easy to modify the style, number and complexity of the vegetation in the workflow. Jeffrey Budsberg and Scott Peterson explained the method of vegetation making in ‘Bonsai’.

Source input can be as simple as a cylindrical model or as complex as a system of connected branches. The user places a new branch by selecting a source (or Bonsai can randomly choose from multiple sources) and clicking on another surface. At that position, the new branch is parented to the clicked surface (inheriting its transforms) and assigned an attribute defining which level it exists in the hierarchy.\(^5\)

Like the process of the procedural tree creation, the cloud making was also developed as a procedural process. For example, the basic primitives for the cloud making are stored in the library in the procedural system and the basic primitives are


\(^5\) Jeffrey Budsberg (DreamWorks Animation), Scott Peterson(PDI/DreamWorks), “Beyond Procedurally Modeled Foliage in Madagascar: Escape2 Africa”,

-46-
combined with each other to make more complex shape in the procedural system. Therefore, it is easy to re-generate flexible art direction and workload efficiency. In *Madagascar: The Crate Escape*, PDI/Dreamworks developed the cloud-making pipeline.

In order to deal with large skies made of visibly hundreds if not thousands of cloud shapes, we created a library made of simple building blocks. Eight 'cloud primitives' are available in the system and describe basic geometry shapes such as spheres, cones or domes. We combine these primitives to create more complex cloud shapes and also store them in the library. We then grow particles out of the same shapes to create the final clouds.55

Fig. 12. Computer generated clouds from Clouds Primitives to final clouds production. Courtesy of PDI/DreamWorks Studios at SIGGRAPH 2008.

In the production of *Madagascar 2: Escape Africa*, PDI/Dreamworks also developed “Sod”, the procedural system for making grass, and the system provided workload efficiency and interactive feedback among each department. For example, the

artists in layout, surfacing, set-dressing and animation department in the procedural process can have creative feedback, which reduces their workload.

Traditionally, our surfacing department develops the placement and style of grass on our ground environments. This approach provides little feedback for our set-dressing and animation departments. We developed a system, sod, to address these issues. Sod encompasses a suite of tools which allows the set-dressing department to quickly place simple geometric shapes on the ground. A layout artist draws curves, lofts them into slabs, and conforms them to the ground. In addition to the ease of layout of these shapes, this geometry provides benefits to other departments needing quick feedback as to the placement and location of the grass. The surfacing department then converts these shapes into data for our fur shader.\footnote{Robyn Rindge and Feng Xie (PDI/DreamWorks), "Shaping, Simulating and Rendering the Grasses of Madagascar: Escape 2 Africa" in SIGGRAPH 2008", Los Angeles, California, August 2008, 11–15.}

Through the layout control system and the procedural creation system such as ‘BLT’ in Blue Sky Studios and ‘Bonsai’, ‘The Sod’ in PDI/DreamWorks, the workflow and creative resources in 3D animation are integrated. The integration deals with massive data and combines the workflow with a control system so the studios can provide the virtual library of creative expression and resources for other projects. The artists also can have more creative feedback in the system and can manage a huge amount of workload efficiently. This kind of systematization in the workflow is helpful for creative expressions in 3D animation. The artists can reduce the workload and attempt more challenging and complicated art works for creative expressions like the
reality effect of Kung Fu martial Art in *Kung Fu Panda*. For example, in the making of fighting scene at the rope bridge, the animators can animate the rope bridge and the character at the same time through the rig by the “Rope Bridge Animation System”.

The interplay between the characters and the dynamic structure of the bridge creates an animation loop, the range of motion is extreme as characters fight kung fu style, and the bridge gets severely damaged along the way. We handled the key issue of the interdependency in the animation by building a rig that enables animators to pose the bridge at the same time they are animating other characters. Secondary dynamics are then layered on top using a procedural FX system. Corrective feedback is automatically applied to the characters-bridge constraints, thus reducing the need for manual adjustments. As a result, the whole process can be iterated easily. In addition, as the system is fully layered, animation changes at any level will automatically trickle down to finer animation layers.57

In the production of live action, to overcome physical difficulty and complexity of handling the creative factors in the shooting, procedural control and creation systems are deployed. For example, in the production of *Speed Racer*, car simulation engine was used to express the reality of dynamic car racing and the engine was connected to other creative pipelines in the production. John Gibsony and Erik Gamache in Digital Domain described the system.

