Literature Review

1) Veronica S. Pantelidis (1993), The use of virtual reality (VR) in education can be considered as one of the natural evolutions of computer-assisted instruction (CAI) or computer-based training (CBT). Reasons to use virtual reality can parallel all the reasons one would use a two-dimensional, computer-assisted instruction simulation. At every level of education, virtual reality has the potential to make a difference, to lead learners to new discoveries, to motivate and encourage and excite. The learner can participate in the learning environment with a sense of presence, of being part of the environment. The model resulted from a study to identify, use, and evaluate immersive virtual reality's affordances as a means to facilitate the mastery of complex, abstract concepts. Studies show that a virtual environment can “stimulate learning and comprehension, because it provides a tight coupling between symbolic and experiential information.

2) Michael Rorke, et al. (1997), have explain that Immersive virtual reality (VR) places the user inside of the computing environment, blurring the distinction between the environment itself and the user interface to access that environment non-obvious. This lack of distinction between environment and interface makes it difficult to place menus and other interface elements where the user is both able to access them easily and where they do not obscure large parts of the user’s field of view. system called the 'Virtual Remote Control' (VRC). The VRC consists of a physical device (a small touchpad tracked using a Polhemus InsideTrak magnetic tracker) which the user is able to hold and for which there is representation in the virtual environment. The VRC is represented in the environment by a virtual menu. The user is able to make selections from the virtual menu by moving their finger around the touch pad part of the VRC and 'tapping' on the required action. Additionally, the user is able to select an object for the action to be applied on, by 'pointing' the representation of the VRC at the object - as one would point a remote control at a Hi-fi of TV set.

3) Stephen Brewster et al. (1999), Computer-based visualisation techniques, however, depend almost entirely on high-resolution graphics and for visually-impaired users the problems of using complex visual displays are great. There are currently only limited
methods for presenting information non-visually and these do not provide an equivalent speed and ease of use to their graphical counterparts. This means it is impossible for blind people to use visualisation techniques, so depriving them further. And investigate and solve this problem by using techniques from Virtual Reality (VR) that will allow users to feel and hear their data. 1) Investigate the cognitive and perceptual properties of the different sensory modalities and the problems blind people face when trying to visualise information, 2) Develop new visualisation techniques using VR and multimodality to allow blind people to use complex information, 3) Investigate how these new techniques can be incorporated into future visualisation systems.

4) Jeremie Allard (2000), author has explained to focuses on the design of high performance VR applications. These applications usually involve various I/O devices and complex simulations. A parallel architecture or grid infrastructure is required to provide the necessary I/O and processing capabilities. Developing such applications faces several difficulties, two important ones being software engineering and performance issues. We argue that application modularity is a key concept to help the developer handle the complexity of these applications.

5) Sandra Dutra Piovesan et al. (2000), the author explain the virtual reality is being more and more used in the education, enabling the student to find out, to explore and to build his own knowledge. The author presents an Educational Software for presence or distance education, for subjects of Formal Language, where the student can manipulate virtually the target that must be explored, analysed and studied. With a simple interface, with easy comprehension and using, this paper presents educational software where the student manipulates the objects that will be studied in 3D, getting easier the study of concepts and theories about Automatons, Regular Expressions and Minimization of Automatons interacting directly with the object in 3D. To the design of the automatons, the software uses tolls in 3D, as the Blender and the VRML (Virtual Reality Modelling Language) and to the publishing of a page on the internet it is integrated the Program Language PHP. The results reached with the use of the developed software show the attributes that make the ideal Virtual Reality for situations of research and learning taking
the discipline as a reference of the classroom to the computer labs and making more interesting to the student, making the learning easy.

6) Michael Rorke et al. (2000), has suggested that the, Virtual reality is no longer hampered by the absence of appropriate hardware, but rather the absence of understanding about the medium and how to deal with its shortcomings. The sensory input missing from current virtual reality systems (e.g. the lack of haptic feedback) must be compensated for, in order to make these systems more accessible and usable to the general public. The methods presented the tools for overcoming these problems, providing a framework for creating better and more usable applications of the technology.

