Virtual reality making dreams come true

From Page 1

viewpoint in the modelled display. When your head moves, the visual scene changes. The result is a change of viewpoint as if the eyes and head had actually moved in a real world.

In spite of the many technological limitations, many VR environments easily create a compelling sense of "being there", of presence or immersion. Immersion seems to be facilitated by the ability to control attention and focus on the new VR to the exclusion of the real world. Being able to see parts of one's own body, even in cartoon form, adds to the experience. It also depends on the use of a good visual imagination.

For instance, if you are to experience a virtual room, then you start the show after putting on the HMD. In front of your eyes you will see one portion of the room. The speakers will give you the humming sound of a portable fan that might be on table on the right of you. You may not see it but its sound in your right ear will make you feel its presence. When you turn right, the sensory devices will note your movements and would transmit signals to a controller program. This program, on knowing the movement, would update the picture on the screen in front of you. Now you will see the table and the fan in front of you. The sound would also gradually shift with your movement from the table. This will give you a closer view of all the elements in your vision and the sound of the fan will also increase accordingly.

This is what can be termed a minimal environment of virtual reality. There are even more advanced devices that include special gloves which give you the feel of touch. You can grab objects in a virtual environment though in reality there would be nothing in your hands.

Virtual reality has a very wide utility. For military, there are flight simulators that make a pilot feel as if he is actually flying a particular aircraft. It gives them the feel and sound of the aircraft's engine and throttle. The views through the windows also appear to be real. A few years back this kind of VR equipment did not belong in a home. But now it has become affordable for almost anyone. Now you can buy VR headsets at a shop.

A VR headset comes with

operation theatre. TELEOS, a new VR surgery simulation system, was recently adopted and will be used by students at the Harvard medical school.

VR is also being used today in architectural designs. You can walk thorough your house even before its has walls, stairs or windows. You can amend their style and see the changes made instantly. You can do this until you finalize the design. This will save a great deal of time and money.

Commercial airlines and the US air force have sophisticated flight simulation systems to teach pilots to operate complicated aircraft. These simulations are extremely realistic, complete with random mechanical breakdowns and built-in emergencies so the pilot has to respond to the unexpected situations. Snow, rain and flocks of birds can appear during a virtual landing.

Many of the licensed flying authorities all over the world have reduced the actual flying hours. This was made possible by the availability of the VR technology.

The former US president George Bush learnt and polished his skills through training on VR equipment before taking a real parachute jump for the first time at the age of 75.

Edutainment: The union of technology and entertainment has enormous potential for education, particularly in the form of simulation games that have been branded "edutainment". This was made possible through a synthesis of videogame and educational simulations. There is a vibrant creativity in the development of these games and it promises rich experiences in fantasy that liberate imagination and promote probing explorations of new hypotheses and information.

