

Virtual Reality: An Integral Part of SDG4 (Sustainable Development Goal 4)

Eyitayo Alimi

Department Of Computer Engineering

Covenant University

Ota, Nigeria

alimieyitayo@gmail.com, eyitayo.alimi@stu.cu.edu.ng

Abstract—This paper explains the role of Virtual Reality in ensuring inclusive and equitable quality education and importance of ‘immersive technology’ to the teacher, the student and also how it aids inclusive teaching and learning. Virtual Reality (VR) sometimes called Virtual Environments (VE) is a new tool in education which helps students see and experience the outside world while in their class rooms. With the developments in web, mobile and Virtual Reality technologies as well as mass adoption of smart and mobile devices by the society, significant opportunities have emerged for e-learning applications. While helping them grasp what is being taught they also have the pleasure of being in two worlds or places at the same time. Apart from being an interesting educational experience, it also saves the educational institution the logistics involved of embarking on an excursion. While what is read in a textbook can be easily forgotten, the same cannot be said for Virtual Reality – it’s hard to forget what is experienced in the virtual world. While a picture is worth a thousand words, in the virtual world you will not only be seeing and hearing, but will also be ‘feeling’ as if you are actually present there. Such an experience can be hard to forget. Many teachers understand how effective Virtual Reality as an educational tool can be, and are supporting its increased use from elementary schools thru institutions of higher learning.

Keywords—SDGs, MDGs, Virtual reality, Education

I. INTRODUCTION

Over the years, technological evolvment has been with tremendous speed. This is the case in all walks of life and education is not an exception. Education has since moved from white chalks with black boards from markers to magnetic white boards. In the developed world, the future of education has fast transformed into smarter and disruptive technologies like Virtual Reality / Augmented Reality and Nigeria should not be an exception.

Millennials are born with a lot more brain than the baby boomers and as such they expect information / education to be delivered to them in a format that they are in tune with.

Millennials are the technology generation and it’s a no brainer for Nigeria to tap into this via Virtual Reality in the educational sector.

Educating the next generation of Nigerians should be an immersive process using Virtual Reality because our young ones are mostly technology literate and also easily understand technology than the baby boomers before them. Virtual Reality in our education system would go a long in speeding up the technological development of Nigeria.

We are in the 4th Industrial Revolution. The 4th Industrial Revolution relies mainly on Knowledge economy and Virtual Reality is going to be playing a major part because it would aid the education of the youth who will eventually become knowledge workers.

What VR is; What VR is not

At the beginning of 1990s the development in the field of Virtual Reality became much more stormy and the term Virtual Reality itself became extremely popular. We can hear about Virtual Reality nearly in all sort of media, people use this term very often and they misuse it in many cases too. The reason is that this new, promising and fascinating technology captures greater interest of people than e.g., computer graphics. The consequence of this state is that nowadays the border between 3D computer graphics and Virtual Reality becomes fuzzy. Therefore in the following sections some definitions of Virtual Reality and its basic principles are presented.

Applications of VR

Motivation to use VR

Undoubtedly VR has attracted a lot of interest of people in last few years. Being a new paradigm of user interface it offers great benefits in many application areas. It provides an easy, powerful, intuitive way of human-computer interaction. The user can watch and manipulate the simulated environment in the same way we act in the real world, without any need to learn how the complicated (and often clumsy) user interface works.

Examples of VR Application

Data and Architectural Visualization



Figure 3.2.1.1 VR in architecture: (a) Ephesos ruins (TU Vienna), (b) reconstruction of destroyed Frauenkirche in Dresden (IBM).

