School of Physical and Geographical Sciences

Earth Sciences and Geography

INNOVATION PROJECT

Development of digital video techniques within a student-led e-learning system

Nigel Mountney
Stuart Egan

School of Physical and Geographical Sciences
Earth Sciences and Geography
Keele University
(Contact Nigel Mountney, n.p.mountney@esci.keele.ac.uk, Tel. 3171)

2005-2006

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Summary

- This project involved the development of a learning and teaching system based around a database of digital video clips and related digital media that are integrated into a series of student-led practical exercises in earth sciences and geography.
- Digital video footage was shot, edited and produced into a series of 11 short films, each dealing with a particular earth science and geography topic. Attention has been focussed on explaining natural phenomena that cannot be adequately explained using traditional learning and teaching methods.
- Digital video clips are archived in 3 main formats: very high quality digital video tape (DV-AVI), high quality MPG2 for distribution on DVD-Video disks and medium quality WMV for transmission over a computer network and dissemination via the virtual learning environment.
- The 11 films are available on 2 DVD-Video disks that can be disseminated to students at unit coasts of ~£0.20p. Students can either watch the films on a computer or on television via a hardware DVD player. Associated interactive exercises are included on data partitions on the DVDs.
- The 11 films are also available in Windows Media Video (WMV) format hosted on a web server where they form the core data for a series of exercises presented via a web-based front-end. Students can download the video clips and associated exercise questions over the Keele campus network.
- The exercise questions have been devised to integrate with the associated video clips. Exercises are presented as dynamic, interactive PDF forms that have been produced using Adobe Acrobat and Designer. Students answer questions based on the content of the video clips and fill in their answers directly within the PDF forms. Results are then emailed directly to a server application that automatically reads the electronic form answers before returning a mark and feedback to the students.
- Some exercises encourage the students to use the video hardware and software purchased as part of this project to record their own footage of physical experiments and use time lapse and slow motion features to discern aspects of physical behaviour that would otherwise not be evident.
- The entire package can be used in a variety of ways. A) Direct incorporation of video clips into PowerPoint files by lecturers. B) Students can watch each of the 11 films from start to finish on DVD. C) The exercises can be completed by large student groups as part of a practical class. D) The exercises can be completed as part of a student-led revision programme.

1. Background to the project

The aim of this project has been to develop a learning and teaching system that employs the medium of digital video in order to demonstrate the behaviour of various natural physical processes that have hitherto been difficult to describe and explain using more traditional teaching methods. At the heart of the proposed learning facility is a database of video clips that provide students with a dynamic, exciting and innovative learning experience. These have been integrated within an interactive, student-driven learning environment through the development of a dedicated, web-based front-end interface, interactive aspects of which have been developed using Java and JavaScript – programming languages used for the development of dynamic html systems. These video resources are presented as a series of e-learning practical exercises designed to develop independent learning skills in students, especially those operating in large teaching group settings.

A fundamental objective of this project has been the filming, collation and editing a series of video clips that portray earth science and geographical phenomena and their integration with a variety of other digital media types including still photos, animations and computer model simulations in order to produce a dynamic and innovative set of graphical learning resources (Figures 1 and 2). Implicit in this process has been the distillation of 'raw' data into a refined and integrated end-product designed specifically to help students understand complex dynamic processes and to help them solve complex 3D and 4D problems that are common in branches of earth sciences such as stratigraphy. The video footage and related resources are delivered as a series of practical-based exercises.

Understanding cross bedding

Understanding cross bedding

Understanding cross bedding

Ancient aeolian environments

Deltaic sedimentary environments

Deltaic sedimentary environments

Braided river environments

Submarine fan environments

Figure 1. Example screen-shots from a selection of video clips within the database.

Project components

Figure 2. Principal components used in the construction of the digital video e-learning system

Figure 3. The web-based front end to the system.

