VIRTUAL REALITY

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ABSTRACT:

The term 'Virtual Reality' (VR) was initially coined by Jaron Lanier, founder of VPL Research (1989). Other related terms include 'Artificial Reality' (Myron Krueger, 1970s), 'Cyberspace' (William Gibson, 1984), and, more recently, 'Virtual Worlds' and 'Virtual Environments' (1990s).

The relationship between our actions and their perceivable results is ruled by what we call the laws of nature. It is general understanding that our actions act upon real objects, which react according to the laws of nature, what then can be perceived. Virtual Reality Facilities (VRFs) simulate the action perception relationship in a physically correct manner but without involving real objects or real events. Just the same do mathematical models of nature . So it stands to reason that VRFs can be considered as analog models of nature If a physical theory is false its predictions cannot be verified. If a VRF were false we would have strange and unusual perceptions as if different laws of nature would be valid. It is suggesting to say that we would fail to survive in nature when using a false mathematical as well as a false analog model. So, an analog model of nature can be useful even if it is not 'true'.

Virtual Reality is an enabling technology that has wide applications in training, product design, etc. Virtual reality (VR) technology is being used to resolve problems in real-world situations. The National Aeronautics and Space Administration (NASA) is using VR to train astronauts to repair the Hubble Space Telescope.

In this talk, we present a brief introduction into Virtual Reality as a human centered interface technology.

- **CONTENTS:**
- Introduction`
- VR lab
- Input devices
- Applications
- Future
- Impact
- Conclusion

1.

Virtual Reality (VR) is defined in Encyclopedia Britannica as the use of computer modeling and simulation to enable a person to interact with an artificial three-dimensional visual or other sensory environment. VR applications immerse the user in a computer-generated environment that simulates reality through the use of interactive devices, which send and receive information. VR is also known as "artificial reality," "virtual world," “virtual space” and “cyberspace.”

It can also be defined as “An artificial reality that projects the user into a 3D space generated by the computer. A virtual reality system uses stereoscopic goggles that provide the 3D imaginary and some sort of tracking device, which may be the goggles themselves for tracking head and body movement.

Most current virtual reality environments are primarily visual experiences, displayed either on a computer screen or through special or stereoscopic displays, but some simulations include additional sensory information, such as sound through speakers or headphones. Some advanced, haptic systems now include tactile information, generally known as force feedback, in medical and gaming applications. Users can interact with a virtual environment or a virtual artifact (VA) either through the use of standard input devices such as a keyboard and mouse.

The simulated environment can be similar to the real world, for example, simulations for pilot or combat training, or it can differ significantly from reality, as in VR games. In practice, it is currently very difficult to create a high-fidelity virtual reality experience, due largely to technical limitations on processing power, image resolution and communication bandwidth. However, those limitations are expected to eventually be overcome as processor, imaging and data communication technologies become more powerful and cost-effective over time.

Virtual Reality is often used to describe a wide variety of applications, commonly associated with its immersive, highly visual, 3D environments.

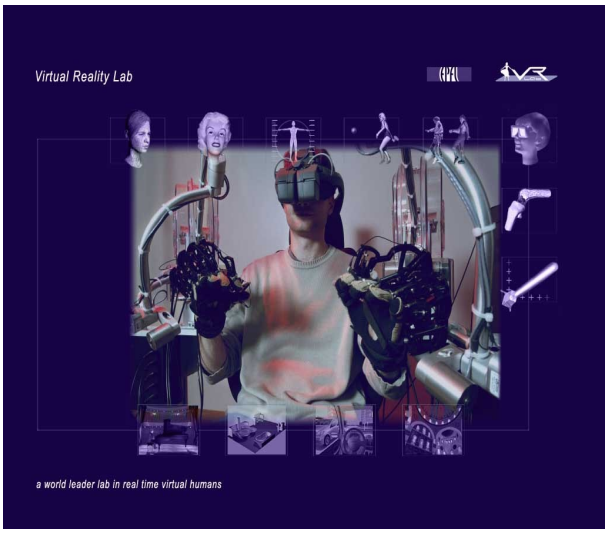
TERMINOLOGY:

The term *artificial reality*, coined by Myron Krueger, has been in use since the 1970s but the origin of the term *virtual reality* can be traced back to the French playwright, poet, actor and director Antonin Artaud . The earliest use cited by the Oxford English Dictionary is in a 1987 article entitled "Virtual reality", but the article is not about VR technology.. The concept of virtual reality was popularized in mass media by movies such as *Brainstorm* and *The Lawnmower Man*.

