

A GAME ENGINE BASED ARCHITECTURAL SIMULATOR ON MULTI-PROJECTOR DISPLAYS

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1. Introduction

To make whole one image on screens that is generated by many computers and synchronization among computers, there is a need for a network software environment for multi-projector display system. Although the development costs increase for parallel programming for multi-projector display system, there is a possibility that the program cannot be executed at an enough speed since the network bandwidth might become a bottleneck. There are some software environments for that kind of multi-projector display system like Chromium that is latest version of WireGL (Humphreys, 2001&2002). WireGL is a kind of Client-Server Model, which one rendering server sends the data of rendering to many computers. While it can use the application without modification of source, it requires heavy network traffics. The other type of operating software is VR Juggler (Cruz-Neira, 2002), and CAVE Library that is a kind of Master-Slave Model. In the Master-Slave Model, every computer has same application programs to render the image that only keep the synchronization of rendering and events. But, these programs require a specialized skill and knowledge to modify the source of program for the certain rendering PC-Cluster system.

2. Networking software environment for multi-projector display system

A novel networking software environment for the multi-projector display system, developed in our laboratory, which enable us to use the common software in the PC-Cluster for multi-projector system. It is a kind of middleware environments based on the Master-Slave Model that only requires low network bandwidth. By intercepting API calls, this software environment allows an existing application to run transparently in clusters. Achieving this method, we can synchronize the rendering time and event processing between master node and slave node. We just replace the reference import table of API in execute file for API hooking that make no modification in source of application. In VEs, the interaction between human and virtual world is important to magnify the sense of presence through the several interfaces. The computers carry out some tasks generated by the user interaction through input device. In PC-Cluster, the events of user interaction are synchronized thorough the API-Adapter that broadcast the input signal from master node to slave node at the same time.

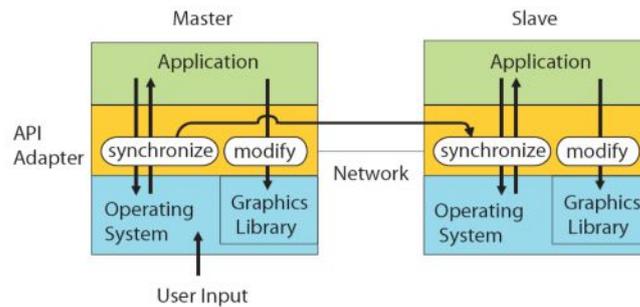


Figure 1. Concept of Network Software Environment

We implemented the proposed system in an actual cluster-based multi-projector displays and evaluated it, even though the developing of new network software environment is an ongoing project. There are several types of testing applications that are simple Open-GL software, Direct-X application, and commercial render engine of Quake-III. We have succeeded in setting up the network software environment with relatively small effort in the simple open-GL and Direct-X application. When there is a complicate event in the application, it needs more effort to establish the API-Adapter for the real-time graphic render engine for example real-time render engine in Quake-III.



Figure 2. *Game Engine on Multi-Projector Displays & Human Behavior Experiments*

References

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