7) Vildan Tanriverdi et al. (2001), Virtual reality (VR) interfaces contain a richer variety and more complex types of objects, behaviours, interactions and communications. Therefore, designers of VR interfaces face significant conceptual and methodological challenges and the thinking comprehensively about the overall design of the VR interface; decomposing the design task into smaller, conceptually distinct, and easier tasks; and communicating the structure of the design to software developers.

8) Daniel Thalmann (2001), In this paper the author has explain the process of 3D animation is the lack of 3D interaction Visual feedback, in a typical computer graphics application that requires items to be positioned or moved in CAD system.3D animation where also highly irregular shapes are created. Virtual worlds only through the window of the workstation's screen with a very limited interaction possibility. Today, new technologies may immerse us in these computer-generated worlds or at least communicate with them using specific devices. In particular, with the existence of graphics workstations able to display complex scenes containing several thousands of polygons at interactive speed, and with the advent of such new interactive devices as the
Space Ball, Eye Phone, and Data Glove. VR-based animation techniques all techniques based on this new way of specifying animation. We also call VR devices all interactive devices allowing communicating with virtual worlds. They include classic devices like head-mounted display systems, Data Gloves as well as all 3D mice or Space Balls.

9) **Stacy Kluge et al. (2002)**, has been describe the virtual worlds provide a mechanism to incorporate constructivist, experiential, and student-centred learning practices into the classroom. The authors also discuss the challenges and the benefits of using virtual worlds in education as well as some implications for the future of education.

10) **Tomasz Mazuryk et al. (2003)**, has explain that Virtual Reality (VR), sometimes called Virtual Environments (VE) has move attention in the last few years. Extensive media coverage causes this interest to grow rapidly. Very few people really know what VR is, what its basic principles and its open problems are. In this paper a historical overview of virtual reality is presented, basic terminology and classes of VR systems are explain, followed by applications of this technology in science, work, and entertainment areas. All components of VR application and interrelations between them are thoroughly examined: input devices, output devices and software. Finally, the future of VR is considered in two aspects: technological and social. New research directions, technological frontiers and potential applications are pointed out. The possible positive and negative influence of VR on life of average people is speculated.

11) **Giuseppe RIVA et al. (2003)**, have explain that, Virtual Reality (VR) can be considered as the leading edge of a general evolution of present communication interfaces involving the television, computer and telephone. Main characteristic of this evolution is the full immersion of the human sensorimotor channels into a vivid and global communication experience. Since telemedicine is principally focusing on transmitting medical information, VR has the potential to enhance this function. Particularly VR can be used in telemedicine as an advanced communication interface, which enables a more intuitive mode of interacting with information, and as a flexible environment that enhances the
feeling of physical presence during the interaction. This technology is now used in remote or augmented surgery, and surgical training, which are critically dependent upon eye-hand coordination. Recently, however, different researchers have tried to use virtual environments (VEs) in medical visualization and for the assessment and rehabilitation in neuro-psychology, technological, ergonomically and human factor issues and specific guidelines are presented for expanding the use of VR in telemedicine.

12) Kami Hanson et al. (2008), have explain that there exists an increasingly attractive lure of using virtual reality applications for teaching in all areas education, but perhaps the largest detriment to its use is the intimidating nature of VR technology for nontechnical instructors. What are the challenges to using VR technology for the design and development of VR based instructional activities, and what are the recommended approaches? This addresses the issues regarding identifying the appropriate techniques for integrating VR into traditional instructional design, and the considerations for development for non-technical educators. And also involving virtual anaesthesia, budgetary limitations, funding, and other factors.

13) Chwen Jen Chen (2009), have suggested that the VRID an instructional design and development model to guide the design and development of educational virtual environments. Although the four phases of the model are described one after another in an ordered sequence, the model holds to the concept of non-linearity and flexibility in which reflections from the participatory team are crucial to determine the exact sequence of tasks being taken. To date, the theoretical issues of using virtual reality in education are not widely addressed. Indeed, to enable effective and proper infusion of such technology into an education setting, more fundamental research, such as design-based research that aims to generate theories on virtual reality learning, should be further encouraged. In such research, various aspects of the designed learning environment are adjusted and tested in their naturalistic contexts, in the effort to derive a general theoretical framework. Research should also focus on identifying the advantages of virtual reality methods, devising innovative methods that employ the unique features of
this technology, and figuring out the approaches to implement this technology that can help to improve the quality of education as well as to direct the proper use of virtual reality.