Our initial approach was to use rFactor, a high end commercial car simulation engine. This same engine was used to control the motion base on-set used for the cockpits. It performed very well at that task, allowing the actors to drive the motion base with realistic car motion. A Maya pipeline was built to export the tracks to rFactor and we started driving. The highly accurate physics engine of the simulator that worked

so well on set was its undoing for production work. It became apparent that neither our driving skills nor the A.I. built into the engine was capable of dealing with the speeds and types of tracks featured in this film. These issues extended to other dedicated car engines we looked at, a more flexible solution was needed.  

Fig. 13. **Left:** The original animation, *Speed racer.* **Right:** Car simulation engine, rFactor created realistic racing scene in the live action film, *Speed racer.* The film showed both aspects of animation and game, creating new style of film. Courtesy of Warner Brothers Pictures 2008.

In this chapter, I have discussed the relationship between the workflow of digital cinematography and creative process in animated film to understand how effectively digital cinematography contributes to creative works and design aesthetics. The discussion was developed based on the creative system in animation production. Especially, I examined the creative feedback, intuitive work in the procedural creative system, the integration of separate workflow and effective management of creative resources through the artists' work experiences and the workflow in studios. The universal form of animation has been shared in a similar production process and workflow system of both live action and animated film. This is the main factor for a

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universal aesthetic of visual design in film art. In digital cinematography, there is no border between live action and animation. For instance, *Final Fantasy: The Spirits Within* (Hironobu Sakaguchi, Columbia Pictures, 2001) and *Polar express* (Robert Zemeckis, Warner Bros., 2004) came from the game, picture book or animation genres. In these films, the storytelling, camera work, visual style and aesthetics are very similar to those of live action. On the other hand, the digital actor of *Beowulf* (Robert Zemeckis, Warner Bros., 2007) and virtual car racing of *Speed Racer* (Larry and Andy Wachowski, Warner Bros., 2008) are made within the same kinds of aesthetics and technology of 3D animation.

Digital workflow affects visual reality and storytelling in both live action and animation. It provides the basis for the crossover of ideas, stories, styles and genres. It is no longer only for the efficiency in production or special effects in the production. The narrative, genre and aesthetics of cinema were developed with the appearance of cinematography. And they are in another kind of renaissance because of the design aesthetics of digital cinematography.

![Fig. 14. Although the shots come from different genre, the tone and texture is very similar in the universal form of animation. Left: Beowulf, Courtesy of Warner Brothers Pictures 2007. Middle: Polar express, Courtesy of Warner Brothers Pictures 2004. Right: Final Fantasy: The Spirits Within Courtesy of Columbia Pictures 2001.](image-url)
Chapter Five
The research of digital cinematography and my independent animated film

The digital cinematography research examined the creative relationship between media technology, workflow, production pipeline and creative process to establish the aesthetic characteristics of digital cinematography: the influence of industry infrastructure on creative area and the alternatives of design aesthetic for independent production. Through my animated filmmaking, I will examine the relationship between the workflow and design aesthetics of independent production.

In digital production, the creative elements such as color, tone and style have been shared in a similar production process and workflow system. The shared creative data of digital workflow is created by various computer applications. This creative data is measured and stored to be composed aesthetically. The artists choose the most suitable elements from the diverse options provided by the applications and apply them to a modularized workflow. This kind of digital production provides the basis for the crossover of ideas, stories, styles and genres.

Compared with feature film, independent animated film's theme, plot, characters, and settings are relatively diverse. Independent production has also been influenced by the advantage of digital cinematography such as realistic performance system, un-limited variation, immediate simulation and interactive feedback in the
production process. Digital cinematography provides more opportunities for choosing story, genre and style in independent production. Furthermore, various topics can be adopted from other media forms such as cartoon, book, cinematic of video game, TV commercial and music video. This advantage provides more creative opportunities for various themes, plots, characters, sets, styles and genres in the production of digital animated shorts.