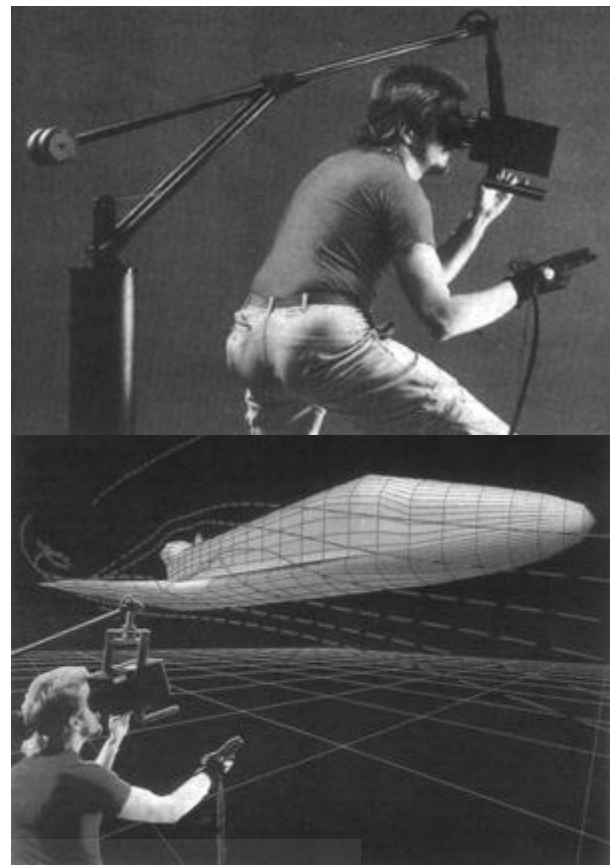


Figure 3.2.1.2. Exploration of airflow using Virtual Wind Tunnel developed at NASA Ames: (a) Outside view, (b) inside view (from [Brys93f]).



Figure 3.2.1.3. VR in chemistry: exploration of molecules.

G. Training and Education

E. Modeling, Designing and Planning



Figure 3.2.2.1. FhG Virtual Design (FhG IGD).

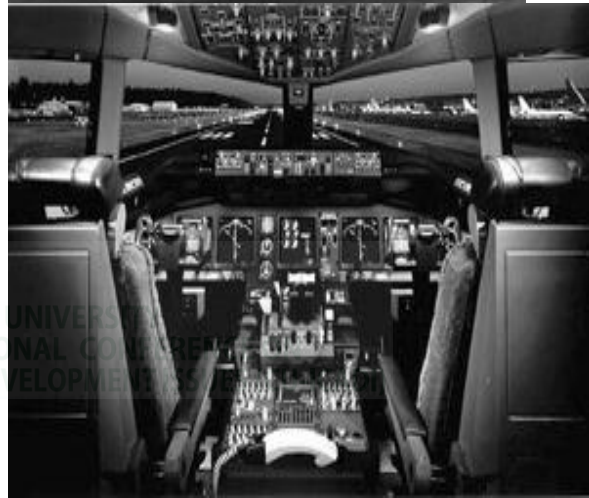


Figure 3.2.3.3. Advanced flight simulator of Boeing 777: (a) outside view, (b) inside view (from [Atla95]).

F. VR In Medicine -Telepresence and Teleoperation

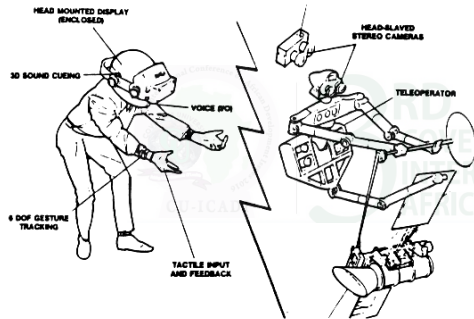


Figure 3.2.3.1 The idea of teleoperating (adapted from [Bola93]).

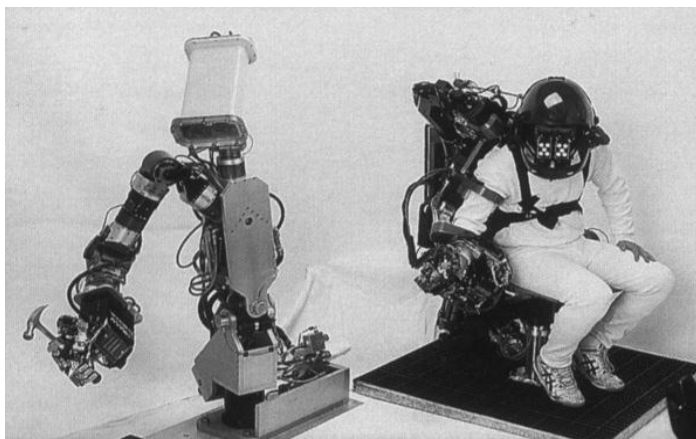


Figure 3.2.3.2 The advanced teleoperation system developed at NOSC.

One can say that Virtual Reality established itself in many disciplines of human activities, as a medium that allows easier perception of data or natural phenomena appearance. Therefore the education purposes seem to be the most natural ones. The intuitive presentation of construction rules (virtual Lego-set), visiting a virtual museum, virtual painting studio or virtual music playing [Loef95, Schr95] are just a few examples of possible applications. And finally thanks to the enhanced user interface with broader input and output channels, VR allows people with disabilities to use computers [Trev94, Schr95].

II. VIRTUAL REALITY (VR)+ VIRTUAL ENVIRONMENT (VE) IN THE CLASSROOM

Virtual Reality and its environment are very useful in achieving the Sustainable Development Goal (SDG) 2 because they are great tools for inclusive and quality education.

