Comparison of the Characteristics of Three Premium Large-Format Platforms IMAX, Screen X and 360 Degrees Circular Screen

Xinyi Shan*, **Jean-Hun Chung****
Dept. of Multimedia, Graduate School of Digital Image and Contents, Dongguk University, Doctor's course,*
Dept. of Multimedia, Graduate School of Digital Image and Contents, Dongguk University, Professor**

PLF 플랫폼 아이맥스, 스크린 X, 360도 서큘러 스크린의 특징 비교 연구

선심이*, 정진헌**
동국대학교 영상대학원 멀티미디어학과 박사과정*, 동국대학교 영상대학원 멀티미디어학과 교수**

Abstract   The America film, *Beauty and Beast* has grossed over 4,273,401 after being released for 21 days. The growth of movie profit in the video market is also developing rapidly. In this paper, we will focus on the PLF(Premium Large-Format) video technology, because PLF video technology can help audience to enhance the sense of 'immersion' and enjoy a different visual feast. In PLF video technology, IMAX, screen X, 360 degrees circular screen are the most important formats. By comparative analysis of these 3 formats, the biggest difference is their number of screens and appearance. Based on the result we can understand the 3 kinds of PLF platforms better and help us to make a choice between them. In addition, further research about the manufacture method of PLF technology will be discussed.

Key Words : Premium Large-Format, Platform, Screen X, IMAX, 360 degrees circular cinema

요 약 2017년 3월 16일 개봉한 미국 영화 미녀와 야수(Beauty and Beast, 2017)는 21일 동안에(4월6일 까지) 한국 국내에서 박스오피스를 4,273,401명으로 누적되었다. 이런 영화 흥행 수입을 따르면 영화 등 영상 시장이 급속도로 성장하고 있으며, 발달된 정보기술에 따라 PLF (Premium Large-Format) 영상의 관심도가 높아지고 있다. PLF 영상은 관객들에게 극대화된 몰입감을 선사할 수 있고 새로운 시각의 향연을 펼칠 수 있기 때문이다. 본 연구는 PLF 플랫폼에서 가장 중요한 이슈로 떠오르고 있는 아이맥스, 스크린 X 그리고 360도 서큘러 스크린을 중심으로 이 3 가지 PLF 플랫폼에 대한 개념과 특징을 분석 한 후 차이점을 비교 한다. 이 연구 결과에 따라 이 3가지 PLF 플랫폼에 대하여 더 쉽게 이해할 수 있고, 더불어 향후 PLF 영상이 관객들에게 극대화된 몰입감을 선사할 수 있는 콘텐츠를 제작하기 위한 특징들을 분석하고, 개념에 대한 연구를 하였으며 본 논문은 영상콘텐츠 관련 연구자와 산업계 종사자들에게 향후 도움이 될 수 있는 연구 논문으로 사료 될 것을 기대한다. 그리고 향후 각 PLF 영상 콘텐츠 제작 방식을 연구하며, 시각효과를 극대화한 콘텐츠에 대한 연구를 목표로 한다.

주제어 : 플랫폼, 스크린 X, 아이맥스, 360도 서큘러 스크린, 몰입감

1. Introduction

1.1 Objectives and Background of the Research

With the advancement in modern technology, a variety of platforms for movie and other videos have appeared. Recently in order to watch VR (Virtual Reality) contents and so on, new products such as 360 degrees circular screen, screen X and IMAX appeared. When we use these formats to watch movies we usually called them as PLF (Premium Large-Format). So it is necessary to have an analysis and research various of PLF contents platforms.

'Contents' is the plural form of content. It is a concept that collectively manages, distributes and processes texts, codes, sounds, images, videos, etc., digitally for use in wired and wireless telecommunication networks. Contents are roughly divided into digital contents and multimedia contents.[1] Video contents include not only sports, documentaries and movies but also drama and entertainment. Virtual reality which is becoming popular also belongs to video content.

The purpose of this research is to present the characteristic of each PLF contents platform and to compare and analyze them. The issues which people are most interested in recently are virtual reality and stereoscopic video. Based on these various contents, the differences and features of the 360 degrees image, the screen X, the IMAX, and the general screen will be compared and analyzed.

1.2 Range of the Research

The scope of this research is the platform of the image contents viewed in places such as movie theaters, namely, IMAX, screen X and 360 degrees circular screen, which can watch videos in 360 degrees. Based on the books and previous research papers about these platforms, concept of each platform and the features of each platform will be discussed in this paper.