VR LAB:

The Virtual Reality Laboratory (VRL) explores innovative applications of immersive and non-immersive virtual environments in a variety of areas.

For industrial applications, research is focused on virtual prototyping of engineering designs - especially in the automotive and marine industry - the simulation of manufacturing processes, and related engineering tasks. The use of virtual reality in accident simulations, medicine, architecture, archeology, education, and other areas.



INPUT DEVICES:

Data gloves, wands, stair steppers. These and other interface devices used in virtual environments serve as portals into virtual reality.

Data gloves:

Data gloves offer a simple means of gesturing commands to the computer. Rather than punching in commands on a keyboard, which can be tricky if you're wearing a head-mounted display, you program the computer to change modes in response to the gestures you make with the data gloves.

Pointing upwards may mean zoom in; pointing down, zoom out. A shake of your fist may signal the computer to end the program. Some people program the computer to mimic their hand movements in the simulation; for instance, to see their hands while conducting a virtual symphony.

One type of data glove has a web of fiber optic cables along its back. Changes in the amount of light transmitted to the computer by the cables signal how the joints of your fingers are bent. Once the data glove has been calibrated to your hand, your gestures trigger pre-programmed commands.

Other gloves use strain sensors over the joints to detect movement. Yet others rely on mechanical sensors to measure your hand movements.

Some computer users have elaborated on the data glove concept by creating facial sensors, even body suits. Not many scientists have climbed into these get ups, but animators have. Already, facial movement sensors hooked to computers are simplifying their job: animating cartoons.

Wands:

Wands, the simplest of the interface devices, come in all shapes and variations. Most incorporate on-off buttons to control variables in a simulation or in the display of data.

Most wands operate with six degrees of freedom; that is, by pointing a wand at an object, you can change its position and orientation in any of six directions: forward or backward, up or down, or left or right. This versatility coupled with simplicity are the reasons for the wand's popularity.

Other Input Devices:

Almost anything can be converted into a sensing device for simulation in virtual reality. Caterpillar, Inc. attached sensors to a mock tractor cab, complete with steering wheel and pedals, and used this environment to simulate test drives of its new line of backhoe loaders.

Stair steppers are an example of the limitless manifestations of interface devices. As part of a simulated battlefield terrain, engineers from an army research lab outfitted a stair stepper with sensing devices to detect the speed, direction, and intensity of a soldier's movements in response to the battlefield scenes projected onto a head-mounted display. The stair stepper provided feedback to the soldier by making the stairs easier or more difficult to climb.

APPLICATIONS:

ARCHITECTURE & CONSTRUCTION:

Virtual reality is already showing its potential in the architecture and construction industries. A building can be created as a navigable, interactive, and immersive experience while still being designed, so that both architect and client can experience the structure and make changes before construction begins. It has been said that every building built today is actually a physical prototype, leaving little room for input or changes until after construction. Virtual reality would allow for an electronic prototype to be created and modified, so that costly changes during or after construction are avoided.

In the future, clients will want to experience their house or building in virtual reality before final designs are completed and construction begins. Beyond today's capabilities, clients will not only be able to see the structure, but hear sounds from within it, feel its textures, and experience its fragrances. Homebuilders and real-estate developers are particularly excited about the potential of virtual reality to sell their designs. City planners will use virtual reality to consider various changes in the community, greatly assisting the work of zoning and planning boards.

EDUCATION & TRANING:

- VR is just beginning to be applied in education and training. Students can study anatomy or explore our galaxy.
- In the future, students will be able to learn through studying in virtual worlds. Chemistry students will be able to conduct experiments without risking an accidental explosion in the lab.
- Astronomy students will be able to visit a range of virtual galaxies to study their properties.

- History students will be able to visit different historical events and perhaps even participate in the action with historical figures.
- English students could be on stage at the Globe Theater as it was when Shakespeare's plays were first presented. They will also be able to enter into a book and interact with its characters.
- Virtual reality will also be used in teaching adults. Trainees in a wide variety of environments will be able to safely try out new techniques. They will use these practice tasks in hazardous environs and also practice dealing with emergencies on the job.

BUSINESS:

Already, several companies have created three-dimensional visualizations of the stock market. The use of virtual reality in stock market trading will greatly increase in the future.

Those companies trading on various stock markets globally will require this virtual-reality application to identify trends and make trades more rapidly. They will, in fact, be interacting with the stock market in real time.

