A Workstation-based Multi-media Environment For Broadcast Television

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Abstract

This presentation will describe two applications which illustrate expanding workstation power in the real broadcasting world.One is a sophisticated application of virtual reality in which we simulated the environment of the green of the 18th hole in real time during a real professional golf tournament for a broadcast TV program.The other is professional baseball information management system for TV program production in which we incorporated distributed computing,mixed networking,database managing,and computer graphics.

1. Introduction

The multi-media computing environment for commercial Broadcast Television has recently become an important part of pre & post production. For these applications, it is necessary to incorporate information on paper, sound , motion video , and phone lines. The integration of all the above requires linked multi-media databases over high speed networks (FDDI, Ethernet, etc). Digital data is very convenient for computing, but real-time processing of digital audio and full-motion video is beyond the capabilities of any average computing environment . However, the power of computing has been increasing dramatically, and now multi-media work stations have emerged equipped with live video input, real time analog-to-digital conversion, compression, decompression, high-speed digital signal processing capabilities, and good graphics engines.

Here we will describe two examples where multi-media was applied to actual television broadcasting. One system was implemented for the television coverage of the "ABC Lark Cup Golf Tournament", of the Japanese PGA tours which ran from October 25 to 28 1990 at the ABC Golf Course near Osaka, Japan. In a golf tournament, the game is played at 18 different locations at the same time. That requires a good communication system and makes for a very interesting application for a workstation based multimedia environment. The broadcast center at the golf course monitors the game's data at every hole by live video cameras and personal computers connected via modem.

Before the tournament, we made a 3D geometric model of our golf course. This model was used to render the title animation of the TV program, and during the program we used it as the basic world model for a virtual camera looking at the golf tournament simulated with real-time computer graphics. At the real 18th green, we built a base for the live TV commentator from which he could see the whole 18th hole course, green, and the players. He also had a tracking ball which could control the location of the

virtual camera at the simulated 18th hole green. This was our brand of virtual reality as applied to golf.

Our other multimedia TV broadcasting example was a professional baseball application. This was a very wide area integrated network multimedia database incorporating both a main frame, workstations, and PC base computers, and utilizing many types of network protocols (X.25,TCP/IP,...). The multimedia database included text, graphics, and binary data. We accessed the database through the different on-line computers, and displayed the data on the computer screens and live TV screens in our service areas (all over Japan). The other interesting thing is that the Nikkan Data Sports Supply in Tokyo has started offering a video game using this on-line database (with a special game machine, anyone can play at home with this database).

2. Professional Golf Tournament

The goal of a TV golf tournament is to get viewers so involved that they feel that they are actually there at the course watching the star pro-golfers. One of the highlights is on the green of the 18th hole because that is where many dramatic and decisive events take place.

We used 3D computer graphics to model a complete 18 hole course and green. This model was prepared to start this project, about three month before the tournament began. As mentioned previously, this model was the basis for the virtual reality environment, and was also used for the TV title CG animation segments.

Our virtual reality system was composed of the following: (Figure 1,2) Figure 1 shows the equipment at the 18th green which comprised the golf ball position detector block. We positioned two live video cameras watching the ball on the real green. These video signals were overlaid on the PC screen, and the PC compared the signals in order to analyze and interpolate the 3D position of the golf ball. The results (3D coordination data) were transmitted by modems over a multi-wired communications cable.