Resource delivery is being undertaken in part by academic staff in lectures and practical classes, and in part by students via download from an intranet site (Figure 3), Virtual Learning Environment (VLE) or through use of menu-driven interactive DVD-video disks (Figure 4). A further objective of this project has been to encourage students to make use of digital video recording equipment within a series of physical experiments conducted during practical laboratory classes in order to record results that would otherwise not be discernable from standard observations (Figure 5).

The past five years have seen a revolution in semi-professional digital video editing, mainly because digital video cameras have become affordable and desktop PCs have become sufficiently powerful to be able to capture and edit digital video footage at near broadcast quality. Only now are the capabilities of this exciting new medium starting to be employed within taught courses to enhance the student learning experience. The power of digital video lies in the ability to precisely edit footage and mix video with still images, captions, audio overdubs, computer simulations and virtually any other type of digital media. This allows difficult concepts to be explained and illustrated in a manner that has hitherto not been possible.

Figure 2 Example of a menu screen from a DVD-Video devised as a learning tool for use in the Year 2 Geography module 'Deserts and Desert Systems'. Each thumbnail launches a video-clip that portrays examples of processes covered in each lecture within the course. Much of the video footage was collected during research by Mountney in the Namib Desert (1996-1999).

2. Project details

This learning and teaching facility is composed of two main components. Firstly, a web-based user interface that provides an overall 'look and feel' for the system and which takes the form of a menu-driven system that can be used to navigate between various video resources (Figure 3). Secondly, the system contains a series of video clips (Figure 1) and related media that graphically depict various complex or dynamic processes that are difficult to explain using more traditional teaching methods. The near universal acceptance of web pages as an interface for information exchange made this format the best choice as a gateway to the various computer aided learning (CAL) environments that have been developed, namely the series of video-oriented practical and assessment exercises presented here. Integration of the system into the Web CT VLE is being explored.

Student-led video exercise (flume I)

Student-led video exercise (flume II)

Figure 5. Example screen-shots from a student-led video exercise. Students filmed turbid flows in a flume tank and used slow motion techniques to determine the physical characteristics of the flows.

From a basic pedagogic perspective, the video resources are available in a variety of formats such that they can be used by lecturing staff to augment lecture and practical class teaching through seamless incorporation into PowerPoint presentations. Additionally, video clips are available for students to download over a departmental intranet and, where appropriate, they are being disseminated on low-cost DVD-video disks (Figure 4), thus encouraging both the development of independent learning skills in students and an engagement with e-learning.

Figure 6. An example screen-shot from a graphical user interface, which formed part of the prototype system developed as an assessed practical exercise for the Year 3 Geology module 'Advanced Sedimentology'. Students navigate around the block model 'visiting' regions in order to gather facts, answer a series of questions and solve problems. Each of the 'V' icons is associated with a video clip, which can be used to observe dynamic processes (e.g. flash floods) in action.

At a deeper pedagogic level, this project has developed a series of practical exercises based around the use of digital video for the observation of natural phenomena that cannot be witnessed first-hand (e.g. earthquakes, volcanic eruptions, catastrophic floods). In their simplest incarnation, these practical assignments involve students watching video clips before answering a series of questions based around the events therein. However, a more sophisticated approach has also been used whereby video clips form part of a broader e-learning experience. Practical sessions have been developed that use an html- and Java-based web page system to introduce a series of practical e-learning exercises based around various problem-solving scenarios. In order to complete the exercises students work through a series of questions that require examination of video clips to develop an understanding of core concepts within the subject area being investigated. Graphical web pages act as a means to navigate to various video resources that are each visited in turn within the practical session. This concept is best explained further by reference to a specific example. One practical session that has been developed is based around the examination of desert processes and environments. The session commences with students being introduced to a virtual desert environment in the form of an html-based graphical computer model in which typical features such as sand dunes, desert lakes and flash flood river systems are depicted graphically (Figure 6). Images representing this desert system comprise a series of pointers that encourage to students to focus in on specific regions whereupon a variety of digital video clips can be launched in order to gain provide additional detail. Importantly, video clips are supplemented with other related digital media such as still images and computer simulations. Students gather information from these resources in order to answer a series of questions posed within the web-based practical exercise (Figure 7). These types of resources are being employed in a variety of ways: within established practical classes, as supplementary student-led learning and revision exercises delivered as part of an existing course, through a module web site, and as part of formative and summative practical tests. In addition to providing a novel method of assessment, the implementation of these resources also helps to develop independent learning skills in students, and promotes active learning in large group teaching and encourages student engagement with e-learning.