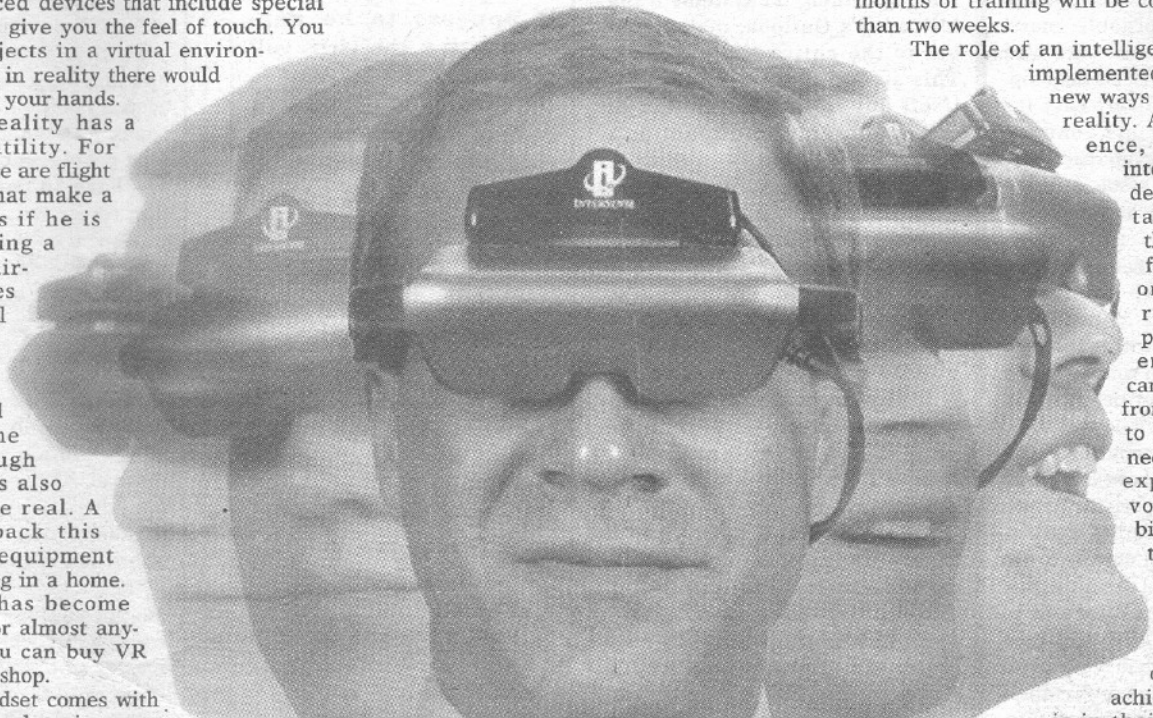
Entertainment is another area where VR has brought a revolution. Virtual games are available to make you feel as if you are in the middle of a battle, for instance. You can see and hear bombs exploding around you. You shoot the enemy and run around to find your way. You open doors, jump through the windows, turn around and see what is happening behind.

Using the environment of a virtual travel agency (open 24x7), potential tourists can explore sites and talk with travel agency people. You might also visit hotels and resorts where you can enjoy pleasant atmosphere, check in and out, and discuss your needs, wants and alternatives with the hotel staff — all with the help of VR equipment.

Training: Trainers are widely using virtual reality during coaching sessions. On an average, in an ordinary classroom environment, a student can give about 15 per cent of his attention to the subject. The remaining part of his attention is diverted by the noise in the surrounding. This noise may be: the student sitting beside, the ceiling fan, or the sound of a motor car outside the classroom. Using the virtual reality headsets, one can focus one's attention solely on the topic being taught without any disturbance from the noise.

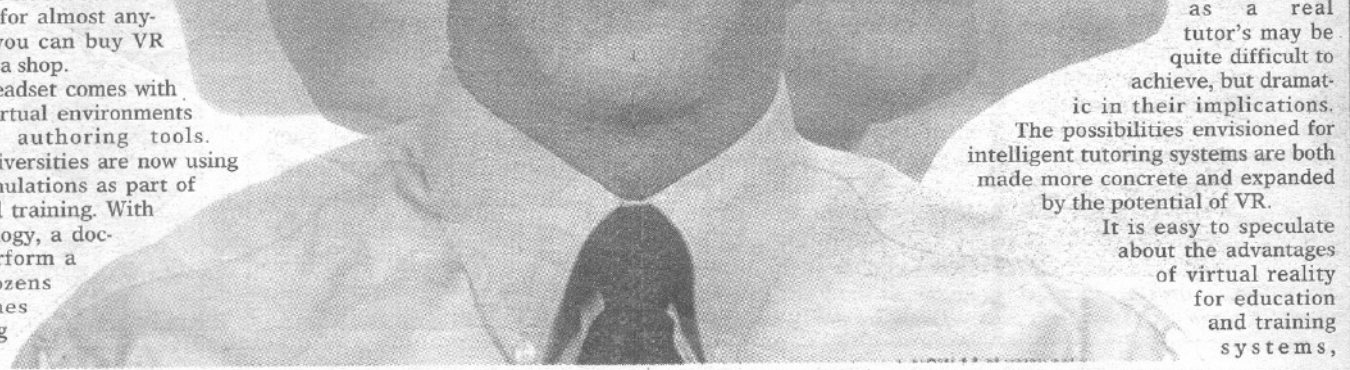
A student in a VR environment only sees the screen and nothing else. He listens only the lecture. This increases utilization of his attention to the maximum, and drastically reduces the time required to understand a topic. A course that would otherwise require months of training will be completed in less than two weeks.