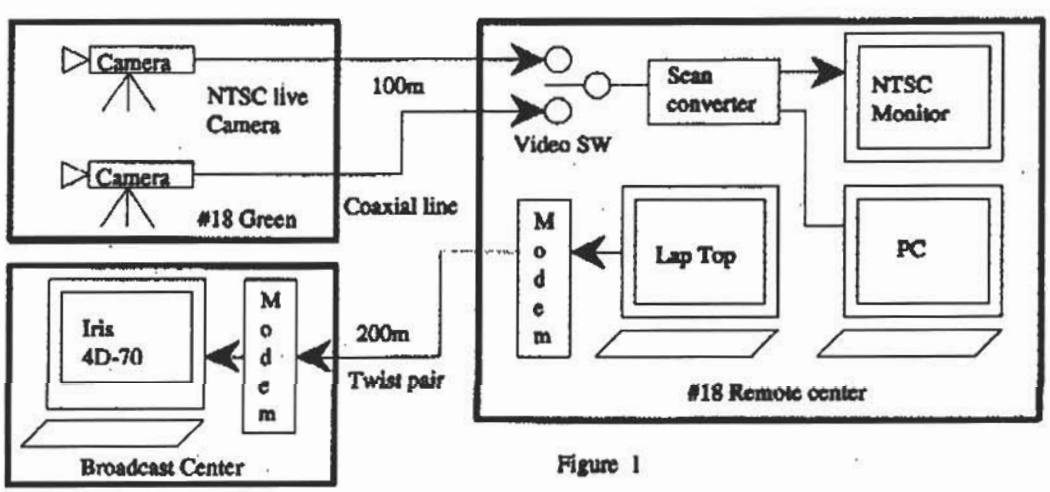

Figure 1

Figure 2 shows the broadcasting center at the golf course. An Iris 4D-70 managed the real-time CG animations. RGB output signals from the Iris were connected scan converted into Gen-locked center NTSC switcher signals. The broadcasting center at the golf course was linked by micro-wave connect to our main broadcasting center in Osaka (this was a traditional NTSC link), and broadcast all over Japan.

The creation of the golf course model entailed making triangular patches of the whole course, including the 18th hole and green. It took us about two months to make them. We rendered the database at

high quality for the title graphics and also used it in our real-time display system which had several modes. One is controlled by a commentator by means of a space ball and mouse. The space ball was used to control the display screen in order to rotate, and zoom in & out .. The mouse was used as the pointer device around the green. Others controls existed for the simulated viewpoints of all the real players, for simulated views to match those of the real TV cameras, and there were special programmed key switches to rotate the virtual green, rotate the whole virtual 18th hole course,etc..

Our whole system was robust enough to perform with great stability in the field during the entire tournament.

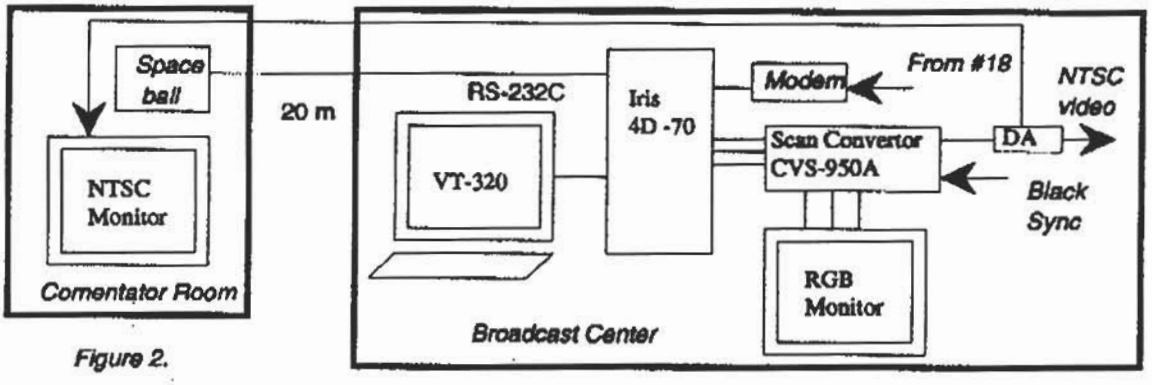

Figure 2.

3. Professional Baseball application

In Japan, there are twelve teams in two leagues. There are a maximum of six games in a single day all over Japan. Five years ago, our station started keeping baseball databases to assist the sports TV show announcers, show producers, and engineers. We used a microvax and our proprietary SDB database software. Our SDB software used the data collected from the previous day's games. At that time it was impossible to update the database with the results of the games on the same day. Three years ago we succeeded in making a database system for internal use only that could be updated in real-time by using a network of PCs.