One of the most dynamic aspects of digital video editing is the ability to mix many different types of source data in order to produce a versatile and stimulating learning experience. To this end, the resources developed are composed of several data types that have been combined (Figure 8). Real-life video clips have been mixed with clips showing graphical computer simulations, footage of rapid catastrophic events such as flash floods are shown in slow motion, cartoon animations are used to explain complex processes such as the motion of large aeolian dunes. Furthermore, captions and other graphical indicators, along with audio overdubs have all been added to the video footage to highlight important points (Figure 1).

A further objective of this project has been to encourage student-led experimental research through the implementation of a series of physical experiments that make use of digital video as an investigative tool. For example, the flume facility within Earth Sciences and Geography is a piece of experimental apparatus that is typically used to make observations concerning the behaviour of fluid flow and resultant sediment transport. While student-led flume experiments yield valuable results, direct observations of the processes at work are often limited. This project has enhanced these practical experiments by offering students the opportunity to shoot their own digital video footage, before processing it using specialist video editing software. Students can then analyse their data (for example by implementing time-lapse video techniques) and subsequently interpret the results in a manner that would not have been possible without digital video (Figure 5). This has developed skills in experimental design; it is encouraging independent learning and is forcing students to critically evaluate their own methodologies. Furthermore, it also promotes team working, thereby encouraging active group learning and enriching teaching with discipline-specific research.

Whilst the video resources developed as part of this project have a specific earth science and geography theme, the techniques employed as an integral part of this project are generic in nature such that they could readily be applied across a range of teaching disciplines within the university. A key part of this project has involved the documentation of the technical procedures and specifications used for the development of the video-based learning resources (see section 4 below and appendix A).

KEELE UNIVERSITY

ESC-20002 Reconstructing Sedimentary Environments

Submit by Email

Current Date 15/08/06

Once you have completed the exercise, click on the button above to email your answers to the course tutor. If you are working offline, you can save your answers to an XML file and email this as an attachment at a later date.

Deep Marine & Slope Environments: Sedimentary Structures

First name _____

Surname _____

Student No. _____

Email _____

Instructions

Consider the ten common types of deep marine and slope sedimentary structures listed below and for each choose an image number that exhibits that structure. To view each of the twelve images associated with this exercise in turn, click on the buttons at the bottom of the page. The same image may be the correct answer to several questions. Some images may not contain any of the structures listed in the questions.

Sedimentary structures

Indicate in the box the number of the image that contains each of the following sedimentary structures

	Sedimentary structure	Image number			Sedimentary structure	Image number
Q1	Load casts on a bedding surface	1		Q6	Normally graded bedding	1
Q2	Flute casts	1		Q7	Concretionry nodule	1
Q3	Overturned bedding	1		Q8	Load structures seen in section	1
Q4	Bouma Sequence turbidite beds	1		Q9	Chevron mark	1
Q5	Bounce/skip marks	1		Q10	Groove markas a cast	1

Currently displaying image number: 1

Choose image: 01 02 03 04 05 06 07 08 09 10 11 12

Copyright Nigel Mountney, 2006

Figure 7. An example page from one of the dynamic, interactive PDF exercises developed using Adobe Designer. JavaScript is used to control how students enter information into the blank fields in the form and to select different images. The completed form is sent direct to a server where it is automatically marked and returned to the student with feedback.

Figure 8. Digital media data types used in the production of the digital video clips within the project.