2. Theoretical Background

2.1 PLF Contents Gallery

PLF contents can deliver impressive visual experience and immersive auditory experience to audience[4]. Because of the high quality performance of the Christie projector, Audio solution, and contents gallery, PLF Contents Gallery is a different from the rest of the general cinema[2].

PLF contents gallery that is located in museums and large cinemas is gaining popularity by attracting audiences with huge screens, premium sound systems and enhanced customer service.

2.2 PLF Platform

The word platform has been widely used in everyday life, art, and business since its creation in the 16th century. When we talk about platform, the station that comes by train comes to our mind first. It is a platform to ride something. The original platform was meant to be a space for taking trains, a stage or a pulpit used by a lecturer, music conductor, athlete, etc. However, the meaning of the platform was gradually expanded to refer to a device or framework and is used in various fields such as computer systems and automobiles. As a result, the platform has expanded to become a universal concept applicable to various fields and widely used.

PLF platform is a popular public viewing platform. Recently in the age of multimedia, the network age, and the digital age, the types of video contents are also varied. The platform evolves as much as possible to maximize the characteristics of video contents.

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1) http://terms.naver.com/entry.nhn?docId=2275242&cid=42238&categoryId=51166

2) https://www.zybang.com/question/1a06c225441a2b3b3e692694c9bb460f.html

2.3 The Kind of PLF Platform

There are many kinds of platforms as well as various types of contents. YouTube, which is generally known, is a network online platform that allows users to upload, watch and share videos. In addition, there are suitable platforms for comprehensive channels, for example cable TV, satellite TV, and IPTV[13]. And in the smart era, it is possible to watch videos on mobile via Android and IOS platforms[12]. In addition, it is also possible to view video contents in a cinema in various formats such as general 2D contents, high-definition 2D contents, 3D / 4D stereoscopic contents, and 360 degree contents. The screening environment is also changing according to the video content of each format. PLF contents such as IMAX contents, screen X contents, and 360 degrees contents that appeared in recent years are becoming more and more popular than conventional cinemas[1].

2.3.1 IMAX
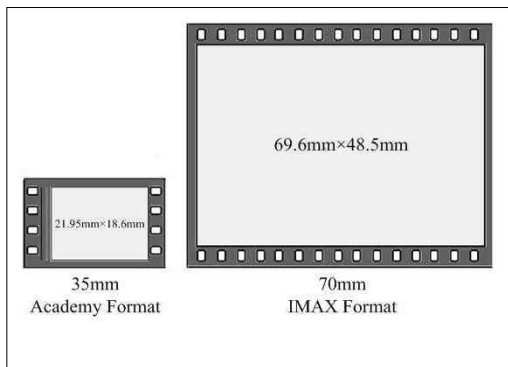
[Fig. 1] Comparison of academy format and IMAX format

IMAX is an abbreviation of "Eye Maximum" which means the maximum visual width that a person can see, or "Image Maximum" which means a maximum image.[3] To put it simply, [Fig. 1] is a high-resolution imaging system that uses a 70MM film format, which is ten times larger than a typical 35MM movie film screen, to project on a larger screen than the conventional one[6].

2.3.2 Screen X

Screen X is the world's first multi-screen screening system jointly developed by CJ CGV and KAIST in 2013. Screen X technology was first unveiled at the 2013 Busan International Film Festival that was selected by the Future Creation Science Department as the "Five Virtual Reality Leading Projects" in 2016. As we know traditional movie theater had only one front viewable screen[2]. But Screen X implements a three-sided screen using not only the front screen but also the two sidewalls as shown in [Fig. 2].


[Fig. 2] Screen X cinema

2.3.3 360 degrees contents gallery

360 degrees contents gallery offered by a 360 degrees circular screen as shown in [Fig. 3]. Recently, the VR industry has gaining popularity. It is a technology that generates an environment that is similar to reality through graphics. It is really a technology that allows us to actually experience an imaginary world. The most common view now is the VR 360 degrees contents. General 360 degrees content can be viewed through VR devices such as VR Box or Google Card Board. VR devices can be used to view 360 degrees contents. Circular screen has the advantage that 360 degrees contents can be seen together in one space. So even it is not yet universal,