Education cannot be comprehensive and excellent until a teacher, a lecturer or an instructor is able to impact the student with adequate knowledge that can be stored in the student's mind for recollection and application as at when needed. It is therefore important, even as the race to meet up with the early attainment of SDG2, VR is a tool important because with it, we can achieve more in a short span if considered and leveraged upon. You will agree after going through this section of the paper,

III. OBSERVATION

The following are some of the observations made during the experiments;

- The (education) session was immersive as all the students in both cases were interested and none left their class rooms until the end of the study.
- There was an increase in their attention span.
- The instructor had to explain almost nothing but just to buttress points raised by the students.
- The rate of memory retention and recollection was swift.
- The students were eager for the next class.
- The only challenge faced was saying 'okay students, class is over'.

IV. CONCLUSION

Within the next decade, we can expect to see Virtual Reality greatly influencing every field in which it is used. One of the fields on which Virtual Reality will have a profound influence is education and training. The combination of Virtual Reality and the right Virtual Reality Company can indeed boost your business's growth.

With the help of a VR headset, users can receive education and training with the help of VR experiences which are extremely immersive. For example, VR can be used as a training tool by medical residents. It can be used to learn techniques and acquire skills in a safe learning environment with no risks. VR can turn out to be a very economical way of educating and training learners on a variety of subjects. VR can help learners to actually 'be in' different ecosystems, prehistoric jungles, sites of archaeological importance and lot more and not just read about them or see them on a flat screen. The common lament of 'studying being boring' will disappear when it comes to education and training using VR, as virtual training programmes can be very engaging and immersive.

All I used as instructional materials then were White Chalks on Black Boards! At some point as my projects advances with years and also the health hazards associated with the afore mentioned, I had to make use of Markers and White Boards.

The picture below shows how instructional materials have shifted in education. I now use the virtual reality headset to teach in the classrooms. This speeds up my social work as it provides the possibility of total completion of all topics commenced as I could take both practical and the theoretic part within one allocated period.

Virtual reality also simplifies the convention of Problem Based Learning (PBL). This is simply through looking as the case of the picture below. The topic for the day was aquatic animals. All that happened was just to write what is to be done-the headsets were distributed and they were asked to write what they saw, heard and felt. They were eager to do that because it was something they found all by themselves!

V. RECOMMENDATION

With its many benefits, Virtual Reality will surely revolutionize all the fields it will be used in. It is simply a matter of time. You too, can use Virtual Reality for greater success in your business by hiring the services of a reputable Virtual Reality company.

I hereby recommend this technology to be a major teaching aid in schools from the elementary to tertiary. Although VR kits are categorically expensive, hence, we at VRNigeria,-the first indigenous Virtual Reality company have made a product out of our several research to give you a whole lot of the immersive experience in a less expensive device

REFERENCES

- [1] F.P. Brooks, "Is There Any Real Virtue in Virtual Reality?" public lecture cosponsored by the Royal Academy of Engineering and the British Computer Society, London, 30 Nov.1994; <http://www.cs.unc.edu/~brooks>.
- [2] I.E. Sutherland, "The Ultimate Display," invited lecture, IFIP Congress 65. An abstract appears in Information Processing 1965: Proc. IFIP Congress 65, Vol. 2, W.A. Kalenich, ed., Spartan Books, Washington, D.C., and Macmillan, New York, pp. 506-508. A similar, but quite complete, paper is Sutherland's "Computer Displays," Scientific American, Vol. 222, No. 6, June, 1970, pp. 57-81.
- [3] M.R. Falvo et al., "Bending and Buckling of Carbon Nanotubes under Large Strain," Nature, Vol. 389, Oct. 1997, pp. 582-584.
- [4] G. Burdea and P. Coiffet, Virtual Reality Technology, John Wiley, New York, 1994.
- [5] R.L. Holloway, Registration Errors in Augmented Reality Systems, PhD dissertation, Department of Computer Science, University of North Carolina at Chapel Hill, 1995
- [6] I. Sutherland: The Ultimate Display. Proceedings of IFIP Congress 2, pp. 506-509 (1965)
- [7] R. L. Anderson: A Real Experiment in Virtual Environments: A Virtual Batting Cage. Presence, Vol. 2, No. 1, pp. 16-33 (1993)
- [8] J. Balaguer, A. Mangili: Virtual Environments. TR of Comp. Graph. Lab.; Swiss Federal Institute of Technology, Lausanne (1993)
- [9] M. Bolas, S. Fisher: Head-Coupled Remote Stereoscopic Camera System for Telepresence Applications. SIGGRAPH'93 Course, No. 23, pp. 12.1-12.11 (1993)
- [10] J. Butterworth, A. Davidson, S. Hench, M. Olano: 3DM: A Three Dimensional Modeler Using a Head-Mounted Display.