Last year we improved the system by replacing the PC network with a network of multi-tasking multi-port unix workstation with a central database server . This now allows for increased capacity and real time online queries. This year we installed a commercial network database server by Sybase which uses the SQL language interface for the multimedia database.

Our current system is composed of three segments. Data acquisition from all over Japan, the internal mulfi-media data server, and visualization machines for TV & Radio Figure 3. shows whole diagram in Japan

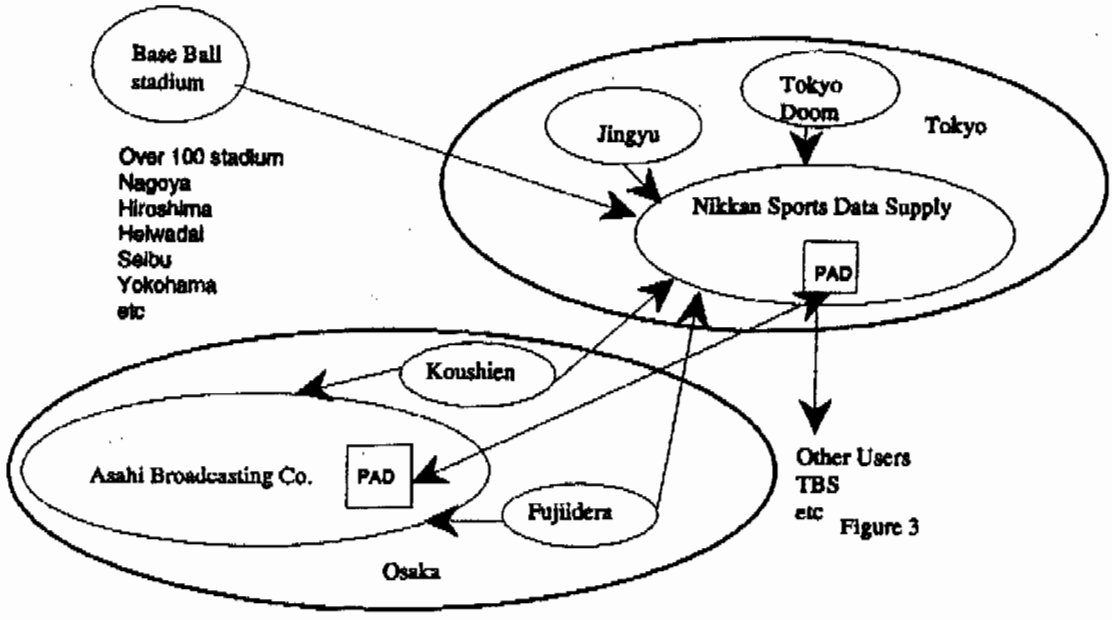

Figure 3

3.1 Data Acquisition

All of the online data is initially entered by PC-based laptops (IBM-5535) from baseball stadiums, and then sent to the main frame computer (IBM-4381) which is managed by NIKKAN SPORTS DATA SUPPLY in Tokyo. They control this data using their own database, and service many company through reserved data lines. One interesting application is a real time game service called "Pro Yakyu VAN" which is a cooperative project between Nikkan Sports Data Supply, Kyoudou-VAN, and Sega Enterprise using NTT dial Q2 lines.

3.2 Database and Network management System

We get the data through one X.25 line (between Tokyo and Osaka).

We have two systems. The older one which was named SDB is a Micro-Vax II, running VMS, and the Mumps environment. The SDB data comes in once a day after the all baseball games in Japan are finished. After all incoming the data from Tokyo is sent, the database is updated. Every morning SDB delivers the new database information. At the beginning of the season in April, SDB is initialized and a new baseball database is started, and at the end of baseball season in October, it is closed.