Through my practice of digital animated filmmaking, the design aesthetics of independent production will be examined in the relationship between digital workflow and creative processes such as art direction, storyboarding, story reel, modeling, layout, character setup, lighting, rendering, compositing, colour grading, and editing.

In chapter 4, I discussed the relation between the workflow of digital cinematography and creative process in animated film production to understand how effectively digital cinematography contributes to creative works, design aesthetic and visual culture. The discussion focused on the creative pipeline and system in 3D animation production. I examined the common creative factors such as limitless adjustment, pre-visualization, virtual camera work, and procedural creative systems and how they effectively contribute to the design aesthetic, visual storytelling and artistic inspiration in the universal form of our visual culture, the so called “animation DNA” of Lev Manovich. In this chapter, I will discuss the production of an independent animated film to examine how effectively digital media has influenced creative

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processes, visual storytelling and design aesthetics. This discussion will be developed in the production process of my independent project *The Wheel in the Wind*. Also, creative factors in digital media such as digital painting variation, story reel making, 3D simulation and interactive working feedback in the production process of *The Wheel in the Wind* will be examined to show the creative influence of digital media in the independent production.

I was inspired by some amateur wheelchair racer who participated in the Seoul International Wheelchair Marathon. Several years ago, I read an article about him in a newspaper of Korea. It said that he started wheelchair racing at mid age as an amateur racer. Around that time, I was considering starting my study in digital film. In a study or career, starting late is likely to be a disadvantage and in Korea it really is. His story encouraged me to make decision about my new career.

Months later, I watched SIGGRAPH best shorts at animation theatre which mainly screened independent animated film in Seoul. I was very touched by digital animated shorts such as 9, *Birthday Boy*, and *Cathedral*.

Those shorts were SIGGRAPH winners. Especially, 9 and *Birthday Boy* were made by students. The camera work and picture composition of 9 and the story of *Birthday Boy* were impressive. *Birthday Boy* was a film about a boy’s birthday in the Korean war. It showed the contrast of young boy’s innocence and the tragedy of war. The story was very unique compared with conventional animation narrative such as comedy, fairy tale or fantasy because of the reality of characters. And it dealt with the
tragedy of war by implicit expression. I realized there were new possibilities of storytelling in short animated film of independent production and I decided to start a digital film course for my filmmaking.

I started my media career as a graphic designer at a publishing company in Korea and I was involved in graphic design for broadcasting in a cable TV channel. During the career I experienced the change of media such as Apple Macintosh computer as a desktop publishing, digital production, broadcasting system and personal computer as a filmmaking tool. As a motion graphic designer, I would like to make film by myself from concept to editing. This short is the first step of my career as an independent animated filmmaker.

**Story and design aesthetic of 3D animated short**

Compared with feature animation's conventional genres such as comedy, fantasy and fairy tale, independent animated film's theme, plot, characters, and settings are relatively diverse. In terms of storytelling, in 3D animated shorts, there is no limit to choosing the genre, and huge amount of topics can be adopted from other media forms such as cartoons, comic books, picture books, video game openings, TV commercials and music videos. For instance, this kind of content in diverse media are recomposed in the virtual space of desktop production tools, which provides more opportunity to deal with various themes, plots, characters, settings, alternative structures, genres and styles. Traditionally, personification of conceptual images in animation provided various characters such as animals, aliens, monsters, mythological creatures, machines and robots and food. In 3D animation, 3D mesh objects have realistic actions through
the character rigging system in the virtual space. Therefore, the characters such as inanimate objects, monsters and animals can act like real actors. In animation, the character itself provides the emotional message in the story. For instance, 'Woody' was well performed with voice acting by Tom Hanks in the virtual space provided by a computer graphic system, which contributed to the more believable storytelling of *Toy Story* (John Lasseter, Pixar Disney, 1995). Moreover, 3D animation has not only a realistic rigging system but also un-limited variation, immediate simulation and interactive working feedback in the production process. This advantage provides more creative opportunity for the various themes, plots, characters, sets, styles and genres in the production of 3D animated shorts as well.