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3) http://terms.naver.com/entry.nhn?docId=1986928&cid=40942&categoryId=33091

circular screen is developing now.
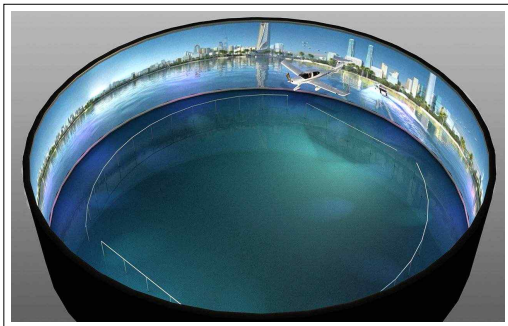
[Fig. 3] 360 degrees circular cinema

2.4 Development of PLF Platforms

IMAX was first unveiled at the 1970 World Exposition in Osaka, Japan. Since the opening of the first IMAX permanent establishment in Toronto, Canada in 1971, the first IMAX theater was opened in 63 Building in 1985 in Korea[11]. After that a theater was opened at the 1993 World Expo in Daejeon. Until October 2015, IMAX theaters had opened 1,000 in the world and distributed in 40 countries and regions. So far, in Korea, CGV Wangsimni, Cheonho, Ulsan Samsan, Jeonju Hyoza, Ilsan and Daegu were designed as IMAX theaters, and other screened movies using the IMAX brand were made by converting ordinary movie theaters.

The past 2016 year, Screen X was installed and operating in more than 80 theaters around the world, including China, the United States, Thailand, and it is expected to expand to 1,000 screens worldwide by 2020[3].

The 360 degrees circular screen concept emerged in the early 20th century. Unfortunately, the technology was not mature at the time, as a result it failed. Since then, the 360 degrees circular screen has evolved and more than 300 circular screen contents gallery have been established around the world so far. On June 13, 2015, the 360 degrees circular screen movie ″Millennial Folk（千年佛足）″ attracted the attention of the world after its opening at the Dazu Rock Carvings Museum in China.

3. Methods

Based on the above information, the basic concepts of PLM platform IMAX, screen X, and 360 degrees circular screen have been elaborated. The characteristics of each PLF platforms can be analyzed and compared.

3.1 Problems of the Research

1) What are the characteristics of a general cinema platforms?
2) What are the advantages and disadvantages of each PLF platforms?
3) What is the difference between a general cinema platform and a PLF platforms?

3.2 Methods of the Research

This paper analyzes three types of PLF image video forms (IMAX, screen X and 360 degree circular screen), presents the concept of each PLF platform for understanding, and analyzes the advantages and disadvantages of each platform. In addition the features of general cinema platform (standard screen) will been compared and analyzed. Finally, we will look at the development direction of the video platform market through the above results.

4. Results and Discussion

4.1 Features of General Movie Platform

Before the concept of PLF movie appeared, the platform was a 180 degrees screen with only one side view. The size of the screen varies depending on the area of the movie theater, the projector, and the distance of the screen. A typical standard screen has a

ratio of 4: 3.

When we watch movies the screen has several effects. The most important of these are the image quality of the movie, the brightness of the screen, and the reduction and contrast of the colors.

4.2 Features of PLF Platforms

In this section, characteristics of IMAX, screen X and 360 degrees circular screen are analyzed.

4.2.1 Features of IMAX

IMAX has a larger size and higher resolution film projection system than conventional films. Its system includes video content, projectors, sound systems and screens photographed in the IMAX film standard.

[Fig. 4] IMAX projector

For enhancing better image effects IMAX requires a larger film resolution. Therefore, the horizontal resolution provided by the movie camera of the ordinary 35MM film is about 6000, and the horizontal resolution provided by the movie camera of the IMAX can be returned to 18000. IMAX uses a 70MM film format to significantly increase the resolution of video content[14]. When shooting standard movies, the IMAX film format speeds up to three times the normal movie film format speed to meet 24 frames of exposure in one second. The projector is also different from existing movie projectors shown in [Fig. 4]. The power

consumption of the specially designed Arc Light in IMAX projector can reach about 15 kilowatts. The cost of producing and broadcasting IMAX movies is high because of such unique facilities and large space[15]. Because of this disadvantage, IMAX movies are usually about 40 minutes shorter than regular movie content. But in recent years, 90 minutes of IMAX movies have been produced[7].

4.2.2 Features of screen X

Screen X is a new concept that broke the traditional movie viewing methods. In addition to the screen on the front, two auxiliary screens are added on both sides to form a 'C' character. This uniquely shaped screen offers movie audiences a 270 degrees cinema viewing platform and a wider viewing angle[1].

Screen X has the advantage of using a three-sided view of the movie theater to see a large picture, but it also has the disadvantage that distortion occurs where two screens meet each other. When the films are shooted by three cameras, a job called 'Stitching' has to be done to connect the three sides[5]. When the actor passes through the stitched surface, distortion is created.