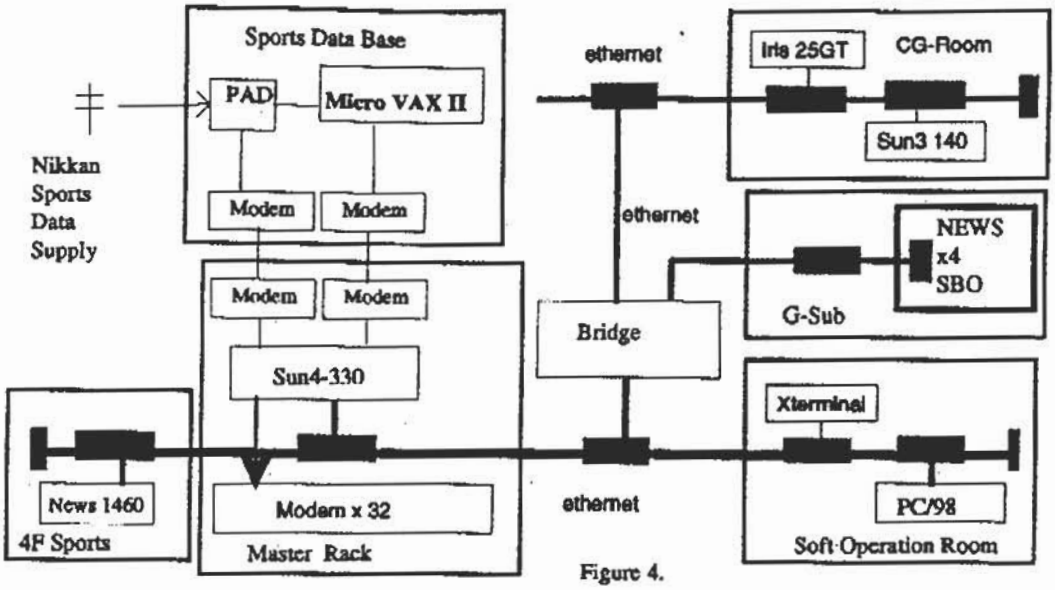

Figure 4.

The new one BNS system uses a Sun-4 330, and the Sybase SQL environment. This is run throughout all the seasons. The main units are connected by ethernet, and communication through this network is by transaction SQL. The baseball database is maintained by a Sony News work station located in the sports section. The basic database query services use modems and dumb text terminals.

3.3 Visualize system

The G Studio (one of our TV studios of which we have 6), is designed for live shows like golf, baseball, and football games. The computer resources in this room are four Sony News workstations linked by NIS (NFS). Two of the News have NTSC frame buffers which display on-line players' name, SBO, and TOKUTEN referenced in our SDB and BNS by modems & ethernet.

The C studio for general purpose TV, is used to produce the evening news show every day. In the news show we present current baseball information from this database. All of the data come from modems, and are displayed on PCs by our proprietary software.

4. Past and Future Direction

In 1986 we worked on making an Experimental Video Workstation which was a design project in computer-aided editing using an Audio/Video, Database and Computers, at the Film/Video Section of the MIT Media Laboratory. At that time we had only a small network, under 100 M storage device, and special user interfaces. The basic configuration was composed of and HP Bobcat, a PDP11 based UNIX machine, a U-matic VTR, laser discplayers, and an audio follow switcher. The project concept was to make a pictorial database for the computer-aided video editor for which we designed a virtual display & buttons on the HP starbase window.

In 1987 we built similar tools on a Sun-3, using MO disk storage for the NAB. This system had a very large capacity disk which could read & write A/V signals in real time. But the Sun windows interface was not powerful enough for our A/V information interfaces.

In 1988 we installed a Parallax board on the Sun, we re-designed the interface from Sun windows

to X11, and reported and demonstrated the results at IBEE Japan.

In the next few years we hope to see an international multimedia standard emerge so that we can upgrade our system to incorporate multimedia. In the meantime, we are investigating existing and planned multimedia formats which we can adopt in the near term. We are starting to design a multimedia data format which has a wide variety of font handling capabilities appropriate for NTSC and HDTV video production.

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6. References

1. David R. Lampe "Athena Muse:Hypermedia in action"
2. Stewart Brand "The Media Lab"
3. Russell Mayo Sasnett "Reconfiguable Video"