The production process of *the Wheel in the Wind*

The production of animation consists of many creative processes. Approximately, these processes are divided into three sections: pre-production, production, and post-production. Story writing, character design, art direction, and storyboarding processes constitute the pre-production section. The production processes depend on such diverse techniques as cells, stop-motion, puppet, sand, drawing, painting, and computer animation. Each technique has its own unique production process. In terms of 3D animation production, the production consists of layout, story-reel making, modeling, texture mapping, character setup, animation, lighting and rendering processes. The post-production process in animation is similar to other film process such as compositing, colour grading, sound mixing, editing, printing and mastering.
In the next section, the process of the production and the creative factors will be discussed through the case study of independent studio project. The case study is based on the production of animated short *The Wheel in the Wind* from story writing to post-production editing.

1. Story

In the story of the *The Wheel in the Wind*, the theme is the love, death and despair of a wheelchair racer. This kind of story is more suitable for an independent project than feature-film animation. The plot is constructed in a flash-back structure, which crosses the main character’s memory of the past and the wheelchair racing in the present. This flash-back structure is mainly planned for the symbolic storytelling in the limited time available. And the structure was suitable to show strong relation between the present and memories of the wheelchair racer.

My story was developed during my course by reflecting on the wheelchair racer in the newspaper. Many students in my school ride bicycles. When I saw people riding bicycles, I could imagine them riding tricycles in their childhood. People’s simple actions like walking, running in some atmosphere told me many stories in their life. For example, a walking old man in autumn leaves can imply loneliness and regret for the past. On the other hand, a running boy in the green tells me about his hope for future. This kind of symbolic scenes themselves can tell more without dialogues or facial expressions.
I planned to show symbolic actions in some atmosphere to express the wheelchair racer's life in a very short duration. I showed the revolving action of wheelchair racing, his memories and the sky as a symbol of hope. In the scene of their riding bicycle together, Sunhee’s leaning on Chulsoo’s back and her arms hugging him showed their love. And in the wheelchair racing scene, his hands spinning the wheels implied his hope for life. I chose a flash-back structure to show the connections of action with memories. I used wind and piano sound in scenes set in the present, and the same piano sound was used in scenes set in the past for connection with the present.

2. Character

Fig. 15. The drawing of main characters, Chul-soo and Sun-hee. Produced by Kwansoo Kim 2009.
In this story, the main characters, Chul-soo and Sun-hee, do not talk but show their life and love. In the development of the story, one of the main difficulties is character design and style. In the design and style of the characters, I did not want photo-realistic shape. I wanted to convey the personality and feeling of the character through the visuals. The first approach of character design was derived from the Manhwa (Korean comics) and Man-hwa film style. Because it does not exaggerate the shape nor bring photo-realistic details so the style is suitable to convey emotion. In the beginning, I tried gloomy atmosphere for the story. However, the visual was too dim and the shape looked like a mannequin. Therefore, I changed the visual into cartoon style.
3. Art Direction

From the early stage of pre-production to the layout and modeling process, the colour, tone and mood of *The Wheel in the Wind* are established to make a visual style. This is the critical phase for the creative decision in the production stage. For example, the modeling, texturing, lighting, and rendering process in production are directly connected with the art direction of the visual style. To translate the story into the tone and mood of the visual style, the colour palette and concept image are provided. It is useful to make each shot’s colour, tone and mood.
I tried gloomy atmosphere and prepared monotonous colour palette that applied the same colour tone to each shot. However, the visual atmosphere was too dim and the shape looked like a mannequin. Therefore, I changed the visual into cartoon style and made a new colour palette.

Fig. 20. Drawing, modeling and the first visual concept of Chul-soo's wheelchair racing. Produced by Kwansoo Kim 2009.