The role of an intelligent tutor can be implemented in a variety of new ways through virtual reality. As a ghost presence, the tutor can interact with a student through digital speech, through text that floats in the air, or through replays. As a physical presence, the tutor can vary in reality from a stick figure to a realistic mannequin, with facial expressions and voice. The possibilities for realistic guidance that is believable and as forceful as a real tutor's may be quite difficult to achieve, but dramat-



affordable for almost anyone. Now you can buy VR headsets at a shop.

A VR headset comes with scores of virtual environments and with authoring tools. Medical universities are now using surgery simulations as part of their school training. With VR technology, a doctor can perform a surgery dozens of times before going near a real



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It is easy to speculate about the advantages of virtual reality for education and training systems,

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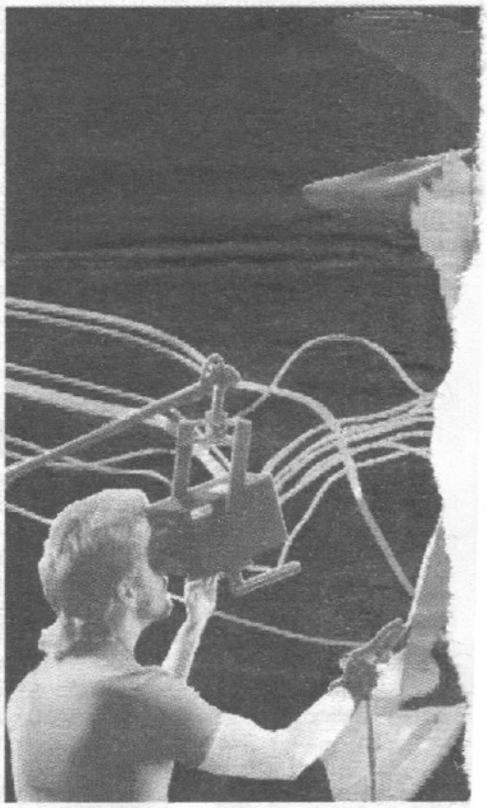
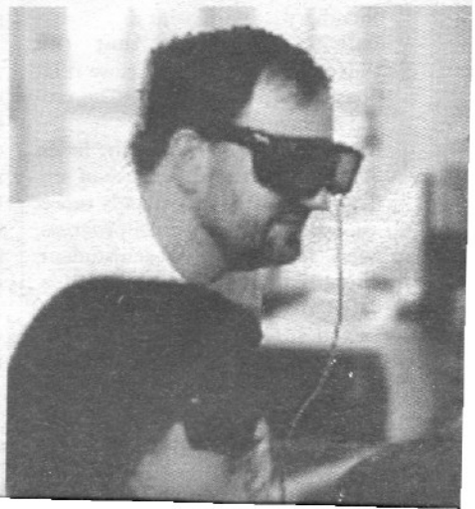
You can perfect your swing on a golf simulator like this



The Virtual Windtunnel (above) is an application o modern computational fluid dynamics simulation



