PC Based VR System

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1.Introduction

In June 1989, VPL(U.S.A) introduced the first VR products in the world. At that time people were strongly impressed by seeing people who wearedthe DataGlove and the Eyephone.

In Japan VR has drawed the public attention with the book "World of Virtual Reality" written by Katsura Hattori, Asahi Pasocon in '91. and the ICAT'91 was the first of VR symposium and had played an important role as a pioneer of VR. At the time"Virtual Reality" was translated into "Kaso Genjitukan" or "jinkou Genjitukan"in Japanese then now "Virtual Reality" is used as it is and it is not technical jargon any more. Probably the word "Virtual Reality" has an impact more than any other word in a couple of years therefore this word is not only word for technological revolution but it has a possibility to change our standerd of life.

When VR was introduced, workstation was a main computer platform which was most important factor of Virtual Reality and its price was over thirty millions yen, which means "new technologies need much money". However with remarkable progress of PC in this four years, its cost is only a couple of million yen for application of VR system. As a result of it, Virtual Reality is not far beyond customer's reach any more and now it is system for people to get with a low price. Application of VR with PC might be key factor of progress of VR to come into wide use.

2.Necessity for computer performance

Virtual Reality is the feedback system for 5 senses of sight, hearing, touch, smell, taste to human being by the virtual space which are created by the computer. Human being get into the virtual space and feel such as the reality.

As Virtual Reality, Head Mounted Display which is a main device for feedback of a information as you just look in a space drawed by computer .To produce three-dimensional picture with a real-time and interactive in computer needs a high performance computer for trhee-dimentional geometry calculation, texture mapping, high speed redering, etc. As computer performance progresses such as a quality of picture you see through VR system also improves. It has been said that information from eyesight is 80% of all information which a human being can

get using the five sense. Therefore to improve a quality of picture you see in VR system means to come to more practical use of VR, in other word it depends on performance of computer.

3. Current VR system

Currently, there are two kind of computer platforms for making the VR applications. One is the Workstation platform, other one is Pesonal computer platform. The folowing is the feature of VR system.

(1) Platforms

① SGI platform

Figure 1. indicates a organization of VR system based on SGI (Silicon Graphics Inc.) platform.

The performance of workstation of SGI is probably highest VR system in the current VR systems because SGI hardware has designed considring importance of function of graphics. So SGI platform has the graphics engines for the high-end platforms.

Especially, the textere mapping is very imporatant fuction for making VR system. Crimson Reality Engine platform is available for real time texture mapping becauase the texture mapping is managed on the grahics engine. However Indigo low-end platform is very slow for texture mapping because the texture mapping is managed by software. The Onyx system is the newest platform of SGI and its performance is wonderful because its architecture is configured by multi CPU and the user can extend the CPU in compliance wite VR applications.

However SGI platform is very expensive. The Indigo Elan platform costs about eight million yen, the Crimson reality Engine platform costs thirty million yen, and the Onyx platform costs more than fifty million yen.

② Sun platform

Figure 2. indicates a organization of VR system based on Sun platiform (Sunmicro Systems).

Sun Workstation is considered to be best device as EWS and its market share is No.1. But usage of workstation of Sun as the VR platform is limited because its graphics function is not good comparing with SGI workstation. Recently add-in type graphics boards makes it possible to enhance the graphics performance. Its price, more than a couple of million yen, is lower than SGI workstation.

③ PC platform

Figure 3. indicates a organization of VR system based on PC platform.

PC platform is organized with PC/AT(or compatible machine) which is the world-wide standerd PC, and graphics accelerator. Speaking of performance of PC, it has developed remarkably, i486-33MHz in 1991 and 66MHz double-clock in 1992. In this March Intel introduced 586 CPU "Pentium" which performance is 112 MIPS and is better performance than low-end WS. "Pentium" PC will become the mainest PC in 1994.

According to "Micro 2000 plan" by Intel, in 2000 micro processor with 2000 MIPS will come up and post "Pentium" has already developed now.

