

A Survey on Projector-based PC Clustered Distributed-Rendering Large Screen Displays and Techniques

Munjae Song ¹ and Seongwon Park ²

¹Institute for Graphic Interfaces, 3rd Fl, Ewha-Sk Telecom Bldg. 11-1 Daehyun-dong, Seodaemun-gu, Seoul 120-750, Korea

mjsong@igi.re.kr

²Graduate School of Information, Yonsei University, 134 Sinchon-Dong, Seodaemun-Gu, Seoul, Korea

seongwon@yonsei.ac.kr

Abstract. Large screen display systems are common display systems nowadays. Especially projector-based PC cluster large screen display systems share most of large screen display system market and they are main research topics today. A lot of researchers research on cluster algorithms, computation power improvements, high performance graphic rendering technologies, high speed buses, networks, and HCIs. Also, remarkable research results are being published by technical leading groups. Whereas, following groups who want research on large screen display have difficulties even to build a test system. Unfortunately, there are not enough information to build large screen display systems. In this paper, we survey on projector-based PC cluster large screen display technologies that use distributed rendering.

Key words: Large screen display, Tiled display, PC cluster, Projector-based, Distributed rendering

1 Introduction

The projector-based PC cluster large screen display technology has a dramatic improvement a past decade. It has few advantages, and its advantages make PC clustered systems are popular. Next are the advantages of PC clustered large screen display systems.

- PC performance is improving very fast. Current CPUs have multiple cores and acceleration functions for vector calculation, e.g. MMX, 3D NOW and SIMD. Almost every PC is equipped with high-performance graphic cards having multiple rendering pipelines, programmable Shaders, and sometimes multiple GPUs.

- Using COTS (Commercial Off-The-Shelf) systems lowers system cost by cutting down prices and increasing product stability. Projector-based PC cluster large screen display systems which use COTS devices are widely used because they are low-price and reliable system.

- There is a number of PC clustering open/free software which has abilities to customize and improve for building large screen display systems.

Nowadays, many researchers use seamless projector-based PC clustered distributed large screen display systems. We include our surveys, experiences of building large screen display systems. We believe this paper will help research groups who want build a projector-based PC clustered distributed large screen display system. Especially, we focus on research groups that research with large screen display systems, but do not want research on large screen display system deeply.

2 Cluster software

In this section we survey cluster software, discriminating large screen display software. The cluster software has two types. One is image-based streaming software, another is distributed rendering software. Table 1 shows advantages and shortcomings of two types of large screen display software.

Table 1. Comparison table of large screen display software.

Type ^o	Advantages ^o	Shortcomings ^o
Image-based streaming software ^o	- Do not consider that update scene graph, timer, random number, and user input ^o	- Dedicate network devices for wide bandwidth ^o - Clients do not use their resource ^o
Distributed rendering software ^o	- Typical network device ^o - Clients use their resource and master has small loads ^o - Handle big and complex data with distributed system ^o	- Difficulties of update scene graph, timer, random number, and user input ^o

2.1 Image Based Streaming Software

There are a lot of image based streaming software, but in this section, check remarkable software. TeraVision [19], SAGE [8][23] and Juxta View[10] are remarkable research results.

2.2 Distributed Rendering Software

Following, we review remarkable distributed rendering software, some of them are open source and others are commercial products. Open source software are flexible but commercial products do not need additional development and are stable. Good classifications of distributed rendering software can be found in [27], [18]. Remarkable distributed rendering softwares are CAVE[15], VR juggler [3], Syzygy [24], Jinx [25], OpenSG [22], Chromium [6], NAVER [17], Nova [32][29].

3 Hardware devices

Projector-based PC cluster large screen display system needs special hardware devices[33][7]. For example, projectors[2][4][16], graphic cards[14] [31], projector stages[28] [20] [30], and screens are needed for building large screen display systems.

4 Software requirements

Some projector-based large screen displays need several features. These features are not essential functions but, make improve large screen display system's quality better. For example, edge-blending[12][11][5][13], NLDC (NLDC) [20][21][1][9]and Frame-lock. Fig. 1 shows implementation process with software features.

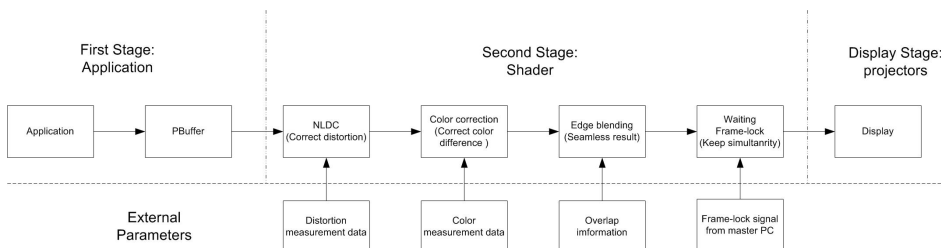


Fig. 1. Flow chart of implementation process

5 Conclusion

Large screen display systems are common display systems today. Especially projector-based PC cluster large screen displays are most popular large screen display systems. Projector-based systems are more useful for making seamless large screen display systems than multi-monitor systems. This paper shows a guide to build projector-based PC clustered large screen display systems. We believe this paper is useful to understand building projector-based large screen display systems.

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