Fig. 21. The second visual concept in cartoon style. Produced by Kwansoo Kim 2009.
4. The variation of the visual continuity: digital storyboarding

Two types of the storyboarding were developed. The thumbnail storyboard was provided to translate the story to sequence imagery and the painted storyboard focused on the continuity and layout. The thumbnail storyboard was helpful to catch the visual idea and ‘Post-it’ was useful for fast drawing and quick composition and changing the continuity.
The painted storyboard was needed for the more detailed visual composition of each shot. The painted shots show visually what is closer to the reference image. The image processing application "Photoshop" and "Painter" were used for the painted storyboard. These digital painting tools were helpful for the variation of the visual idea. I used ‘Post-it’ to catch the image and to draw it quickly. However, it was not enough to develop the images. I could try more variations in the picture composition works such as angle, pose, framing, background and continuity in a short time. The variation work on the digital painting application provided a creative advantage.
5. Immediate feedback of the continuity: story reel

To check the continuity of the story, a thumbnail and painted 2-dimension story reel were made in a non-linear editing tool. In the thumbnail reel making, the scanned storyboard pictures were trimmed and assembled. In this process, each shot’s timing is roughly decided with the balance of sound. Random access and immediate feedback are the main advantages of digital media production. In the non-linear editing tool, the scanned storyboard images were not only cut, copied, resized, distorted,
skewed and re-positioned easily, but also used to quickly check the creative feedback such as the timing, composition and continuity on the pre-view monitor.

Fig. 28. The show reel making for the continuity. Produced by Kwansoo Kim 2009.

6. Modeling

To express realistic Man-hwa (Korean comics) style, two main characters, Chul-soo and Sun-hee were made in life-size modeling. The appearance of characters was not too exaggerated. Chul-soo and Sun-hee do not talk and they mainly performed riding scenes such as tricycle, bicycle, motorcycle, and wheelchair so the models did not

Fig. 29. The life-size model of wheelchair racer, Chul-soo. Produced by Kwansoo Kim 2009.
need face morph objects and animation. The life-size models were made in polygon mesh which is reliable for further process such as rigging, weight painting and animation, however, the modeling was getting complicated. For the main movement of leg and arm animation, more vertices and polygons were made for effective animation. The props like tricycle, bicycle, auto-bike, racing wheelchair and wheelchair also were made in polygonal mesh and the rough polygon was divided in detail with sub-division tool of ‘Maya’ application.

7. Interactive feedback of the camera work: digital layout

Each shot’s 2D layout was roughly established in the painted storyboard as the static imagery sequence. In 3D layout, each shot’s spatial depth, camera direction and staging were decided. Instead of the making a 3D story reel, during the production the visual composition of staging and camera work were checked in the 3D simulation in the ‘Maya’ application. The simulation provides instant feedback for the creative decision and correction. For instance, when trying diverse camera angles, the simulation played the updated camera angles immediately and checked the lighting as well. This kind of real time or near real time simulation is one of the creative advantages of the digital production.
8. Easy adjustment of animation and character setup

For the animation of the two main characters, ‘Full Body Inverse Kinematics’ in ‘Maya’ rigging system was deployed with Chul-soo and Sun-hee’s polygonal mesh. The rigging system was mainly positioned for the arm and leg animation. The main animation was Chul-soo’s wheelchair racing animation. For the realistic arm animation, the motion of wheelchair racing was researched. I collected the photos of wheelchair racing and investigated the actions of them. The whole cycle of the arm’s motion was divided into several categories and extreme motion of the animation was made.
In the key frame animation of the production, key frame editing was through the random access correction system. It was effective for detailed manipulation of the motion. In the application ‘Maya’ ‘Grapheditor’, ‘Trax editor’ and ‘Dope Sheet’ are main menu for the effective key frame control.

Fig. 32. The Rendered shot with the selected camera and Lighting. Produced by Kwansoo Kim 2009.