The three features of screen X are as following. First, by utilizing both sides of the movie theater along with the screen, the story becomes three times more abundant. Second, as space expands on three sides, expression techniques through various creativity become possible. Finally, we can present the maximized reality feeling and immersion feeling through the wide panoramic view image by using three sides.

4.2.3 Features of 360 degrees circular screen

The 360 degrees circular screen forms a 360 circular shapes by connecting several screens (usually nine). By making the field of view wider than screen X, the audience can fall into the environment and maximize the sense of immersion. However, the disadvantage is

that because of the large viewing angle audience may miss the main part of the main character or other components when viewing the video contents.

Because the 360 degrees circular screen consists of several screens, small gaps are left for each connected screen. Depending on the technology we use today, such as shooting and broadcasting, each adjacent screens cannot match perfectly, because we need some space between adjacent screens. This gap provides space for installing the projector equipment[8]. In addition, the 360 degrees circular movie theater generally has no seats, and instead has a handle in the center of the movie theater. The audience stand in the middle of the screen and can move freely according to the content. So 360 degrees circular movie is about 20 minutes and it is landscape oriented content[9].

4.3 Comparison of PLF Platforms

Through the previous contents, we analyzed the concept and characteristics of the general movie platform, IMAX, screen X, and 360 degrees circular screen. A comparison of these analysis are shown in <Table 1>.

<Table 1> Comparison of the characteristics of general cinema platform and PLF cinema platforms

	General Screen	IMAX	Screen X	360-degrees Circular-screen
Quantity of Screen	1 (4 ; 3)	1	3 (270 degrees)	9 (360 degrees)
Format	35mm	70mm	S	70mm
Coverage	2D	2D	2D & 270 Screen X	360 cover
Duration	10~160 min	20~90 min	20~130 min	10~15 min
Lens	Wide angle lens	IMAX lens or Ultra wide angle lens or Fisheye lens	Wide angle lens	Ultra wide angle lens or Fisheye lens
Device		IMAX Projector	2K DLP, Lazor Projector	HMD
Camera			cinema camera	consumer camera

The main difference between the IMAX, screen X, and 360 degrees circular screen is the number and shape of the screen. The IMAX has the largest size of screen (10 times the normal screen), the screen X has three screens forming 270 degrees in 'C' shape, and the 360 degrees circular screen has several screens. Accordingly, the image film format and the image pickup lens are all different. And because of the high cost of producing IMAX content and the limitations of 360 degrees circular screen content, IMAX and 360 degrees content generally do not last for a long time[10].

It is necessary to produce contents suitable for each platform in order to maximize the advantages of each PLF platforms. 360 degrees circular screen only matches 360 degrees foreground video content. Among them, there is a lot of content that introduces scenery and sightseeing spots. Screen X is often used to promote commercial advertising content, and IMAX is often used for watching action videos because it can give a bigger visual impact than other platforms.

5. Conclusion

In this paper the concepts and features of the three PLF platforms, IMAX, screen X and 360 degrees circular screen, were analyzed, focusing on. The advantages and disadvantages of each platform have also been analyzed. Based on the appreciation effect of general movies, PLF contents can provide a sense of realism, presence, and immersion through a special platform, but there are limitations in producing contents. Based on the results of the research, the PLF platforms can be understood more easily and the choice will become easier to select a suitable platform for each screen and produce various contents in future PLF contents.

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선 심 이(Xinyi, Shan)

· 2014년 2월 : 평택대학교 영상디자인학과 (BFA)
· 2016년 2월 : 동국대학교 영상대학원 멀티미디어학과 (MFA)
· 2016년 3월 ~ 현재 : 동국대학교 영상대학원 멀티미디어학과 박사과정
· 관심분야 : 3D Computer Graphic, Contents Design, VR, Lighting, Visual Effects, Game Effects 등.
· E-Mail : yarina.0122@gmail.com

정 진 헌(Jean Hun, Chung)

· 1992년 2월 : 홍익대학교 미술대학 시각디자인학과(BFA)
· 1999년 11월 : 미국 Academy of Art University Computer Arts (MFA)
· 2001년 3월 ~ 현재 : 동국대학교 영상대학원 멀티미디어학과 교수
· 관심분야 : VR, Contents Design, 입체영상, 3D Computer Graphic, Computer Animation, Visual Effects 등.
· E-Mail : evengates@gmail.com