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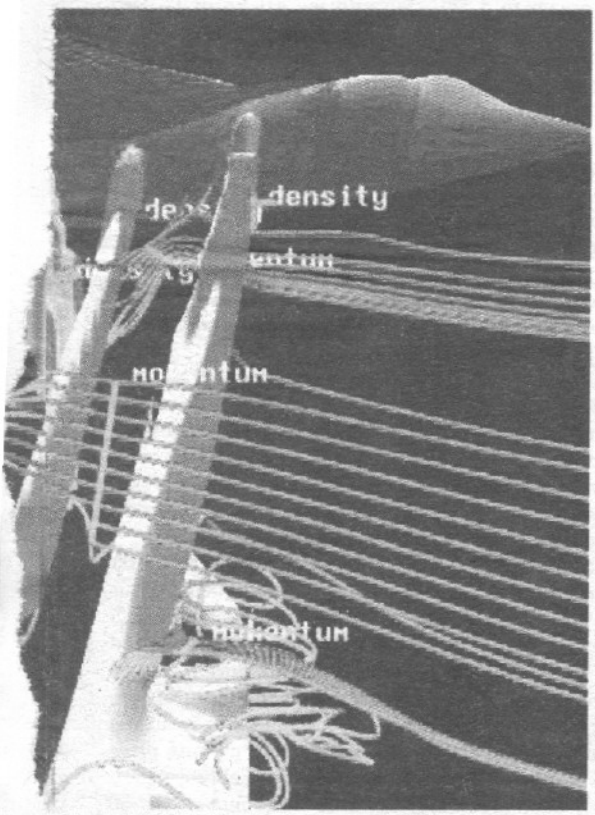


virtual reality interface technology visualize the results of

but specific examples provide a better grounding for both advantages and disadvantages, to demonstrate where VR has an appropriate role at this, the beginning stage of its development.

Language students and their teacher could take on the role of some of the characters. Upon entering this virtual environment, students would practise a foreign language, speaking with other people in a non-threatening environment while learning.

The uses of simulations in past intelligent tutoring systems were already exploring the edges of VR graphically. Distance learning experiments and digital libraries were already understood as sources of electronic learning.

Distance education: Virtual reality offers exciting possibilities to distance learning. One can explore the various aspects of virtual reality in its "stand-alone" mode (no group interaction; no network or Internet connections; only "user-world" interaction) as well as via the World Wide Web (with multi-user capabilities), and how it may relate to distance education.

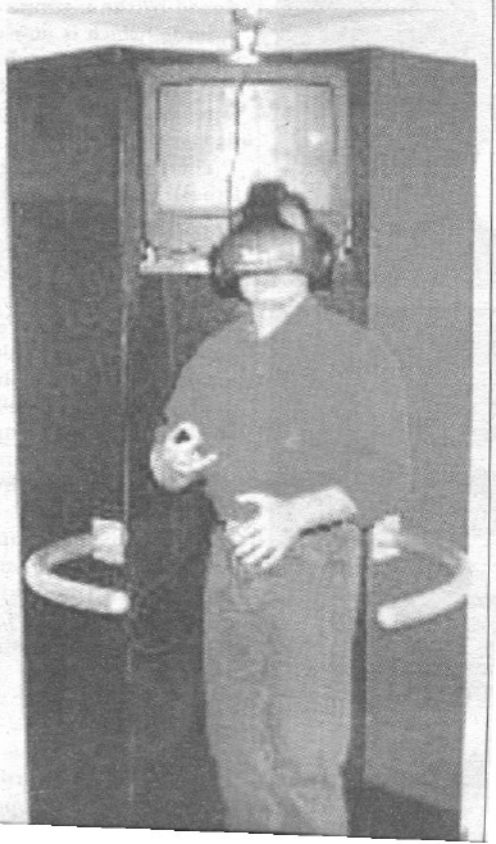
How "stand-alone" virtual reality is currently being utilized in education? There are many educators around the world who are "environments". These environments afford an enhanced level of experience due to the greater visual, and potentially auditory and tactile, involvement of the user with the subject matter.

Students in Australia used desktop VR to build geometric solids so they could be studied from the inside as well as the outside, shrink and expand the objects, deform and join them, thus giving more understanding than the usual work with wood models, etc.