14) **Enrico Gobbetti et al. (2010)**, have explain that the Virtual environment technology has been developing over a long period, and offering presence simulation to users as an interface metaphor to a synthesized world has become the research agenda for a growing community of researchers and industries. Considerable achievements have been obtained in the last few years, and we can finally say that virtual reality is here, and is here to stay. More and more research has demonstrated its usefulness both from the evolutionary perspective of providing a better user interface and from the revolutionary perspective of enabling previously impossible applications. Examples of applications areas that have benefited from VR technology are virtual prototyping, simulation and training, telepresence and teleportation, and augmented reality. Virtual reality has thus finally begun to shift away from the purely theoretical and towards the practical. In addition to further research and development on actual hardware and software issues, all the areas of VR technology would benefit from research aimed at better understanding the role of sensory cues and human perceptual issues. This improved understanding not only is required to know how sensory cues can be delivered or simulated, but when and how they should be used. As a conclusion, we can say that given the complexity of VR, the importance of human factors, and the lack of standard solutions, the secret of successfully implementing professional VR applications is to set realistic Expectations for the technology.

15) **Bobbie Ticknor et al. (2011)**, have suggested the term virtual reality (VR) is believed to have originated in 1938 with author Antonin Artaud, who referred to the theatre as “la realite virtuelle” (Davis, 1998; Zorn, 2010). Although used in this sense to describe more abstract concepts, visionaries were already beginning to create devices to mimic reality. In 1929, inventor Edward Link created the first flight simulator. Virtual reality systems
are used to achieve a broad range of goals in a variety of fields of study. The criminal justice system can benefit from this rapidly expanding technology in three specific ways. First, the issues of experimental control and problematic research methodologies can be addressed. Second, both practitioners and offenders can benefit from training within virtual environments. Third, rehabilitation efforts can be improved by providing offenders a safe and controlled environment for treatment. With dwindling resources and increasing correctional populations, virtual reality offers cost-efficient and effective means of addressing the diverse needs of the criminal justice system.

16) Chris Cocking (2011), has propose that use of VLEs in education is increasing exponentially and this is opening up exciting new opportunities, as learners interact with each other more and more in virtual worlds. This may even result in changing the very way in which we view education. “The definition of learning as information re-gurgitation is giving way to a notion of learning as centring upon immersive learning experiences that are inherently social and collaborative”.

17) Jan Linxweiler et al. (2011), has proposed that, most computational fluid dynamics (CFD) simulations require massive computational power which is usually provided by traditional High Performance Computing (HPC) environments. Although interactivity of the simulation process is highly appreciated by scientists and engineers, due to limitations of typical HPC environments, present CFD simulations are usually executed non interactively. A recent trend is to harness the parallel computational power of graphics processing units (GPUs) for general purpose applications. As an alternative to traditional massively parallel computing, GPU computing has also gained popularity in the CFD community; we motivate the use of GPU computing to facilitate interactive CFD simulations. In our approach, the simulation is executed on multiple GPUs instead of traditional HPC environments, which allows the integration of the complete simulation process into a single desktop application, we show a fully bidirectional fluid-structure-interaction for self-induced membrane oscillations in a turbulent flow. The efficiency of the approach allows a 3D simulation close to real-time.
18) E. KirubaNesamalar et al. (2012), has describe as Virtual Reality is a computer system used to create an artificial world in which the user has the impression of being in that world and with the ability to navigate through the world and manipulate objects in the world. Virtual Reality (VR) is a term that applies to computer simulated environments that can simulate physical presence in places in the real world, as well as in imaginary worlds. Most current virtual reality environments are primarily visual experiences, displayed either on a computer screen or through special 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. Virtual reality is used to describe a wide variety of applications commonly associated with immersive, highly visual, 3D environments. The development of CAD software, graphics hardware acceleration, and head mounted displays, database gloves, and miniaturization have helped popularize the notion. People often identify VR with head mounted displays and data suits.

