Avatar Supported Learning in a Virtual University

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Abstract:
As e-learning gains importance in academic education, new opportunities emerge by the use of advanced avatar technology, specifically with the use of iBot2000 technology to create "robot avatars" as teachers. The objectives of the paper are to study the options, extent and limitations of avatar technology for academic studies in under- and postgraduate courses.

In recent years, Tony Dyson, a worldwide acknowledged robot expert, creator of Star Wars' R2D2, has developed the iBot2000 technology. It is used to create intelligent virtual robots adaptable to different environments with the ability to speak different languages providing logical answers to questions asked. This technology offers the opportunity for blended e-learning to enter the field of the virtual 3-D university (Dyson 2009). Information about this was collected through interviews with Tony Dyson revealing the inventor's view on such technology's advantages within academic studies.

Key Words: virtual learning, avatar technology, iBot2000, virtual university

Introduction
Universities in many countries now offer courses on both a traditional classroom setting and an online format, where students can complete much of their studies from home. Online technology can be especially attractive to mature and part-time students with time constraints, and also allow universities to attract students from around the globe, with students from a range of countries enriching cultural experiences.

Student interaction and the desire of international learning experience may find some future orientation by using popular web applications like 'second life' (Christensen 2008:144). Its popularity of virtual interaction and community membership may be a model, which could enrich academic studies. This paper intends to shed some light on opportunities, which may offer a combination of an already rather popular online behaviour (Second Life) and future-oriented student experience by exploiting such behavioural practice. This intention leads to the potential combination of three main concepts:
- The community concept
- Web 2.0 and second life
- Avatar technology

The ultimate combination would result in a totally virtual academic world. Students of a course are creating a second life character of their own imagination, study, walk and interact in a virtual campus and are attached to virtual lecturers presented by interactive avatars, virtual robots. Nevertheless it needs to be stated that this will need a long time of further improvements, as technology and artificial intelligence are presently not able to bridge all complexities involved.

Avatar – Human Interaction

One of the chief appeals of the immersive virtual environment is that it serves as a medium of communication among remotely located people and that they are able to meet and interact in a virtual 3-D environment (Garau et al. 2003). There are a variety of applications and uses of avatars and 3-D interactive applications in a virtual university environment. For these systems, visitors usually communicate with the programme through a command driven system and have a virtual representation of their requests. For example, they can "walk" through a virtual building with different floors and interact with a human-like virtual guide, or avatar (Panayiotopoulos et al. 2001:109-110). The avatar as a virtual human helps the user navigate inside the application, and can display places, walk from one area to another, and load information on the screen (Panayiotopoulos et al. 2001:113).

Video conferencing is one application that can be effectively used within the 3-D university environment. Initial attempts at this type of video conferencing were less than effective due to insufficient bandwidths and inefficient video compression techniques, but recent technical advances have decreased these issues (Kauff et al. 2002). The ability for instructors to create virtual tutors can offer students a much more flexible schedule when their regular instructors may not be online.

Culbertson (no date) explains that by using avatars, firms can combine the best of face-to-face training with computer-based training, and save money on human trainers or faculty. Avatars may offer an almost human touch that some students may find as an effective substitute for instructors who may not be available during specific timeframes. Culbertson (no date) also lists some direct advantage to learners of using avatars:

- Motivate learners and have the ability for avatars to interact on the student's schedule, as opposed to a human instructor's limited availability.
- Can create interest and fun in learning.
- Can demonstrate soft skills being important in business success.
- Can drive higher rates of learning and completion of subject.

The use of virtual reality and 3-D technology has been successfully used in the higher education environment, although it is still considered a relatively 'new' method of teaching and learning within academia. Yellowlees et al. (2006) conducted a successful study using Second Life as an education tool about the hallucinations of psychosis using two patients with schizophrenia. A medical school university tested the interaction between patients and doctors using gestures and speech with avatars and confirmed that immersion had a positive impact on the students and they found it a powerful tool for teaching and training (Johnsen et al. 2005).

iBot2000 Technology in Education

Avatar technology was already introduced in the 1990's but suffered at the time from technical problems, as it required long interaction times and had high restrictions of its capabilities. One of today's major protagonists is Tony Dyson, best known by its robot R2D2 performing in the Star Wars movies.