Current VR system of PC platform needs graphics accelerator for enhancement high-speed rendering. There are two types of graphics accelerator, one is Intel DVI board, the other one is 860 RISC graphic board. The DVI bord is basically used for the compression and expansion of picture but by using graphics functions of micro codes on this bord the high-speed rendering and texture mapping are possible to do. Recently 860 graphics board is gettig to be the main stream. Comparing with DVI board, 860 graphic board has three times speed for rendering and four times resolution for texture.

In terms of price, since COMPAQ stepped in PC/AT market with low price strategy, the price competition in market had been severe but price of PC/AT with 486-66MHZ is below 200,000 yen and its cost performance is about 20 times higher considering price of 486-33MHZ was 1,800,000 yen two years ago.

④Selection of Platform

Whether you select WS platform or PC platform as VR depends on what applications you will design or how much you will have the budget for it. In case budget is sufficent and a research of VR is main pourpose, SGI-WS is recommended. PC platform is recommended for people who knows only vague idea of VR and want to start to study.

(2) Software for maiking VR applications

Currently for making applicatons of VR, WTK(WorldToolKIt) which developed by SENSE8 Corporation (U.S.A) is considered to be the best software, which was awarded best VR Software at U.S VR'93 Conference.

Now there are various kind of CAD modeler and a system for presentation of housing business which have walk-through function and these system are called VR but strictly speaking they are different

from VR. Because these system does not have concept of five sense of human and it is only extension of their main function. So the WTK is only software which can be called as software of VR. WTK is a software which developed focusing on applications in easy-way and it is used for VR application software for construction, interior, amusement and medical field. Features of WTK is as follows.

① Over 400 kinds of C Library function

WTK has Over 400 kinds of function as C Library and these functions are devided into some categoies such as Universe, Object, Vew-Point, Sensor, Texture, etc. User can select these categories as their pourpose of application for designing VR application.

② PC version WTK, WS version WTK

There are two type of WTK, PC version for PC/AT and WS version for Sun and SGI. User can select the platforms according to performance.

③ Cross platform

PC version WTK and WS version WTK has compatibility as source code level. Therefore an application which developed with PC version WTK can be used on WS version WTK if you re-compile. Whether you develop applications based on PC or WS depends on performance requierd by the applications and budget for platforms.

④ Supporting for VR Sensors

WTK supports 3D sensors and operation device which are needed for VR on standard level such as, magnetic sensor, ultra-sonic sensor, 3D-mouse, Spaceball, Joystic, BOOM, etc.

⑤ Options

WTK also has 3D-Sound "Beachtron", Network option to share the Virtual World with a couple of people, and the devices for the texture.

4. Future Trend

PC version and WS version platform are considered to progress rapidly its performance. A progress of sensing technologies and also computer technologies are needed for utilization of VR into various field.

Besides progress of technology, reduction of cost for VR system should be achieved to facilitate utilization widely. I hope reduction of cost of WS but as the future trend of VR, PC version VR system will be used more because of lower cost.

With diffusion of VR, the software like the WTK will probably appear and what important is to develop applications faster and easily and its expansive, copmpatibility.

5.Conclusion

It has passed two years since VR is introduced to Japan. Due to sluggish economy in Japan, pace of diffusion is slow but VR expands to various field such as Universities, companies steadily. Moreover since computer technology has been progressive which accerelates speed of reduction of cost and speed to high-performance.

This new concept "Virtual Reality" is adapted into various fields and it will not take a time to be part of our daily life. What most important for Virtual Reality is imagination for creativity and a bravery to jump into it. Therefore it might be necessary to foster imagination through experience of VR yourself.