3. Relevance to the University learning and teaching strategy

The project is directly compatible with the following aspects of the University's mission in terms of learning and teaching:

- To equip students with core skills and knowledge in IT, numeracy, problem solving, oral and written presentation, and team working, which are transferable into post-university experience.
- To promote independent learning by enabling students to study a variety of topics at their own pace. In addition, students are encouraged to reflect on their knowledge and understanding of these topics via provision of feedback built into the e-earning system.
- To disseminate innovative practice to other members of the University by producing a set of documentation explaining the techniques used in the development of the system (see Appendix A).
- To enhance the quality of student learning of key skills by providing an innovative CAL approach to complement more traditional lecture and practical class teaching.

4. The project workflow

Industry-standard hardware and software have been used in the development of the system. Particular attention has been paid to developing workflows and techniques for the seamless integration of the various hardware and software products employed (Figure 9). Digital video footage was compiled from a library of clips, many of which were already available, whilst others were shot specifically for the project. Video footage was edited using Adobe Premiere (Figure 10), Adobe After Effects (Figure 11) and Video Redo and integrated into the web-based delivery system using Macromedia Studio MX and Microsoft FrontPage. Additionally, Java Applets and programs (e.g. for simulations) have been developed using the Sun J2SE 5.0 Java Development Kit (JDK) and Netbeans Integrated Java Development Environment. Some elements of the CAL practical exercises have been produced using Adobe Designer, which is software that is specifically designed for combining text, graphics and user response forms within an interactive environment. Microsoft PowerPoint and Adobe Acrobat were also be used to provide additional material for the practical exercises. Adobe Encore was used to design DVD-Video menu systems (Figure 12) and to write interactive DVD-Video disks that are being made available to students wanting to complete the exercises at their own pace or who require additional revision or independent learning resources. Appendix A provides more detailed information relating to the workflow employed for video production at high quality, with particular discussion of the various file format containers and codecs used.

Figure 9. Simplified workflow used for the editing and production of digital video films within the project. Blue boxes represent software processing steps. Green boxes represent output formats. "DW'er" = Macromedia DreamWeaver. "Acrobat" = Adobe Acrobat and Adobe Designer.

5. Components of the finished product

The learning facility consists of the following components (see also Figure 1):

- A resource database of digital video clips that illustrate aspects of dynamic processes in the earth and geographical sciences. Clips have been collected in recent years by various staff members in Earth Sciences. Additional clips have been given, royalty free, for academic use from a variety of external sources. Further clips are being collected as part of the ongoing project.
- A web-based interface provides a common 'look and feel' to all aspects of the system and incorporates a series of template-based e-learning practical exercises that can be run either over an intranet or directly from a DVD disc. Whilst the practical exercises developed have been populated with specific examples from the subject areas of earth sciences and geography, the templates upon which each example is built are generic in nature and are therefore customizable such that they can be used to set up similar exercises in other disciplines.
- A series of computer simulations, graphical animations and still images depict a variety of earth science phenomena and are used to augment the video footage.
- The appendix to this document explains how the 'raw' video and related data have been built to form a set of dedicated learning resources. The techniques employed are generic in nature and appendix A explains the settings used for the capture and processing of video footage, for the export of video to formats suitable for use with popular software packages such as PowerPoint and for the compression of video for web-based delivery and DVD production.

Specific video-based practical e-learning exercises that have been developed as part of this project include:

• Understanding cross bedding • Classification of bedforms • 2D bedforms & cross bedding (2 films) • 3D bedforms & cross bedding (2 films) • Ancient aeolian sedimentary environments	• Braided river environments • Meandering river environments • Deltaic environments • Submarine fan environments • Modern aeolian sedimentary environments

Specific student-led laboratory experiments that have been developed that make use of digital video as an investigative tool include:

- The nature of fluid flow and resultant sediment transport in a series of flume tank experiments.
- Development of an analogue sand-box model to investigate structural deformation in soft sediment (currently under development).