In 2006 Dyson started to develop his own virtual technology, iBot2000. This is a virtual interactive robot that can display different characters, so that it can look like a robot or a human being; designed differently to attract various audiences, whether for corporate use, children or academia. This brings it closer to the second life attributes. iBot2000 can present brochures for download, can play movies or present music, may present games and so on.

However, iBot2000's unusual approach is the specific interaction using AI. A user can type a question into a specific field and the robot replies by speech making the iBot2000 technology presently rather unique. Dyson has developed the technology that it comes across to a real-time chat function – a question receives a logical reply, which can be used for further (logical) discussion with the virtual robot. The additional speciality is that such interaction can take on up to eight different languages. This offers a vast opportunity of direct interaction – as successfully tested (schools in Malta, 2007, 2008 and Pittsburgh, USA, 2008) – especially as personal tests proved, the logic of replies is already rather high (Dyson 2009).

Using a technology like iBot2000 is suggested to provide a number of advantages:
- Attractive presentation of learning content
- Inviting to repeatedly studying content for intensified learning of details
- Offering the opportunity of learning at any place with web access
- Customisation of teaching to specific groups of ages
- Overcoming certain language barriers
- Leading to student satisfaction by the use of popular applications known before in different context
- Intensifying learning outcomes by applying ICT technology
- Leading towards blended learning

Based on these experiences and outcomes with pupils, Dyson developed the iBot2000 technology further for addressing requirements of higher education institutes. The proposition for universities is that they may now use parts of the iBot2000 technology to reconstruct their physical campus in a virtual world.

The avatar technology may present lectures and seminars similar to a real lecture presented in a lecture theatre. However, with the present implication that the function of asking the virtual lecturer questions is rather limited, since a) this development is still at its beginning and due to financial restrictions not fully developed yet and b) the programming of logic answers is highly complicated because, as Dyson (2009) explains, questions can be asked in so many ways that this process is overwhelmingly complex and thus needs substantial further funding for research and development. Foreign students may ask questions using various grammar and words, which cannot be recognised easily by the fixed avatar programmes, especially when programmed using the grammar of a native speaker. This can either result in a wrong reply or none at all. Nevertheless some underlying fun is provided, as students may create their own character (similar to second life) and walk in the virtual world as if it is the real campus.

The acceptance of students to engage in such different type of studies needs to be assured, hence studied and tested, since there is an initial danger that the distraction provided by the extra features may reduce learning outcomes and knowledge gained. On the other hand, once prepared and available, students can take advantage of consuming such lectures as often as they want and take advantages of those additional comments, which were raised and discussed within the lecture, either amongst peers or between lecturer and students. This includes the advantage of an individual time of consumption. The real-time recording of such interaction during those lectures makes them more interactive and enriches the experience when consumed later or repeatedly. This is considered as superior to consuming pre-recorded lectures, e.g. using You-Tube, as those pre-recorded lectures are static and cannot add additional discussion.

The expectation is that in the next few years technological developments will continuously be able to overcome the current restrictions. Converging technologies make this

concept of iBot2000 even more future-oriented, since it is designed and prepared for different interfaces, including both computers, mobile phones and other devices.

A virtual campus avoids the foundation of a physical university and the high investment in full infrastructures, and professors can be located throughout the world. The virtual campus application supports the framework of intercultural communication in a different, but potential way to design modules and courses for students of multinational organisations, including lectures for continuous professional development, with different cultural background as it allows universities to found offshore universities without creating the and investing in full infrastructures.

A Critical Inspection of Avatar Technology in Higher Education

As we stated at the beginning of this paper, academics and students have already discovered Web 2.0 for their exchange, needs and interactions. Many of the popular applications were adopted and created an environment in which academia is a centre and profits from web-based structures in- and outside its own ICT-channels. Barnatt (2008) and Christensen et al. (2008) highlight that the impact of the Internet on higher education institutes cannot be ignored. This suggests that a wide variety of tools and applications is already in use and raises the question about the potential interface for avatar technology. For instance, where is the useful point avatar technology can add value to academies and increase the student experience?