9. Lighting and Rendering

To present emotional drama in the animation, three or four point lights were deployed as key, back and fill light and one or two ambient lights for the overall illumination. The objects do not have texture mapping, however, they have basic materials such as ‘Lambert’, ‘Phong’ and ‘Blinn’ and low shadow distribution and falloff of lighting were planned to express the atmosphere of the shots. Each scene was rendered in ‘Maya’ software render with alpha channel and motion blur option for composite works.
10. Instant checking of the look and tone: compositing and colour grading

The rendered layers of each shot were composed in the composite application ‘Combustion’. For the keying work, basic ‘Discreet Keyer’ was used with ‘Shrink’, ‘Erode’, and ‘Blur’ option for the smooth edge of the layer. Each black and white layer was painted in the similar color of the art direction’s color palette. ‘Discreet Color Corrector’ in ‘Combustion’ displays coloring zones: master, highlights, mid-tones, shadows are painted in four different colors respectively. The four colors were selected in the art direction’s color palette and the tone and mood of *The Wheel in the Wind* were made as suggested in the concept picture. The brightness, contrast, hue and saturation of the color were varied and adjusted to make the visual style. In the composite and color grading process, instant checking of the creative factors and various parameters of the adjustment is an advantage of digital production.

Fig 33. Color correction of the bicycle scene. Produced by Kwansoo Kim 2009.
11. Variability of the visual style

The first visual was too gloomy and the shape was looked like a mannequin. The visual style of “The wheel in the wind” was changed to Man-hwa (Korean comics) style. It does not have exaggerated shapes none photo-realistic details so it is effective to express the story. Most of the production files such as modeling, shading, animation and compositing data were stored digitally. Therefore, I modified the shading data in ‘Maya Hyper shade’ and tried two different styles: cartoon and mono tone. Cartoon style was selected as the last edition because of efficient storytelling.

![Korean Cartoon, mono tone style rendering and shading in Maya Hyper Shade.](image)

Fig. 34. Korean Cartoon, mono tone style rendering and shading in Maya Hyper Shade (from left to right).

Produced by Kwansoo Kim 2009.

12. Editing

The composed shots were edited in the editing application ‘Premiere-pro’. To present emotion, the shots were simply edited without transition effects. Non-linear editing provides interactive feedback of the editing result, random access of the working sequences and no-limit of correction. These are important merits of digital production.
The variation of the visual composition in digital storyboarding, the immediate feedback of the continuity in story-reel making, the interactive feedback of the camera work in layout, the easy adjustment of animation and character setup, and the instant checking of the look and tone in the compositing and color grading process in independent production correspond to the creative factors of industrial animation processes such as limitless adjustment, pre-visualization and virtual camera work. The creative factors in both industrial and independent forms contribute to design aesthetics, visual storytelling and artistic inspiration of the universal form of animation in live action and animation industry through the similar creative infrastructure based on digital cinematography.

There was frame jitter in cycling scenes of Chulsoo and Sunhee because of the mixture of 30 frame per second and 25 frame per second in the production process. Instead of re-rendering the scenes, the scenes were converted in Compressor in a MAC desktop computer. Although there was blur in the frames, I chose the conversion of the frame for the efficiency in the production.

I have not been traditionally trained as an animator so the animation production was a big challenge to me. However, studio graphic tools and works were familiar to me and all production workflow was based on graphic tools in a desktop computer. It was big advantage to make my visual style in this kind of independent, affordable digital production.
I tried two different styles, mono-tone and cartoon. In the mono tone cut, I focused on a gloomy tone to express pessimistic feeling and inserted scenes set in a hospital and angel to show a person’s powerlessness against his fate. However, in the second cut, I focused more on Chulsoo’s hope in his life. I changed the color and texture with ‘cartoon shader’. The color, tone and texture of Korean Man-hwa style were helpful reference for my film. I did not make two different version at the beginning. I tried the style in the last part of production changing some parameters or manipulating menus in the graphic application of a desktop computer. Establishing my own visual style helped to improve the creativity of my film.
Chapter Six
Conclusion: Design Aesthetic in Media Transition

This study has attempted to establish the main characteristics of the aesthetic influence of media transition through the visual design of digital cinematography that reflects changed workflow and creative system in the contemporary imagination industry. I examined the relationship between changed media infrastructure and main aesthetic factors in media transition to address their influence on the creative elements of contemporary filmmaking. This discussion was developed in live action and animation and in an independent production to examine the relationship among workflow, the production pipeline, creative factors and design aesthetics.