19) Misty Antonioli, et al. (2012), has presented that the AR has already begun to help students learn more efficiently as well as increase their knowledge retention. However, before AR becomes mainstream in education, like desktops, laptops, tablets, and even cell phones have become, special consideration must be taken into account on the usability, cost, power usage, visual appearance and the like, in order for content AR simulations activities to become part of the regular academic curriculum. AR has proved to be an engaging way for students to participate in their learning. This new technology allows the learning to be student-centred and create opportunities for collaboration that fosters a deeper understanding of the content. AR is on the way to becoming an important part of education, and its use will continue to grow.

20) Jinzhou Wang (2012), has explained Virtual reality technology is becoming perfected and perfected with the aid of computer hardware, software and virtual world integration technology, which can simulate the real world dynamically. The dynamical circumstance
can make reaction according to people's form, language and so on immediately, by which a real time communication is formed between people and virtual world. Therefore virtual reality technology has been applied in sports training, competitive sports, etc. and is playing a significant role in competitive sports development. Aim of research is to resorts documentation method, professor interview and mathematical statistics to research the application of virtual reality technology in competitive sports concluding analysing its importance and future development. Its aim is to make scientific breakthrough in virtual reality technology application in competitive sports, which can advance competitive sports development, to advance our country to be sports power and to force people to challenge themselves. In that manner we can also use virtual reality for practical purpose.

21) **Maryam Vafadar (2013)**, has proposed that, Virtual Reality systems have drawn much attention by researchers and companies in the last few years. Virtual Reality is a term that applies to computer-simulated environments that can simulate physical presence in places in the real world, as well as in imaginary worlds. Interactivity and its captivating power, contribute to the feeling of being the part of the action on the virtual safe environment, without any real danger. So, Virtual Reality has been a promising technology applicable in various domains of application such as training simulators, medical and health care, education, scientific visualization, and entertainment industry. This research is a technical brief on Virtual Reality technology and its opportunities and challenges in different areas.

22) **Mehryar Nooriafshar et al. (2014)**, has proposed the importance and effectiveness of visual features in teaching and learning materials. It has been demonstrated that multimedia can provide a very effective teaching and learning environment in such a way that the learning style preferences. The visual aspects and interaction with the multimedia system are the most preferred features amongst the surveyed students. In all of these studies, the surveyed students have also indicated that the visual features play a very important role in understanding the concepts. This paper reports the research findings of using virtual reality in teaching and learning, investigates the possibilities of incorporating virtual reality technology into the tertiary education courses. It was
concluded that virtual reality multimedia could enhance learning by providing much more realistic images and visual features.

23) Anh Mai Nguyen (2014), have explain that in this prototype, only one single 3D Touch device is used to wear on a finger. However, to enable multi-touch capability, it is possible to use more than one device on multiple fingers such as two index fingers, or index finger and thumb. With 3DTouch, and explored implementing the gestures using the characteristics of optical sensors. This method may be novel relative to approaches using mechanical buttons, or capacitive touch technology. However, a further evaluation on the gesture recognition is necessary to investigate its performance in outdoor environments and across different textures. Also, we would like to further evaluate the performance of 3DTouch against the existing 3D input devices such as mobile touch devices across different 3D virtual environment platforms (e.g., desktop, home theatre, or CAVE). With touch interaction concept employed, 3DTouch can also be used with mobile touch devices with added value of finger orientation. This may be useful for certain applications that take finger orientation into account.

24) Pawel Buchwald et al. (2015), this article presents by author chosen modern information technology solutions in virtual reality. The additional goal of this research is to provide a concept for the possibility of realization of the computer system for special imaging, helpful at 3D objects prototyping. The chosen 3D visualization devices are presented, as well as modern control interfaces with examples. Finally, the concept of connecting presented devices and applications with Unity 3D for construction of a prototyping application. Prototyping is the initial phase of the product manufacturing, and its purpose is to create the designed item according to the documentation. A significant stimulus to the development of the use of virtual reality is a drop in the price of equipment for three-dimensional visualization.