Avatar technology in combination with the creation of a virtual campus may be a rather attractive approach. Nevertheless, outcomes need to offer values for both, academies and students. This could find early limitations, since not all of students' locations may provide sufficient broadband lines allowing quick interactions. Language barriers and cross-disciplinary influences of academic subjects require a vast effort of content to be made available. For universities being always restricted in their investments it can be a rather complex and expensive project, while for students a problem zone may be distraction, which could result in engaging too much in second life, than in using second life for learning, i.e., a possible reduction of intended achievements by learning outcomes.

Addressing academic realities in this context means as well that there is a decisive difference in interacting with real tutors and lecturers and a robot missing human attitudes and behaviour. As Richardson's citation of Kitto and Higgins provides evidence, tutors with broad face-to-face tuition experience have reported problems in doing so online and most students (80%) of a study preferred face-to-face tuitions (Richardson 2007:2, 4). The proposition is that avatar technology will create here even more distance between lecturers and tutors and students.

Advantages and Restrictions

In contrast to existing promotion- and profit-oriented software, the avatar technology has three major fields that deserve specific discussion. The first is the automatic translation that is provided by the iBot2000 avatar technology in the text modus. Such function is considered as an important criterion, which none of the mentioned competitive software provide at the moment. Nevertheless, with regard to existing translation software and its known problem of translating things in the appropriate context, this may not be able to provide students the precise reproduction of lecturer's words into a different language during a real-time discussion.

The second advantage is the replacement of a lecturer and multiple viewing of lectures. A major difference is that the iBot2000 avatar can run Q&A sessions after the lecture, as the technology enables users to have a logical chat of necessary depth and width

with the programme. At the moment, the degree of logical discussion tested in iBot2000 is already high, but with regard to the many different forms that questions may be asked by students using different words and notions, the need of cross-disciplinary knowledge need to be programmed. As Dyson (2009) states, this is a lengthy process needing careful considerations for the achievement of effectiveness. A long period of development, test and experiment will be considered necessary enabling students of different origins, with various learning styles and ways of thinking to find it helpful and satisfactory.

The third field of interest is the creation of virtual communities. It is suggested that one of the success factors of second life is that individuals, who for various reasons find it difficult to be accepted in their real life social environment, may overcome such difficulties in a virtual university environment (Dyson 2009). The idea of placing such a community within a campus environment has the advantage of increasing the feeling of social bonds. Similar to real life, virtual student leagues could then create their own specific attractiveness additionally.

Based upon the discussions with Dyson, in order to compete with current technology, the strategy of differentiation should be considered (Dyson 2009). This is suggested as a) the implementation of an avatar software and b) the creation of a virtual university. Some of the features may not necessarily require the design of a virtual university, i.e. the avatar could function as a stand-alone application without needing to be placed in a virtual campus (Dyson 2009).

Currently, a number of the functions have already been fulfilled by existing software and some of them are used as parts of universities' ICT-systems. The complexity of the full iBot2000 technology is likely to present a number of adoption problems to interested universities. This is seen in the areas of quality assurance of learning outcomes, acceptance by students, complexity within ICT-systems, extent of necessary programming, changed requirements of lecture presentation, high investment in complex interactions between lecturers and the ICT-department and so on. Different learning styles in respecting to different students' individualities suggests an additional problem – for instance, such virtual environment may be for some students too distracting and could cause a negative effect on their pursuit of a good degree. However, in the future, we could expect the technology to offer a number of powerful advantages for E-learning – by the time when most of the problems are overcome due to technology advancement.

Further Research
Due to the aforesaid, a decisive question for the application of avatar technology in higher education is what Stefik et al. (2006) described in the context of innovation as the dance of the two questions, "what is possible?" – to which extent will virtual robots be able to take on specific tasks of lecturers and meet students' expectations – and "what is needed?" – will students accept to interact with human-machine interfaces [HMI].

Whilst avatar technology is constantly under development, Dyson (2009) explains that giving always-logical replies to different questions still remains a major challenge. Further research is required to explore the possibility of developing and maintaining an extensive and functional database requiring substantial resources and investment, which a single university might not be able to afford.