With students being able to actually share space and time in a virtual environment, the capabilities of using this technology for distance education are enormous. No longer will students have to view the facilitator (instructor) from a "distance". Face-to-face communication becomes accessible and the capability of group collaboration on projects are now possible, even if there are oceans between the students and teacher.

An open university has a virtual computer laboratory and the students from anywhere in the world can do the practical while sitting at home.

VR in defence: As mentioned in an example above, VR is extensively being used by the military and other defence agencies for train-



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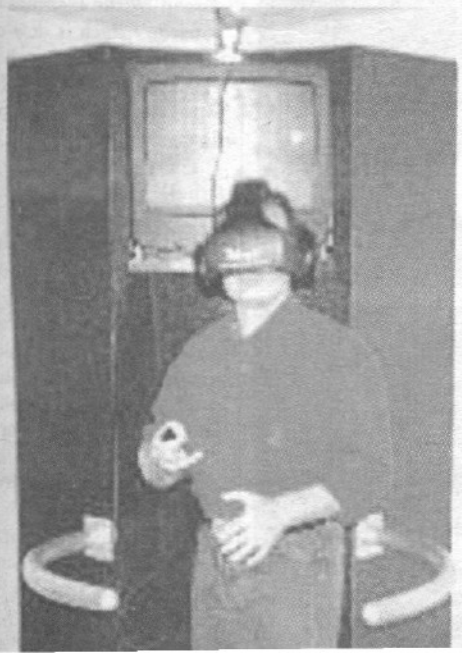
VR in defence: As mentioned in an example above, VR is extensively being used by the military and other defence agencies for training their staff before sending into the actual mission. On similar basis United One's biggest VR projects is the Defence Simulation Internet. This project is a standardization being pushed by the USA defence department to enable various simulators to be interconnected into a vast network. It is a result of the Defence Advanced Research Projects Administration (DARPA).



A VR system can help you get over your phobia of spiders

The Defence Simulation Internet SIMNET project is a collection of tank simulators networked together to allow unit tactical training, making it possible to allow simulators in Germany to operate in the same virtual world as simulators in the US, partaking of the same battle exercise.

VR in medicine: Hospitals are using virtual surgery simulations that make it possible to perform a surgery dozens of times before going near a real patient. A US-based medical company is developing and marketing specialized VR technology for this purpose. The company is funded by the leading venture capital firms and is associated with one of Europe's leading research and teaching hospital, the General Hospital in Vienna. It was the first worldwide successful display of knowledge-guided surgery offering the surgeon intra-operative telecon acknowledgment via Internet.

The company has developed its original technology to visualize a surgery-based operating field on improved reality. Virtual anatomical structures are merged in realtime with endoscopes video or microscope view and displayed in the head mounted display of the surgeon. The surgical procedure can also be transmitted via Internet for intra operative consultation with leading experts. Specifically for the placement of dental implants, a virtual implant system was developed and is now being marketed. ■

The writer is principal, Karachi College of Computer Science, Karachi

Can VR cure vertigo?

VERTIGO is the result of damage to the body's balancing mechanism. This mechanism is called the vestibular system. It is also linked to the sense of sight through the vestibular-ocular reflex (VOR). This means that when nerves in the ear sense that the head is moving one way, they tell the eyes to move the opposite way to compensate. Sufferers of vertigo have a slow VOR. This causes their gaze to slide along with the movement of their heads, leaving them confused and nauseated. If only the world moved more slowly, these patients could keep their bearings, even with their sluggish VORs. And for brief periods, at least, Dr Viirre has found a way to put the brakes on, through the use of virtual-reality technology.

When wearing a pair of goggles fitted with small video screens, one of Dr Viirres subjects has the impression of standing within a computer-generated panorama, which can be examined in any direction in real time. Or, for that matter, in not-so real time: by adjusting the computer, Dr Viirre or one of his collaborators can control not only what the subject sees, but how fast he perceives it.

motion at half-speed, Dr Viirre shrinks the size of the virtual scene by only 45 per cent. That still keeps things moving at a slightly discomfiting clip for the patient, even though the pace is much slower than in the real world.