25) Mike Alger (2015), has presents some pre-visualization design methods for volumetric user interfaces and experiences within the larger scope of a virtual reality operating
system. have explained why virtual reality harbours a promising opportunity for human productivity. And explained what types of content it is best suited for and the most likely ideal locations for that content, both ergonomically and understandably, also detailed workflow methods through which we can design interfaces to interact with and modify that content using existing technology explained that virtual reality is a rapidly evolving topic, changing frequently. It is very possible that much of these concepts an workflows will be rendered obsolete within even a year’s time Where writing, film, television, radio, theatre, graphic design, etc. have expected elements, head mounted displays remain conceptually open-ended. As a community, we are discovering the medium’s unexpected strengths and weaknesses. In coming years the consumer market will run virtual reality through the refining crucible of ethics, etiquette, and social acceptance. Rating systems, legislation, and standards Committees will form to ensure the mitigation of social risks. We will soon see the first VR related death, claims of head mounted displays causing cancer, blaming the medium for causing violence, social detachment, psychologically or physically melting the brains of its users. Alongside this will be the immersive storytelling, compelling experiences, and discussions of human bodily transcendence by way of technological augmentation. And, of course, there is the prospect of heightened productivity and happiness.

26) ArtiYadav, et al. (2015), have suggested that the study proposes a new method for applying AR technology to interior design work, where a user can view virtual furniture and communicate with 3D virtual furniture data using a dynamic and flexible user interface. And all the properties of the virtual furniture can be adjusted using occlusion-based interaction method for a Tangible Augmented Reality. And proposes a marker based augmented reality application using Android operating system which will help to combine virtual objects with the real environment.

27) Chris Christou (2015), has explained that, Virtual Reality is produced by a combination of technologies that are used to visualize and provide interaction with a virtual environment. These environments often depict three-dimensional space which may be
realistic or imaginary, macroscopic or microscopic and based on realistic physical laws of
dynamics or on imaginary dynamics. The multitude of scenarios that VR may be used to
depict make it broadly applicable to the many areas in education. A key feature of VR is
that it allows multi-sensory interaction with the space visualized. This combination of
multi-sensory visualization and interactivity make VR ideally suited for effective learning
and try to explain this effectiveness in terms of the advantages afforded by active learning
from experiences.

28) Gilson Giraldi et al. (2016), has represented the basic of virtual reality (VR) describe
their application, how to interacting with 3D computer generated worlds. Also discuss
virtual reality applied to scientific, visualization, medicine, and engineering and main
perspectives of virtual reality is project at LNCC and present various virtual reality
devices like Head mounted Displays, VR glasses, Crystal Eyes, Elsa Revelator glasses
,Data glove, Cyber puck,& explain various VR system like Cave immerse Desk, Infinity
wall, Collaboration VR system and various application area of VR. Like Architecture
walkthrough ,Medicine, Archaeology and Arts, Entertainment, Simulators & Training
Engineering ,Scientific data analysis & VR at the LNCC.

29) Rashidi Abd Rashid, et al. (2016), has described that the Augmented Reality (AR)
technology have received attention in recent year due to the growing number of
smartphone devices. Smartphone function is powerful enough to have the capabilities to
support AR technology. One of the fields that AR can take advantage of is the tourism
industry. AR application installed in a smartphone able to provide features to help
facilitate tourist activities and enrich their experiences. Developing such application
requires a thorough study on software requirements. Thus, the purpose of this study is to
analyse the requirement needed to develop a mobile AR tourism application and propose
such requirements for future research and development.
30) Xue-qin Chang et al. (2016), have been describe that, Virtual reality technology as a new kind of remote education media technology, with its powerful teaching advantages and potential, is bound to vigorously promote the informatization development process of distance education. Applying VR technology in remote education research is still in its infancy, combined with the Web 3D technology itself is not mature and standard is not unified, and hinders its application in distance education. System based on virtual reality technology is a systematic project; need to be done in accordance with the method of system engineering design and implementation. The system is a simulation of real life in campus where students can take activities such as having class, doing exercises and making friends; and teacher can make lectures, review works of students and conduct examinations; managers can manage the daily teaching activities and students' affairs.