With reference to the existing applications (e.g. second life, Blackboard) in and outside the university based ICT-structures, the need of installing the avatar technology is under debate. There is little doubt that avatars could be applied by many business organisations to replace many FAQs and to offer guided tours on their corporate web-

sites. A further application may be incorporate training and professional development as part of the concept of permanent learning and continuous professional development.

However, with regard to the present options available to students, future study is needed to explore students' perception on the avatar technology. For example, what kind of functions could be provided to engage them? What kind of interface do they prefer? This may help identify the need of the avatar technology and shed light to the future development of the iBot2000, so that it is consumer-oriented and user-friendly.

Conclusions

Avatar technology like iBot2000 can offer a different and enriching perspective for future learning and teaching activities. Future research is needed to provide direction for further developments on the project. This may help iBot2000 overcome the technical problems so that it can offer users an increasingly satisfying and engaging learning experience. Dyson (2009) sees an opportunity for iBot2000 in the way that it may present itself as an attractive learning and teaching tool to pupils offering simulative fantasy and enriching learning experience. He states that the tests made at different schools showed that time and intensity of learning is increased by the avatar technology.

With reference to its underlying research, this paper concludes that, with specific regard to students' benefits, it is likely to take a lengthy period of time until all embedded advantages may be fully detected, developed and adopted before this technologically will become applicable in full and obtain commercial viability.

During this time any such new technology is likely to be in strong competition against other software, e.g., facebook, google, WebCT, etc., that is undergoing permanent improvement. As a further quick operational use of iBot2000 technology we suggest a potential implementation within the learning environment of corporations, which have invested more and more in the field of further education for their employees, either by providing in-house training or founded programmes at universities.

As Tidd et al. (2005) argued, *"[a] core characteristic associated with high-performance organisations is the extent to which they commit to training and development"*. These authors rely their statement to the concept of the learning organisation, which has become a decisive point of differentiation with regard to the organisational asset of human capital (Tidd et al. 2005:484-485). Such learning within organisations is an important activity for building corporate competence, which comprises firstly innovative organisations, but needs to be respected by traditionally oriented organisations, too (Edquist 2005). The present technological capabilities of iBot2000 may find the ground for immediate application and offer businesses and organisations direct use and advantageous implementation.

Our concluding argumentation is that a corporate learning environment is frequently centred on specific problems. This suggests that in comparison to an academic learning environment, the complexity of cross-disciplinary requirements at business organisations is reduced and thus requires less extensive programming effort significantly.

For academic purposes, a present opportunity may be the extension of the virtual library (E-resources) to a 3-D library, in which an avatar may function as a virtual librarian being able to guide visitors through the collection of e-books and e-papers: Research papers, academic articles and other literature can be made available as before, but an avatar could act as a high-speed interactive and more precise search guide. Furthermore, the virtual librarian in form of an avatar can recommend additional papers and web-links around a users' core search. This is not too different from technologies, which, e.g., Amazon has already successfully developed and implemented providing

personal recommendations, but allows a kind of a 'personal touch'. This proposes that a number of the present technological limitations stated may be easier resolved.

For participating academic institutions the individual investment will be reduced, since shared among participating partners. These partners may even come from different countries or continents and can benefit from high attractiveness and increased visitor numbers, since the 3-D library with an avatar librarian supports the shifting behaviour of online users more appropriate.

Considering the specific and rather limited environment of a 3-D library, this may go as far as that each user of such virtual library may develop and design his/her own personal library assistant (Second Life features) remembering the fields of individual interest and research, which is not too distant from existing software as Amazon, ebay and the like already use successfully.

Steinmueller argues that the progress of technology offers an "*ever-expanding array of possible applications for ICTs*", which may be time-consuming and expensive to make (Steinmueller 2007:202). Whether avatar-technologies can result in the proposition of Christensen et al. (2008)'s proposition of the *disruptive class* remains unclear yet, since such rather radical development depends on a widespread adoption and has to compete against existing applications, which are available free of cost and have been developed on a constant basis (Steinmueller 2007).

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