

Virtual Reality in Cyberball

The Cyberball, have integrated systems that involve graphical, robotic computation, electromechanical systems of high performance, and apply concepts of Virtual Reality.

With application in the majority areas of the knowledge, and with a great investment of the industries in the production of the hardware, software and computer devices, the Virtual Reality (VR) comes trying a sped up development and indicating perspective in recent years sufficiently promising for the diverse segments, also finding great applications in the training and simulation [1,2].

The VR interface involves highly interactive 3D control of computational processes. The user enters in the virtual space of the applications and visualizes, manipulates and explores the data of the application in real time, using the three-dimensional natural movements of the body. The great advantage of this type of interface is that the intuitive knowledge of the user regarding the physical world can be transferred to manipulate the virtual world. To support this type of interaction, the user uses not conventional devices as HMD (Head Mounted Display), data gloves, etc. These devices give to the user the impression of that the application is functioning in real the three-dimensional environment, allowing to the exploration of the environment and the natural manipulation of objects with the use of the hands, for example, to catch, to manipulate and to carry through other actions [3,4,5].

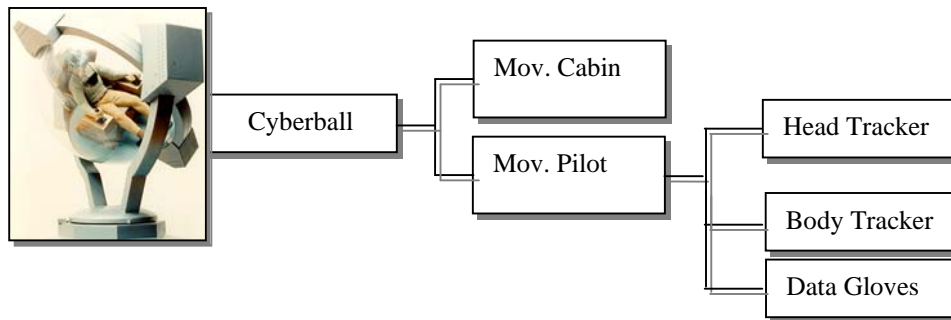
The adaptation of VR systems, in equipment as the Cyberball, brings as technological contribution the domain on diverse areas as: specific manipulation of hardwares and softwares of VR, interfaces between these equipment, the use of high performance computers and good graphical capacity, domain of three-dimensional geometric and graphical modeling, simulation in real time, navigation, collision detection, systems of evaluation and haptics interfaces [5,6].



Virtual Reality devices : Head Mounted Display and Data Gloves

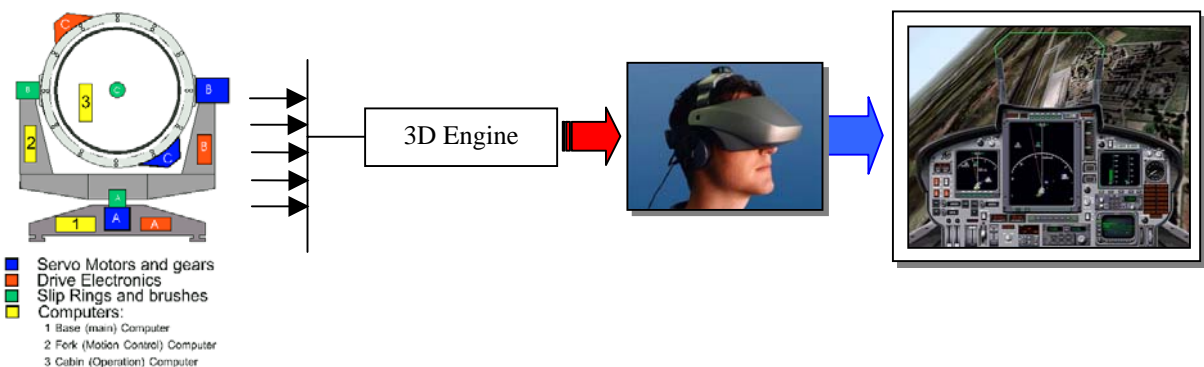
Basically, the application of the Virtual Reality in the Cyberball happens in 2 ways: The reproduction in 3D of the movement of the cabin of the pilot, following all the degrees of freedom (DOF) imposed for

the simulation, and the reproduction of the movement of the head pilot, his hands, arms and legs (6 DOF).



