The Application of Virtual Reality and HyperReality Technologies to Universities

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INTRODUCTION

The term HyperReality (HR) was coined by Nobuyoshi Terashima to refer to "the technological capability to intermix virtual reality (VR) with physical reality (PR) and artificial intelligence (AI) with human intelligence (HI)" (Terashima, 2001, p. 4).

HR is a technological capability like nanotechnology, human cloning and artificial intelligence. Like them it does not as yet exist in the sense of being clearly demonstrable and publicly available. Like them it is maturing in laboratories where the question "if?" has been replaced by the question "when?" And like them the implications of its appearance as a basic infrastructure technology are profound and merit careful consideration. (Tiffin &Rajasingham, 2001)

Because of this, universities, if they are to be universities, will be involved with HR as a medium and subject of instruction and research, and for the storage and development of knowledge (Tiffin & Rajasingham, 2003). The concepts of HyperUniversities, HyperClasses, Hyperschools, and HyperLectures are at the same level of development as the concepts of virtual universities, virtual classes, virtual colleges, and virtual schools in the later part of the 1980s (Tiffin & Rajasingham, 1995).

A project on emerging nanotechnology, Consumer Products Inventory contains over 380 products ranging from clothing, home furnishing, medical scanning and diagnostics tools, electronics, computer hardware, scanning microscopes, and so on (http://www.nanotechproject.org/index.php?id=44&action=view). This is the future environment for which universities will need to educate society.

HyperReality subsumes virtual reality. HR is only possible because of the development of computer-generated virtual reality, in particular, the development of distributed virtual reality which makes it possible for different people in different places to interact together in the same virtual reality. It was the theoretical application of this capability to education, and especially to university education, that lead to the concept of virtual classes in virtual schools and universities (Tiffin & Rajasingham, 1995). Initial experiments simulated virtual classes by using videoconferencing, audio conferencing, and audiographic conferencing. The emergence of the Internet shifted these ideas from a laboratory stage to institutional development of institutions calling themselves virtual universities and virtual schools, by virtue of being able to bring teachers and students together in classes using telecommunications and computers, instead of public transport and buildings.

Today, synchronous and asynchronous virtual classes are conducted using learning management systems (LMS) applications such as Blackboard, Chatterbox, Eluminate, and Lotus LearningSpace on the Internet. Furthermore, highly interactive, reusable learning objects (LOs) that are adaptable in all aspects, and interoperable with other learning objects, are rapidly coming online (Hanisch & Straber, 2003). HypreReality LOs, still in Beta, are being developed.

HyperReality also subsumes artificial intelligence. Teaching machines and computers have been used for instruction since the early days of computer-assisted instruction (CAI) in the 1960s, albeit with little overall impact on education, especially at the university level. However, the growing capability and ubiquity of AI expert systems and agents, the vast amount of repetitive work involved in teaching, and the growing application of business criteria to the management of education suggest that AI agents, conceivably in avatar form, will be adopted in education, and the place where this will begin is likely to be in the universities.

THE NEED

Worldwide, governments face the challenge of increasing demand for university education. In Asia alone, the numbers seeking university places is predicted to rise from 17 million in 1995, to 87 million by 2020 (Rowe, 2003). It is unlikely that such demand can be fully met using the traditional communications systems of education (Daniel, 1996). These are:

- The public transport systems that bring students and teachers together for regular episodes of face-to-face instructional interaction called classes, lectures, seminars, or tutorials;
- The buildings which provide the dedicated instructional environments called classrooms, lecture theatres, or seminar rooms characterized by frame-based presentation media, and workspace on desks and tables. The buildings also need support environments such as offices, rest areas, and recreational facilities;
- Provision for the use of paper-based storage media (books, notebooks, exercise books, assignment folders) in libraries, carrels, desks, assignment drops;
- Laboratory space and facilities; and
- Support infrastructures for telecommunications.

The costs of building and maintaining universities, and the support infrastructures they need, are high, and getting higher. Increasingly, universities turn towards the Internet, where students and teachers can be brought together as telepresences in virtual classes, virtual lectures, virtual seminars, and virtual tutorials. Rumble (1997, 1999, 2004), Turoff (1996), and Butcher and Roberts (2004) all agree that virtual universities on the Internet are significantly less costly than conventional building-based universities. With user pays, it is suggested that the cost structure will further change. Virtual universities that function primarily through the Internet, and have no buildings for student needs, and no demand on public transport infrastructures for students, have been in existence since the mid-1990s. At a minimum, conventional universities today have a homepage on the Web, their students use the Web to help with assignments, and to link with other students, their teachers, and administrators using LMS applications. University management and teachers explore other ways of expanding teaching and administration activities on the Internet, particularly for synchronous learning on desktop, using voice over Internet protocols (VOIP), mobile telephony as they come onstream.

Initially, people tend to communicate through new media in the manner of the old media they are accustomed to. Universities use the Web as a library resource, and for what was traditionally done by means of handouts and brochures, and e-mail for housekeeping notices, seminar discussion, and written assignments on Blackboard. Virtual universities on the Internet tend to operate as electronic correspondence colleges, mainly in asynchronous mode. However, the Internet is becoming broadband, and computers get more powerful and portable. Universities can now use the Internet for streamed lectures and for holding classes by audiographic conferencing, computer conferencing, and video conferencing synchronously and asynchronously. It is possible for students and teachers to have telepresence as avatars, and be fully immersed in three-dimensional distributed virtual classes (Tiffin & Rajasingham, 2001).

The Virtual Class/Lecture/Seminar

Roxanne Hiltz coined the term "virtual classroom" for the use of computer-generated communications "to create an electronic analogue of the communication forms that usually occur in a classroom including discussion as well as lectures and tests" (Hiltz, 1986, p. 95). In 1986, John Tiffin and Lalita Rajasingham inaugurated a long-term action research program with postgraduate students at Victoria University of Wellington, New Zealand that sought to conduct what they called virtual classes, where students communicated with computers linked by telecommunications. They used the term "class" in the sense of an interactive, instructional, communication function between teachers and students, and between students and the term "virtual" in the sense of existing in effect, but not in fact. Tiffin and Rajasingham hypothesized that learning could be effected by means of computers interlinked by telecommunications without the physical facts of classrooms, schools, colleges, and universities. In contrast to Hiltz, they assumed that education delivered in this way would not be analogous to conventional educational practice, but would be modified by the new information technology and take new forms, and that in time this would include meeting for interaction