In the first discussion, I examined how the media technology in the transition influenced the aesthetic elements of screen shape and resolution. The screen shape is not only a critical interface to connect human, commercial, technological and cultural factors of contemporary life in media but also a creative interface for the workflow, creative systems and visual composition, which influence the nature of design aesthetics in moving images.

In terms of the relationship between the screen shape and media technology, the broadcast industry developed various contents and aesthetic forms based on the technological infrastructure: PAL, SECAM and NTSC broadcasting standard. PAL, SECAM have 625 vertical lines and NTSC has 525 vertical lines. These three TV standards have interlaced scanning and 4:3 picture ratios as well. They were mainly designed for effective transmission and based on the early screen shape of motion.
pictures. The film industry also established unique film aesthetic based on the wide-screen such as Vista Screen, Panavision and Cinemascope. All of the aesthetic factors such as plot, character, sets, style, camera work and visual composition in moving images have been recorded and presented on this technological base.

However, the digital technology of media in transition has changed the fundamentals of picture resolution, frame and ratio of screen shape through the digital standard such as ATSC and DVB. As a result of industries’ cooperation, High Definition 24P (24 frames per second progressive scan) digital video format has been established as a universal format of film and TV industry. It contributed to the development of digital cinematography through the establishment of ATSC and DVB. Digital cinematography provides unlimited working layers through the visual interface which creates hybrid workflow and alternative aesthetics. The process incubates hybrid interfaces to connect human, commercial, technological and artistic factors, and the interface influences creative inspiration for media artists and ultimately changes the nature of filmmaking and removes the border between live action and animation.

This kind of creative influence by digital cinematography has changed workflow, the production pipeline, creative factors and design aesthetics in the film and TV industry. In the live action production, the media transition provides the configuration of the high definition video and 24P(24 frames per second progressive scan) picture format. This unique factor provides interactive feedback and intuitive tools such as editing and grading software. It also produces the integration of separate processes, random access and pre-visualized working process in each creative workflow.
The main characteristics of the aesthetic influence of media transition in motion picture are established by the digital workflow and the creative system. The production workflows such as high definition monitoring of shooting, digital dailies, visual effects shooting and Digital Intermediate have replaced traditional work process. Therefore, they have contributed to the establishment of new design aesthetics through the interactive feedback, intuitive tools, the integration of separate workflows, random access and pre-visualized working processes.

Similarly, in animated film production, digitalized workflow and creative systems provide random access pipelines, limitless adjustment, interactive feedback, pre-visualization and integrated systems of creative resources such as “BLT” in Blue Sky Studios and “Bonsai”, “The Sod” in PDI/DreamWorks. This kind of creative process expands the range of design aesthetics. Media artists can easily overcome physical limits and obstacles. For example, the software embedded camera has the same aperture, F-Stops, depth of field, lenses and focal length systems as those of the optical camera and the parameters of creative decisions in virtual space express the same parameters as in physical world. Moreover, the advantage of digital technology changes not only the single work unit but also the whole workflow and creative pipeline.

The process of independent filmmaking was similar to the feature productions of live action and animation industry. In the process, the creative advantages such as digital storyboarding, immediate feedback, interactive feedback of camera work, easy
adjustments, and instant check of the look and tone contributed to my independent production to improve the animation and the aesthetic diversity.

As the discussion about the visual design of digital cinematography suggests, design aesthetics in media transition is created by data representing creative elements in application menu such as sensitivity, resolution, contrast, color gamut, frame/field rate, tone and mood. This creative data is measured and stored for the aesthetic composition of creative decisions. The artists choose the most suitable elements from the diverse options of applications and apply them to modularized workflow. The aesthetics of this design paradigm can be re-produced by limitless combinations of various kinds of creative elements.
Appendix: The script of the production

The Wheel in the Wind

Written by Kwansoo Kim,   Genre: Non-narrative,   Duration : 2min

FADE IN
EXT. AT THE PRESENT
Racing wheel chair’s wheel is running.