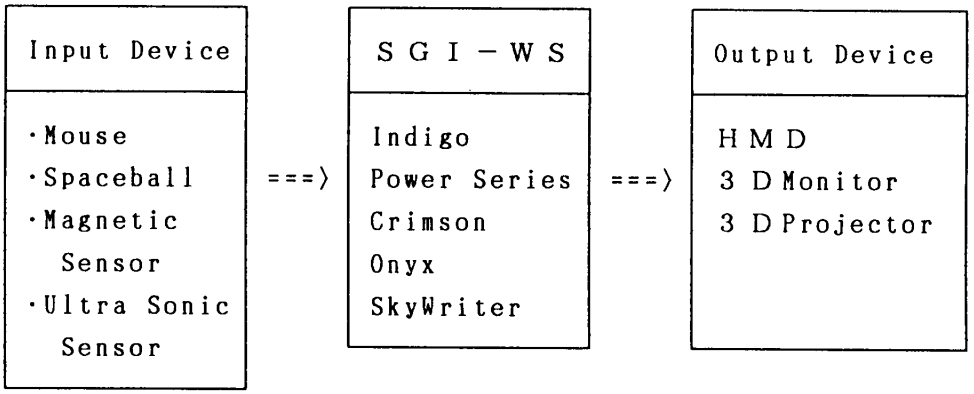

Fig.1 SGI-WS Platform

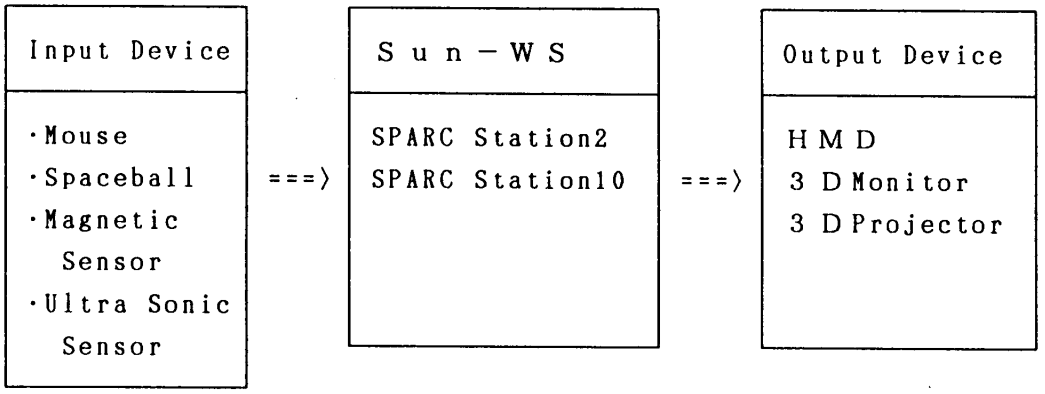

Fig.2 Sun-WS Platform

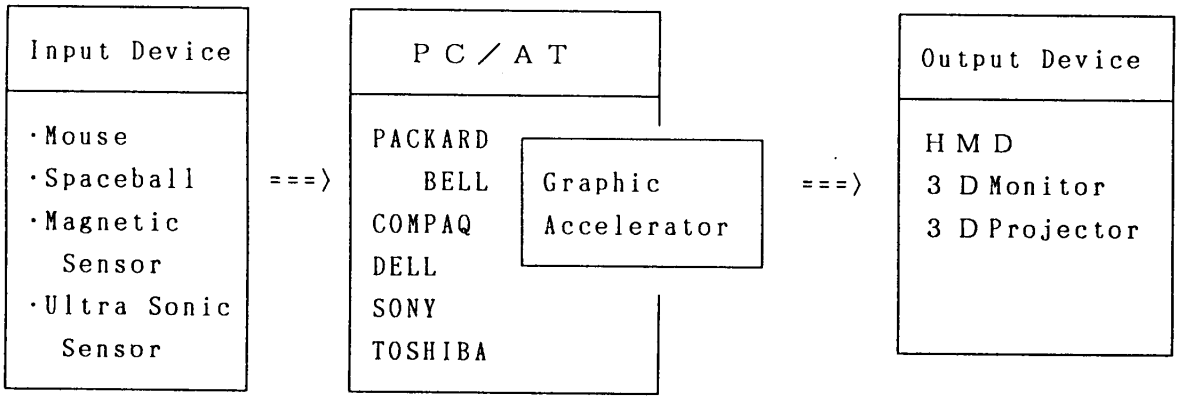

Fig.3 PC Platform