While standing in this decelerated scene, the patient is asked to carry out tasks that require him to search the virtual environment: looking for all the 'people' wearing red shirts, say, or blue ties. Every five minutes, the task is made more difficult by speeding the scene up another 3-5 per cent. At the end of each 30-minute session, the patient's VOR is measured again, and at the next session, the initial speed of the display is set slightly higher than this new benchmark. The control subjects, who are also vertigo sufferers, perform all ten sessions, but are shown scenes that unfold at normal speed.

Dr Viirre's hope was that his test subjects VORs would speed up enough to adapt to these changes, and that the adaptation would continue even when the goggles were off. The preliminary results are encouraging, as he reported this week at a conference of the Association for Research in Otolaryngology (as the field is known) in St. Petersburg

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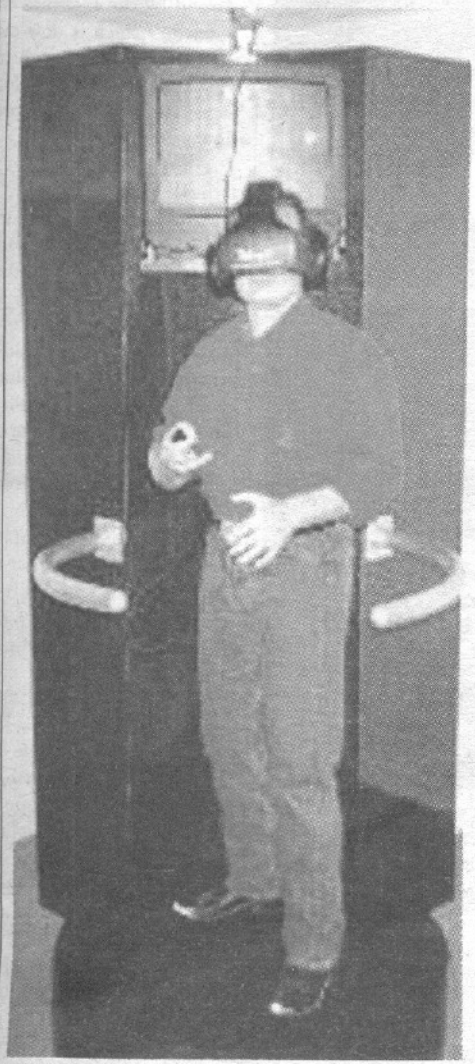

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In the real world, the farther away an object is, the slower it seems to move. (That is why the horizon appears motionless, and is reassuring to look at during a bout of seasickness.) This means that shrinking a virtual scene, which makes it look farther away, also makes it appear to move more slowly. Dr Viirre is using this illusion to train those with a slow VOR into faster performance.

To do so, he follows an old rule of thumb used by mothers and psychologists to get people to change their behaviour. This rule is that a bad habit, or a bad reflex, cannot be undone all at once. It requires gradual coaxing. So he starts by measuring the speed at which his subjects, vertigo patients all, actually register motion. Then, he sets his virtual environment to run just a little faster than that comfort level. If, for instance, the speed of a subjects VOR means that he registers motion at half-speed, Dr Viirre shrinks the size of the virtual scene by only 45 per cent. That still keeps things moving at a slightly discomfiting clip for the patient, even though the pace is much slower than in the real world.

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Once Dr Viirre refines his training regime, he hopes to see larger and more permanent effects. If the project is a success, other patients will benefit from a surprising application of a comparatively new technology. The technology benefits, too. At the moment virtual reality has a rather lightweight reputation, and has not really made its mark outside the entertainment industry. By helping to rehabilitate vertigo sufferers, it will have shown that it is good for something other than playing games. ■ *—Dawn Science Dotcom Monitor*