EXT. SOMEDAY IN THE PAST, CHUL-SOO’S CHILDHOOD
Chul-Soo and Sun-Hee were riding bicycle

EXT. AT THE PRESENT
Racing wheel chair’s wheel is running.

EXT. SOMEDAY IN THE PAST
Chul-Soo and Sun-Hee,s twenties

EXT. SOMEDAY IN THE PAST, CHUL-SOO’S CHILDHOOD
Chul-Soo and Sun-Hee was racing tricycles.

EXT. AT THE PRESENT
Racing wheel chair’s wheel is running.

EXT. SOMEDAY IN THE PAST, CHUL-SOO’S CHILDHOOD
Chul-Soo and Sun-Hee’s family were amused to cheer their race.

INT. AT THE PRESENT
Chul-Soo’s mother is turning the page of the photo album and is looking at the old photo.

EXT. SOMEDAY IN THE PAST, CHUL-SOO’S CHILDHOOD
Chul-Soo and Sun-Hee were racing tricycles.

INT. AT THE PRESENT
Chul-Soo’s mother is looking at Sun-Hee’s photo of uni days.

EXT. SOMEDAY IN THE PAST,
Chul-Soo and Sun-Hee,s adolescence
Chul-Soo and Sun-Hee were riding bicycles.
EXT. SOMEDAY IN THE PAST
Chul-Soo and Sun-Hee, s twenties
Chul-Soo and Sun-Hee were riding bicycle
Sun-Hee sat on the back of Chul-Soo’s bicycle.

EXT. SOMEDAY IN THE PAST,
Chul-Soo and Sun-Hee, s twenties
Sun-Hee was happy riding on the bicycle with Chul-Soo.

EXT. SOMEDAY IN THE PAST,
Chul-Soo and Sun-Hee, s twenties
Sun-Hee was happy with Chul-Soo in a good date time

EXT. SOMEDAY IN THE PAST
Chul-Soo and Sun-Hee, s twenties
Chul-Soo and Sun-Hee had a good time at school

EXT. SOMEDAY IN THE PAST
Chul-Soo and Sun-Hee, s twenties
Chul-Soo and Sun-Hee was happy playing piano

INT. AT THE PRESENT
Chul-Soo’s mother is looking at the photo taken on the day
when she gave a motor scooter to Chul-Soo
as a graduation gift.

EXT. SOMEDAY IN THE PAST
Chul-Soo and Sun-Hee, s twenties
Chul-Soo and Sun-Hee was taking a ride on a motor scooter

EXT. SOMEDAY IN THE PAST
Chul-Soo and Sun-Hee, s twenties
Chul-Soo and Sun-Hee was taking a ride on a motor scooter

EXT. SOMEDAY IN THE PAST
Chul-Soo and Sun-Hee, s twenties
Chul-Soo and Sun-Hee were involved in critical crash
with a truck.

EXT. SOMEDAY IN THE PAST
Chul-Soo and Sun-Hee, s twenties
Sun-Hee died in the accident.
INT. AT THE PRESENT
Chul-Soo’s mother is very sad looking at Sun-Hee’s photo

INT. AT THE HOSPITAL
Chul-Soo’s wheel chair

INT. AT THE HOSPITAL
Chul-Soo was thrown in the abyss of despair

INT. AT THE HOSPITAL
Sun-Hee encouraged Chul-Soo in his dream.

INT. AT THE HOSPITAL
Chul-Soo was in despair

INT. AT THE HOSPITAL
Chul-Soo saw Sun-Hee’s image at the sculpture in the hospital

EXT. SOMEDAY IN THE PAST, CHUL-SOO’S CHILDHOOD
Chul-Soo and Sun-Hee were riding tricycles

EXT. AT THE PRESENT
Tricycle’s wheel is running

EXT. AT THE PRESENT
Bicycle’s wheel is running

EXT. AT THE PRESENT
Wheel chair’s wheel is running

EXT. AT THE PRESENT
Racing wheel chair’s wheel is running.

EXT. AT THE PRESENT
Chul-Soo is racing his wheel chair.

FADE OUT
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