31) Neil Vaughan (2016), has suggested that, this overview presents the current state-of-the-art of self-adaptive technologies within virtual reality (VR) training. Virtual reality training and assessment is increasingly used for five key areas: medical, industrial & commercial training, serious games, rehabilitation and remote training such as Massive Open Online Courses (MOOCs). Adaptation can be applied to five core technologies of VR including haptic devices, stereo graphics, adaptive content, assessment and autonomous agents. Automation of VR training can contribute to automation of actual procedures including remote and robotic assisted surgery which reduces injury and improves accuracy of the procedure. Automated haptic interaction can enable tele-presence and virtual artefact tactile interaction from either remote or simulated environments. Automation, machine learning and data driven features play an important role in providing trainee-specific individual adaptive training content. Data from trainee assessment can form an input to autonomous systems for customised training and automated difficulty levels to match individual requirements. Self-adaptive technology has been developed previously within individual technologies of VR training. One of the conclusions of this research is that while it does not exist, an enhanced portable framework is needed and it would be beneficial to combine automation of core technologies, producing a reusable automation framework for VR.
32) Jorge Martín-Gutiérrez et al. (2016), have represented that, Virtual reality captures people’s attention. This technology has been applied in many sectors such as medicine, industry, education, video games, or tourism. Perhaps its biggest area of interest has been leisure and entertainment. The introduction of virtual or augmented reality had several constraints: it was expensive, it had poor ergonomics, or implied too much work to create contents. Recent technological innovations, including the rapid adoption of smartphones by society, have facilitated the access to virtual reality and augmented reality of anyone. In addition, several large companies like Apple, Facebook, Samsung, and Magic Leap, among others, have increased their investment to make these technologies to improve their accessibility within the next few years. Educational institutions will benefit from better accessibility to virtual technologies; this will make it possible to teach in virtual environments that are impossible to visualize in physical classrooms, like accessing into virtual laboratories, visualizing machines, industrial plants, or even medical scenarios. The huge possibilities of accessible virtual technologies will make it possible to break the boundaries of formal education.

33) A. Pantelić, et al. (2017), author explain the Virtual reality (VR) and augmented reality (AR) are technologies that are very attractive to the learners since they offer new experiences when learning about the real world. The process of developing AR application content with the tool Aurasma Studio. We believe that experiences and lessons learned presented in this paper could help the teachers to plan, design and develop AR applications without spending too much time on the whole development process. The purpose of using VR and AR technologies in education is to achieve better learning effects than by using traditional means of teaching and learning. Recognition will be better if the image has a tonal variation and contrast, if it’s large enough and printed on matte finished paper instead of glossy paper which might reflect the light to the camera. When working with overlays in Aurasma Studio, it is desirable to name them meaningfully for easier handling. Creators need to evaluate the quality of the created AR
contents, order to reduce the probability of students’ cognitive overload and misunderstanding.

34) S E Bazarov et al. (2017), has propose that the development and implementation of communication and information technologies, both in the public sphere of activity and in the learning environment, is an integral part of the modern world. Significant changes which have affect each area of activity, and education is no exception. These technologies are introduced as a need and contributing to the improvement of knowledge and requirements for changing education at a higher level. Before integration of innovative technologies in education, the most common method of teaching was direct interaction between teachers and students in the classroom through their attendance. But by virtual reality method is valid now and has proved its effectiveness. But educational institutions are interested in introducing more productive methods for improving learning interaction and increasing the level of information understanding and acquisition by learners.

35) Jason Orlosky et al. (2017), has explain that, in recent years, virtual and augmented reality have begun to take advantage of the high speed capabilities of data streaming technologies and wireless networks. However, limitations like bandwidth and latency still prevent us from achieving high fidelity telepresence and collaborative virtual and augmented reality applications. Fortunately, both researchers and engineers are aware of these problems and have set out to design 5G networks to help us to move to the next generation of virtual interfaces. The art virtual and augmented reality communications technology and outlines current efforts to design an effective, ubiquitous 5G network to help to adapt to virtual application demands. And discuss application needs in domains like telepresence, education, healthcare, streaming media, and haptic, and provide guidelines and future directions for growth based on this new network infrastructure.