3D Anatomical Models, Adobe® Flash® Animation and Online Communities

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Abstract

Learning objects can be created with a variety of tools and techniques. This paper discusses how learning objects can be developed using 3D models of human anatomy and Adobe® Flash®. The final interactive animations are published as learning objects in Flash format so that they can be embedded in web pages and streamed over the internet.

Learning objects can be used in Learning Management Systems such as Moodle or Blackboard, but can also be delivered through online communities. Students who use the online communities can then discuss the learning objects they have viewed with other users in the community's discussion forums and blogs. This social constructivist technique reinforces the learning they have received by sharing their experiences and thoughts with fellow students.

Introduction

There are a wide variety of ways of creating learning objects and for distributing them to students. [1] In this paper, we discuss how 3D anatomical models, 3ds Max® [2] and Adobe® Flash® [3] can be used to create and publish interactive learning objects.

The social constructivist model of learning states that students learn best when they can discuss their learning experiences with their peers. [4] By providing an online discussion forum, students can take online tutorials and then discuss them with their peers afterwards.

3D Anatomical Models

3ds Max® is a software application that allows the creation, animation and rendering of 3D models. We have used this program to build a wide variety of animations using both third party 3D models and models created in-house. The models are then edited, manipulated, lit and rendered in animated sequences to demonstrate the required learning objective.

Use of 3D animations in web presentations has become more feasible in recent years as broadband internet connections have become more prevalent amongst end users. The animated video sequences are larger files than simple photos so that without a broadband connection it can take several minutes to download an animation.

To assist with online streaming and to add interactivity we use Adobe® Flash® for publishing our animations. The videos are able to be imported as AVI files and can then be annotated and made more interactive using the Adobe® Flash® authoring software.

Accurate anatomy is achieved using carefully constructed, anatomically correct, models. These models are developed over many years from both real life radiology data such as CT and MRI scans and hand modelling by anatomical artists.

It should be noted that creating 3D animations is a time consuming and complicated process. Animations using complex human anatomy are especially difficult to achieve in a way that mimics real life movement or physiological processes.

Adobe® Flash®

Adobe® Flash® is a multimedia authoring tool. Published Flash® movies are in the SWF format and are played back by the Adobe® Flash® Player. The player is embedded into modern web browsers such as Internet Explorer® and Firefox®. The player is also available as a free download from the Adobe web site. [5]

The ubiquity of the Adobe® Flash® Player has resulted in the Flash format becoming the medium of choice for many large web publishing businesses such as YouTube®, CNN® and MSNBC®. The format has excellent video compression technology which means that Flash® is especially good for publishing video content.

Adobe® Flash® movies can be interactive because the authoring software contains a fully functional programming language, *Actionscript*. The amount of interactivity in a movie is decided by the developer. Simple interactions are video controls such as pause and play, drag and drop functions and the creation of interactive 'hot-spots' in the movie. Developers are also able to create complete educational Flash® games using the software. Users can control characters and perform tasks as they do in video games distributed as stand alone software.

Tips for Developing in Adobe® Flash®

1. The latest version of Flash®, CS3, contains many advances including a new version of *Actionscript* and many additional controls for making the authoring process more straightforward. Educators designing learning objects using Flash are recommended to use the latest version.

2. Components are a great way to cut down on the amount of work it takes to create an interactive Flash® movie. Components are small snippets of code and artwork that

can be dragged and dropped into the authoring environment to create interactive elements without needing to code them by hand.

3. Voice-overs can be used to increase the educational value of a Flash® movie. Students listening to a voice over whilst watching a movie play on screen are more engaged and consequently able to learn more from the movie. [6]

Online Communities

The New Media Medicine [7] online community (www.newmediamedicine.com) has been developed over the past 5 years and now has over 39,000 members and the website receives over 1 million page views per month.

New Media Medicine is being developed into an online Learning Management System. The LMS will host courses our courses on Anatomy, Evidence Based Medicine and many other subjects. An online LMS allows community members to take a course online and discuss the content with their peers. User can also publish their own web logs and form online social networks.

Tips for Running Online Communities

1. Learning communities should be open access. By having discussions threads available to the students before they register, they are more likely to join the forum and start responding to discussions.
2. A small number of responsible community members should be recruited to help moderate and manage the forum.
3. A significant number of registered users are required before an online community starts to become self-sustainable. Users want immediate replies to their questions and this can only come with thousands of other users on the site.
4. Online communities should be actively moderated to remove inappropriate messages and to ban offensive users.
5. A "Terms of Use" page should be created and referred to in the case of disputes with users. The "Terms of Use" should be strictly adhered to.

The Development Process

We use a 3 step process for developing e-learning presentations.

1. The client provides us with a preliminary storyboard containing an outline of the presentation. This is usually a PowerPoint® file but could also be a Word® document or PDF®.
2. Artwork and 3D modelling is used to create a full artwork storyboard for approval by the client.
3. Once approved, the storyboard is used to create the full interactive presentation including Voice Over and 3D animations. This is published in

SWF format and can be distributed online, on CD-ROM or over an institutional network.

Partnerships

Partnering with content providers such as the University of Otago has allowed us to create high quality Continuing Medical Education courses. We have also partnered with other e-learning companies such as Go Virtual Medical® [8] to distribute content and assist in future development.

There is further scope for developing international partnerships between universities, hospitals, professional organisations and multimedia developers to share knowledge and increase the quality of learning presentations.

Conclusion

The tools described in this paper are enabling the creation of a new wave of interactive, high quality educational content that can be delivered over broadband internet connections.

By combining high quality multimedia with an online community of learners, a social constructivist model of learning can be achieved in an online setting.

International collaboration between institutions and commercial organisations will enable the creation of informative and entertaining learning content for the next generation of students, wherever they are in the world.

Notes on the Author

Dr Chris Paton, BMBS BMedSci, is a lecturer in Health Informatics at the University of Otago, New Zealand. He is also CEO of New Media Medicine Ltd, a medical e-learning development company and online portal for medical students.

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