- SIGGRAPH Symposium on Interactive 3D Graphics, pp. 135-138 (1992)
- [11] F. Brooks Jr.: Realizing Virtual Worlds. EUROGRAPHICS'95 invited talk(1995)
- [12] S. Bryson: Paradigms for the Shaping of Surfaces in a Virtual Environment. SIGGRAPH'92 Course, No. 9, pp. 13.1-13.10 (1992)
- [13] S. Bryson et al.: Knowledge-Based Augmented Reality. Communications of the ACM, Vol. 26, No. 7, pp. 56-62 (1993)
- [14] J. Cater, S. Huffman: Use of the remote access virtual environment network for coordinated IVA-EVA astronaut-training and evaluation. Presence, Vol. 4, No. 2, pp. 103-109 (1995)
- [15] C. Cruz-Neira: Virtual Reality Overview. SIGGRAPH'93 Course, No. 23, pp. 1.1-1.18 (1993)
- [16] H. Fuchs, G. Bishop et al.: Research Directions in Virtual Environments. NFS Invitational Workshop, Univ. North Carolina (1992). Available also as: <ftp://ftp.cs.unc.edu/pub/technical-reports/92-027.ps.Z>
- [17] W. Gibson: Neuromancer. Novel (1983)
- [18] M. Gigante: Virtual Reality: Definitions, History and Applications. "Virtual Reality Systems", Academic-Press, ISBN 0-12-22-77-48-1, pp. 3-14 (1993)
- [19] M. Gigante, R. Webb: Distributed, Multi-Person, Physically-Based Interaction in Virtual Worlds. Proceedings of Computer Graphics International'93 -"Communicating with Virtual Worlds", Springer Verlag, ISBN 4-431-70125-7, pp. 41-49 (1993)
- [20] R. Held, N. Durlach: Telepresence. Presence, Vol. 1, No. 1, pp. 109-113 (1993)
- [21] R. Holloway, A. Lastra: Virtual Environments: A Survey of the Technology. SIGGRAPH'95 Course, No. 8, pp. A.1-A.40 (1995)
- [22] I. Hunter et al.: A Teleoperated Microsurgical Robot and Associated Virtual Environment for Eye Surgery. Presence, Vol. 2, No. 4, pp. 265-280 (1993)
- [23] Jargon Dictionary. <http://www.fwi.uva.nl/~mes/jargon/> (1995)
- [24] K. Kameyama, K. Ohtomi: A Shape Modeling System with a Volume Scanning Display and Multisensory Input Device. Presence, Vol. 2, No. 2, pp. 104-111 (1993)
- [25] C. Loeffler: Distributed Virtual Reality: Applications for Education, Entertainment and Industry. TR, http://www.nta.no/elektronikk/4.93.dir/Loeffler_C_E.html (1995)
- [26] K. McGovern, L. McGovern: Virtual Clinic. Virtual Reality World, Vol. 2, No. 2, pp. 41-44 (1994)
- [27] S. Pieper et al: A Virtual Environment System for Simulation of leg surgery. SIGGRAPH'93 Course, No. 23, pp. 13.1-13.10 (1993)
- [28] E. von Schweber: Virtually Here. PC Magazine - March 14, 1995, pp. 168-198 (1995)
- [29] M. Sinclair, J. Peifer: Socially Correct Virtual Reality: Surgical Simulation. Virtual Reality World, Vol. 2, No. 4, pp. 64-66 (1994)
- [30] H. Scheirich: Stereoscopies - Principles and Techniques. Diploma Thesis, Vienna University of Technology, Austria (1994)
- [31] R. Schroeder: Learning from Virtual Reality Applications in Education. Virtual Reality: Research, Development and Application, Vol. 1, No. 1, pp. 33-39 (1995)
- [32] R. M. Taylor et. al.: The Nanomanipulator: A Virtual Reality Interface for a (1993)
- [33] I. Sutherland: The Ultimate Display. Proceedings of IFIP Congress 2, pp. 506-509 (1965)
- [34] J. Treviranus: Virtual Reality Technologies and People with Disabilities. Presence, Vol. 3, No. 3, pp. 201-207 (1994)
- [35] D. Zeltzer: Autonomy, Interaction, Presence. Presence, Vol. 1, No. 1, pp. 127-132 (1992) www.vrnigeria.com, www.techygirls.org, www.tasolglobal.com