Cyberball and the movimentation systems

The 3D graphical simulation of the movement of the cabin is carried through by an interface connected to the graphical *3D engine*, that receives the information from rotation and translation of the electromechanical cabin, graphically, bringing up to date, the scene of the simulation in real time. These information are brought up to date in the HMD of the pilot who, at the same time that he physically feels the action of the simulator, visualizes the update of the three-dimensional graphs.



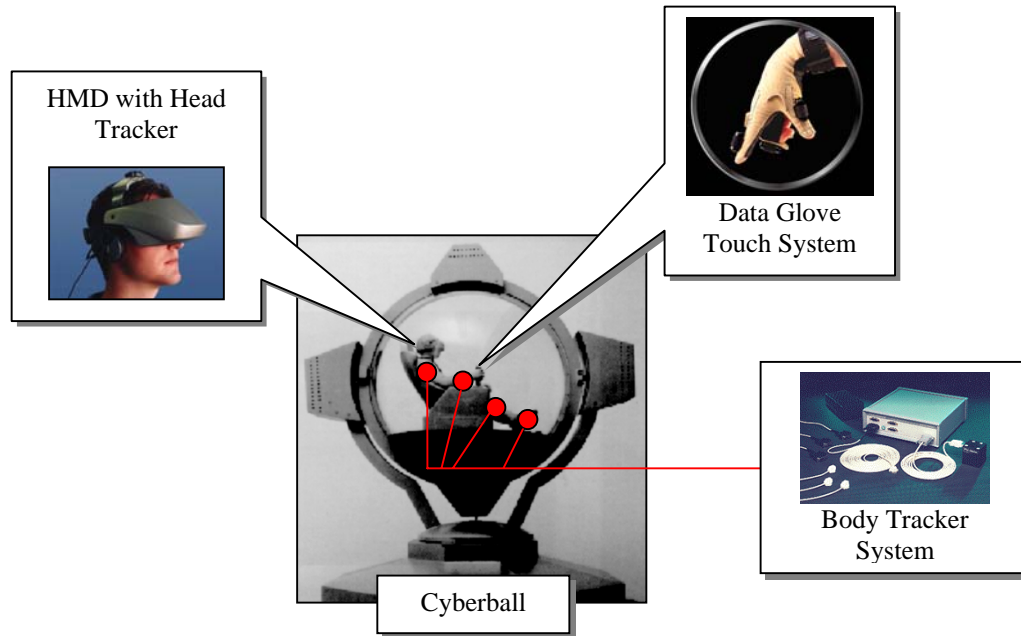
Cyberball and the cabin moviments

The 3D graphical simulation of the pilot in the Cyberball involves the development of more specific interfaces and the use of the motion capture devices (tracker devices) installed in the helmet of the pilot and also distributed in its body. For the movement of the hands, gloves of acquisition data guarantee the capture of these movements.

For the movement of the head is used head tracker connected to the helmet of the pilot. These devices, capture information of rotation and displacement of the helmet of the pilot. To each movement of the head, the tracker informs to the computational system the modified variable and the graphical system 3D brings up to date them in real time, either a rotation or translation of head.

For the movement of the arms and legs of the pilot in cockpit (cabin), diverse sensors connected to the body of the pilot, capture the data and the computational system interprets these data moving the virtual model of the pilot, using inverse kinematics allowing that the 3D system can reproduce these movements in a 3D virtual pilot.

In such a way, the pilot in cockpit of the Cyberball, can see through the HMD, the movement of its arms and legs, simulated for a virtual pilot in real time. The sensation of touch in the virtual panel of cockpit also is simulated through gloves of acquisition of data, with touch sensors, conferring to the system a complete realism during all the simulation.



Trackers Systems of Cyberball

The systems involved in the development and application of the Virtual Reality to the Cyberball project, provides good interactions between the real device - Cyberball - and the 3D environments of simulation.

These integrated systems, that compose the Cyberball, confer a character of technological innovation and promising future perspectives in the simulation of vehicles, either in commercial or military aviation, automotiva industry and areas of entertainment.

References

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