

An adventure game approach to multimedia distance education

Linda Carswell and David Benyon

Computing Department

The Open University

Milton Keynes

{L.Carswell, D.R.Benyon}@open.ac.uk

Abstract

There are many areas of study which are notoriously difficult to present by traditional distance learning methods. Typically these are areas which demand a great deal of interaction between the student and tutor and are best taught through practical experience and considered reflection upon experience. For example, within the discipline of computing, one such area is the teaching of information systems analysis and design. The emergence of multimedia computing has provided educationists with a learning tool more able to replicate some of the desired interaction required to teach difficult areas of learning at a distance. In particular, it offers the opportunity to provide a richer learning experience coupled with interactivity in an integrated learning environment. This desired interactivity is evident in multimedia games as is motivation. These characteristics make the gaming paradigm an attractive catalyst for learning. In this paper we describe the motivation for developing a multimedia adventure game for teaching information systems.

1 Multimedia computing and learning

Although the potential of the computer as a learning tool was recognised as early as 1960, its application generally has a poor record. In a desire to be current, many institutions rushed into this technology without a determined emphasis on the achievement of academic goals [1]. A repeated theme in computerised learning is the utilisation of technology for technology's sake. Tried and tested learning principles are often ignored, resulting in poor quality materials. While the use of computers in teaching offers advantages over other media, such as static and inflexible text based materials, its presence alone is insufficient. It needs to be guided and directed in order to achieve 'education'.

Learning theories have something to offer in guiding the underlying learning structure. For example Bloom's Taxonomy [2] of objectives are still applicable as they identify steps in the learning process which assist in the knowledge development process. Gagné's [3] hierarchy of capabilities is useful to help establish a clearer definition of aims: what strategies should be employed to achieve set objectives.

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The utilisation of task analysis in defining sequencing of learning determines the complexity of the learning required and can identify smaller achievable objectives or competencies which can be mapped to objectives in a multimedia environment. Skinner's theory of operant conditioning [1] can be readily adopted in that desirable actions can be 'rewarded', such as in a gaming environment: pedagogic aims, objectives and instruction are disguised by the aims and motivation of the game. Without a clear specification of learning aims and objectives the materials may fail to achieve the required pedagogic objectives.

Historically, different modes have been used in courseware development, many of which have their roots in recognised learning models. For example, drill and practice has its foundations in behaviourism and focuses on operant conditioning where the subject is reinforced by positive or negative feedback. Tutoring differs from drill and practice in that it serves as a complete learning situation, ranging from the introduction of new material to assessing and recording the learning success. It incorporates a wider range of material and the learners are encouraged to construct their understanding at a self directed pace. Simulations are powerful techniques that teach by imitation and replication [4]. They exploit theories of constructivism based on research by Bruner and Papert in the 70's that suggest 'learning by doing'.

Many of these approaches have been implemented on computers but fail to realise the potential capabilities of the computer as a learning tool. How best to use this tool is still unclear but the emergence of multimedia opens up greater potential for exploitation by providing a learning approach which is interactive, engaging and stimulating. By increasing interactivity and integration a much more engaging and qualitatively richer learning experience is possible. It is this combination of media - text, video/TV, graphics, animation, voice/sound/music and computer-based activities¹ - and interactivity which is encompassed by the term 'multimedia'.

2 Multimedia genres

The dimensions that characterise multimedia may be used to distinguish different multimedia activities or *genres*. The dimensions of this space are *interactivity* and *integration of media*; described and illustrated in Figure 1. The *interactivity* dimension distinguishes the extent to which the user is able to influence the order in which objects are displayed. The *integration of media* dimension seeks to describe both the

¹ Although other media and other modes of interaction are becoming available - e.g. gesture [5] - they are still much less prevalent than the four principal media of text, video, graphics and sound which dominate multi-media.

number of media and the dynamics of the media exploited by the object. Hence the 'user' of a multimedia presentation such as a slide show has little opportunity to influence what happens next whereas the user of a hypertext system has more control over sequencing of objects.

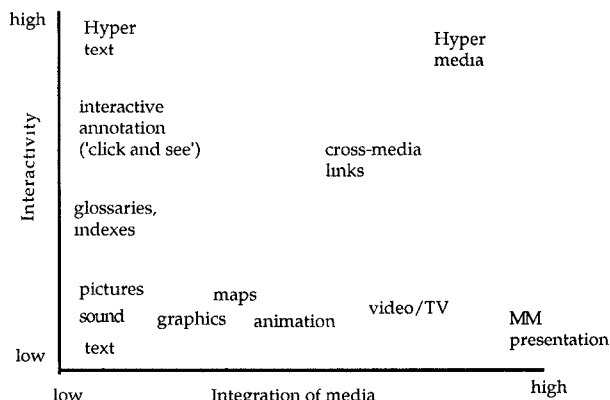


Figure 1 Describing the space of Multimedia

Until recently, computers have been used in distance education as 'single tools' or parts of courses rather than complete teaching instruments. While effective use has been made of this facet of computing its segregation from the learning, and the need for students to switch from one media to another in the learning process, lacks the desired integrated environment. With the emergence of multimedia and the increased capacity to store information, the role of the computer in learning has changed. No longer is it perceived as providing a single function in the learning but as an all encompassing environment providing a complete and integrated learning system.