MARKETING:

Virtual reality is just beginning to be used by companies who want customers to experience their products and to understand them better. They've found that a new technology, such as virtual reality, draws people to their exhibits and involves them with a product much more than standard displays.

Cabletron, a cable network company in Rochester, New Hampshire, has customers travel through their network virtually.

Sapporo, a beer company in Japan, allows customers to visit its production plant to experience the beer-making process in virtual reality.

In the future, virtual reality will be used to develop and test products with much greater customer involvement. A company will be able to create products, gain customer feedback, and then modify the products much more rapidly and inexpensively.

GAMES:

In 1991, the company Virtuality licensed the Amiga 3000 for use in their VR machines and released a VR gaming system called the 1000CS.
This was a stand-up immersive HMD platform with a tracked 3D joystick. The system featured several VR games including, *Legend Quest* (adventure and fantasy), *Hero* (VR puzzle). Etc.

Virtual Reality Wireless TV Tennis Game comes with a toy tennis racket that senses the player's swing, while Wireless TV Virtual Reality Boxing includes boxing gloves that the player wears and jabs with.

MEDICINE:

Virtual reality is just beginning to be used in medicine and medical research. The University of North Carolina (UNC) uses it in biochemical engineering. They test the docking of molecules using visual and auditory displays and a force-feedback device.

Virtual reality is also being used at UNC and other locations to practice aiming X-rays before cancer treatments of that type are performed.

Several companies, such as Maryland, and others are creating virtual bodies, a kind of "body electronic," to enhance medical training.

In the future, medical students will study anatomy by dissecting virtual cadavers much more cost effective and efficient way of studying the human body.

Medical students and surgeons will practice virtual surgery before attempting a new procedure. They may even practice an operation for a specific patient, whose unique body characteristics have been scanned into the computer. Different diseases and medical emergencies can also be simulated to test a medical student or doctor's knowledge regarding treatment.

On a different front, virtual reality could be used for treatments in guided visualization. Patients could use virtual reality to assist in visualizing a part of their body for healing. Likewise, virtual reality could help improve relaxation techniques, providing a pleasant world in which to relax.

FUTURE:

It is unclear exactly where the future of virtual reality is heading. In the short run, the graphics displayed in the HMD will soon reach a point of near realism. The audio capabilities will move into a new realm of three-dimensional sounds

There are however attempts being currently made to simulate smell. . It is worth mentioning that simulating smells, while it can be done very realistically, requires costly research and development to make each odor, and the machine itself is expensive and specialized, using capsules tailor made for it. Thus far basic, and very strong smells such as burning rubber, cordite, gasoline fumes, and so-forth have been made.

Although it is often seen in the context of entertainment by popular culture, this illustrates the point that the future of VR is very much tied into therapeutic, training, and engineering demands.

As new trials and applications are tried out and more data gathered, Hamada says he is sure the technology "will take communications to a new level in content richness, compared to today's communications, which only offers images and sounds". It has long been feared that Virtual Reality will be the last invention of humans, as once simulations become cheaper and more widespread, no one will ever want to leave their "perfect" fantasies.

IMPACT:

There has been increasing interest in the potential social impact of new technologies, such as virtual reality.

Mychilo S. Cline argues that virtual reality will lead to a number of important changes in human life and activity. He argues that:

1. Virtual reality will be integrated into daily life and activity and will be used in various human ways.
2. Techniques will be developed to influence human behavior, interpersonal communication, and cognition (i.e., virtual genetics).
3. As we spend more and more time in virtual space, there will be a gradual "migration to virtual space," resulting in important changes in economics, worldview, and culture.
4. The design of virtual environments may be used to extend basic human rights into virtual space, to promote human freedom and well-being, and to promote social stability as we move from one stage in socio-political

development to the next.

CONCLUSION:

Virtual reality has been heavily criticized for being an inefficient method for navigating non-geographical information.

The major obstacle is the headaches due to eye strain, caused by VR headsets. Repetitive Strain Injury can also result from repeated use of the handset gloves.VR's appeal has largely been due to its marketing. . To give a sense of cultural scale, they compared their technology with others, such as flight, the telephone and the printing press and tried to broaden the range of areas to which the technology could be understood to apply--colonizing discourses. The excessive claims about VR seen around 1989 have been tempered, and VR now has a solid infrastructure of developers, and a receptive public. This success can partly be attributed to the technology itself, but the process is more complex and is strongly connected with the cultural context into which the technology was introduced.