3 Games

Multimedia is heavily exploited by the wide range of computer-based games which abound. While its existence may be shunned in some quarters its significance cannot be ignored. (Figure 2 places some games amongst other multimedia works). If educators can harness the motivation of the game into learning there is potential to stimulate distance learners in a way not previously possible. Recent studies have indicated that multimedia learning alone may not significantly increase knowledge acquisition but when a gaming metaphor is employed it significantly increases knowledge acquisition and user enjoyment [6].

Gaming is characterised by recognising the winner with either a score or a ranking. The use of reward is a strong response reinforcer which serves to encourage the repetition of an action. To be effective, the reward must be immediate and identifiable. Providing feedback or helpful hints at strategic points may also be necessary. Apart from adventure games which are considered below, it is useful to identify three other forms of game.

The 'shoot 'em up' game originates in the early days of *Space Invaders* and such games remain immensely popular. Probably one of the best known in the 'shoot-em up' genre is *Doom* [7]. Related but more 'skill-based' interactive games such as driving and flying games offer another angle on these.

'Strategy' games are typically based on well-known paper-based games such as Battleships, logic games, card games and the like.

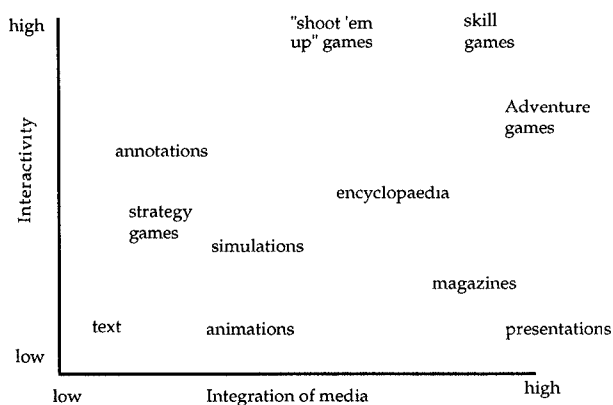


Figure 2 Placing multimedia genres in the multimedia space

Adventure games have been popular on computers for many years. The modern adventure games have developed both engagement and interactivity considerably. The games are typified by placing the user in a computer 'world'. Probably the most notable feature is the use of high quality graphics and sound, and how the user navigates by clicking to indicate the direction, or by 'picking up' an object or operating an object through direct manipulation. These games also include short video clips and the merging of video, graphics and sound come together to provide an engaging experience. *Myst* [8] is generally recognised as the most impressive of its genre. It uses imagination and mystery to interest the player as opposed to violence. Although the interaction is not real time, the users thought processes are challenged as opposed to physical responses, in a world of mystery and puzzlement.

Regardless of your view on computer games they are here to stay. They have powers of motivation and captivation which are not quite fully understood. However, if they can be harnessed positively into a learning situation they are worth exploring.

4 Adventure games and distance education

As providers of distance learning one of our main concerns is the motivation and retention of our students. We are already aware of the problems facing such students and practices are currently reviewed in an endeavour to continually motivate them throughout the course. In various areas of learning there are well documented and recognised topics which are difficult. In conventional teaching these are surmounted by increased tutor-student interaction and tutorial support—something difficult to replicate in distance teaching.

In tertiary education students are motivated when presented with tasks where their reward, successful completion, provides evidence of their progression. Emulating such an environment in distance education is difficult. The rewards are delayed and far from immediate, often dependent upon completion of assignments, which are infrequent. There is potential for feedback at tutorials but due to their nature, opportunity to provide 'reward' is limited.

If we consider some of the characteristics of games they lend themselves to desirable attributes required in a programme for distance education. For example the use of reward is a strong reinforcer for a repeated action, a technique used by educationalists in teaching situations. But this characteristic alone is insufficient. To promote engagement and interest the game should also be high in integration of media (see figure 2) in order to stimulate the imagination. In a teaching environment the use of violence is undesirable rendering the 'shoot 'em up' games inappropriate. These are charted as having a high degree of interactivity, but the media is less integrated. Skill games are high on both scales, but are mainly concerned with physical prowess and hand/eye co-ordination. Adventure games, on the other hand, involve problem solving and the development of transferable skills. They promote interactivity, engagement, enjoyment, with extended periods of concentration on tasks (on and off line) and yet they are benign enough to be inoffensive to a range of user groups.

In order to motivate such students in the learning process it is important to strike a balance. There must be engagement and challenge without frustration. To engage users, the game must be appropriate to their skills and interest otherwise it will be too easy or too difficult. Effective adventure games achieve a harmony between the level of challenge offered and the level of skill required [9]. Boredom can be defined as low challenge, high skills: anxiety can be defined as high challenge, low skills. These must be carefully tempered to provide an interesting and engaging game which motivate the student. Providing a learning environment which addresses such issues for students is a challenge, the adventure game paradigm opens up such possibilities.

5 Summary

The development of multimedia is a tool we wish to exploit, but its presence alone is not enough. There needs to be an understanding of the learning requirements of the student as well as the increased need to motivate the distance learner. The employment of the adventure game paradigm has the ability to engage the student in an environment of interactivity and visualisation where problems can be demonstrated and solved, illustrating cause and effect situations. As the game is the main focus of activity, careful engineering is required to balance the challenge level and skills required. The adventure game paradigm has some interesting and positive implications for distance learners and is worth exploring further.

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