6. Benefits and use of the learning resource to others at Keele

Although the system provides a learning and teaching facility designed in the first instance for earth science and geography degree courses, the overall design and approach can be used as a model for many taught courses, especially those that place an emphasis on practical class teaching and student-driven learning. An important aim of this project has been to produce a guide detailing the technical specification of the various techniques used to develop this learning and teaching facility. This documentation is included in appendix A to this report and is available as a resource for other members of the University. In particular, the procedures used for recording, capturing, editing and producing video-based projects have been documented in such a way as to make the specialist knowledge transferable to video project concepts in other disciplines. Particular emphasis has been placed on explaining the techniques for integrating a database of digital video clips within a web-based delivery system and developing student-led assessed practical exercises.

This project is timely in that the University has provided a substantial amount of funding to refurbish many of its teaching rooms with state of the art multimedia presentation facilities. In response to this investment, many staff now use computer aided presentation facilities to enhance their teaching. Additionally, simplistic animations based around PowerPoint and other popular software platforms have proven popular across the University and demonstrate the usefulness of the medium for enhancement of the quality of student learning. More ambitious integrated CAL-digital video projects are the logical progression of these simple resources and are compatible with the University's learning and teaching strategy to implement e-learning resources in mainstream teaching.

Figure 10. Video editing was undertaken using Adobe Premier Pro (v 1.5.1).

Figure 11. Compositing of digital media was undertaken using Adobe After Effects (v 6.0).

Figure 12. DVD authoring was undertaken using Adobe Encore (v 1.5).

7. Testing and evaluation

The content and design of the system were continually evaluated during development by the project team. In addition, prototype versions of completed sections of the project were passed to selected academic colleagues for evaluation and feedback. Formal evaluation of the software will be/has been carried out by undergraduate students in Autumn 2006 and Spring 2007. A detailed report of the evaluation phase of this project will form an annex to this report (late Spring 2007).

8. Resource allocation (How the money was spent)

The principal costs have been for a digital video camera, with which video footage was acquired. The editing and production of the video footage required specialised software and a capture card with real time rendering capabilities of video footage during the edit process, as well as output facilities to a variety of media (e.g. web, digital tape, video-CD and DVD). Additional licenses for web authoring software were required for specific use on the project. This software and equipment has received extensive use during the lifetime of the project and is subsequently being utilised to apply the learning system to other areas of teaching within the School. For example, the design of proposed system is proving particularly suitable for the delivery of various practical classes across the School, which currently attract large student numbers. A summary of the resources directly relating to the project is provided in the following table:

Resource	Purpose	Cost
Equipment:		
Components for building a PC	Video editing and compositing	£898
Digital video camera	Acquisition of video footage and digital stills	£699
Specialist video capture and editing graphics card	Capturing of digital video data onto PC and its subsequent editing/production	£325
300Gb 7200rpm external hard disk	Video storage during edit process	£99*
Video tape and cables	Recording raw digital video footage	£65
DVD+/-R and RW disks	Writing DVD video disks	£65
Software licences:		
Adobe Video Suite (Premiere Pro, After Effects, Encore, Audition)	Video editing, compositing and integration of related digital media to construct video, DVD-Video production	£150
Adobe Premiere Elements	Video editing	£59
Macromedia Studio & MS FrontPage	Authoring of web material	Already available
Java SDK and Netbeans	Writing Java Applets and Application programs	Free
Adobe Acrobat and Designer	CAL tutorials and exercises, project documentation	£56
Personnel:		
Graduate Student	Preparation of graphical material	25x£6/hr=£150*
Graduate Student	Evaluation/testing of learning system	25x£6/hr=£150*
	TOTAL:	**£2716**

* Money yet to be spent

9. About the project development team

Development of the system has been undertaken by the following development team:

- *Nigel Mountney* has had experience of the evolving field of PC-based digital video editing using a variety of software and hardware since 1999. His main role in the project has been to produce the video footage that forms the core part of the learning resources. Additionally, he has designed the html for the web-based front-end of the system and has developed several Java Applets and Application programs that aid dynamic web-based resource delivery. He has had experience in the use of computing techniques for teaching and research since 1991 and has successfully completed the Keele University TLHEP programme, for which part of his thesis focussed on the use of CAL in enhancing student learning experiences through provision of dynamic teaching resources. Additionally, he has worked previously on contracts to develop interactive web-based resources for geologic information provision in oil companies.
- *Stuart Egan* has been using computing techniques for teaching and research since the mid-1980s and has contributed to development, testing and evaluation of the CAL parts of the project.
- *Evaluators* have been employed to test all parts of the learning and teaching system. Part of this evaluation procedure was carried out by the project development team and other academic members of the School. However, because it is essential that the learning and teaching facility developed is evaluated from a student perspective, undergraduate students and recent graduates have been and are being employed to test the effectiveness of the learning and teaching system, and in particular to test whether the various components of the system are pitched at the right level and to check for continuity between sections.

Appendix A: Technical specifications employed in project workflow

The information in this appendix provides details of the various video format containers and codecs used for the preparation of the video footage used in this project.

- Raw video was either captured directly using a Mini-DV camcorder or digitised from older analogue video tape using Adobe Premiere and a Matrox RX.10 capture card.
- Video was edited in Premiere Pro v 1.5.1.
- Audio was edited either directly in Premiere Pro v 1.5.1 or in Adobe Audition v 1.0.
- Static vector graphics were composed in CorelDraw v 12 and exported in encapsulated postscript (EPS) format ready for incorporation into either Premiere Pro or After Effects.
- Static raster graphics were composed and/or edited in Adobe Photoshop v 7.0 and CS2 and exported in TIF and/or PSD format ready for incorporation into either Premiere Pro or After Effects.
- Other digital media and 2D and 3D visual effects were composed in Adobe After Effects v 6.0 before being exported in Apple's lossless QuickTime format prior to further editing in Adobe Premiere Pro.
- Completed video films were exported from Adobe Premiere Pro in three separate formats:
    - back to Mini-DV tape in DV-AVI format as a very high quality archive
    - to MPG2 and/or M2V/WAV format using the Adobe Media Encoder plug-in ready for production as a DVD-Video disk (standard DVD quality)
    - to WMV format using the Adobe Media Encoder plug-in ready for incorporation into the web site and for transmission across a computer network.
- MPG2 and M2V/WAV video files were imported into Adobe Encore v 1.0 and bundled with a DVD menu system and data partition before being written to DVD-Video disk. DVD-Videos were made available to students who could watch the high quality video on their own computers and/or TVs. The data partition on the disks contains the exercises associated with the videos.
- HTML programming and web site construction was performed in Macromedia Studio using DreamWeaver and in Microsoft FrontPage 2002.
- Java Applet and Application programming was undertaken using the SUN J2SE 5.0 Standard Development Kit and Netbeans 5.0.
- PDF exercises that employ dynamic forms were designed and constructed in Adobe Acrobat Professional v 7.0.8 and by utilizing Acrobat Designer and its internal JavaScript editor.

Digital video raw file format at time of shooting
Video DV-PAL format, 720 x 576 pixels, 25 fps, DV-AVI
Audio 44.1 kHz, 16-bit sample rate
Recorded on to Mini-DV video tape

Video editing file format used in Adobe Premiere-Pro (1.5.1)
Video AVI-PAL format, 720 x 576 pixels, 25 fps, AVI
Audio 48 kHz, 16-bit sample rate
Saved to hard disk in AVI format
Exported back to Mini-DV video tape in DV-AVI (PAL) format

Video editing format used in Adobe After Effects (6.0)
Video Apple QuickTime, 720 x 576 pixels, 25 fps, Apple lossless compression, 100% quality
Audio 48 kHz, 16-bit sample rate
Saved to hard disk in lossless MOV format ready for import into Adobe Premiere Pro

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Adobe Media Encoder settings used to produce video in DVD (PAL) format suitable for writing to DVD-Video disk
Format: MGG2-DVD
Preset: PAL DV 4x3 High quality 4Mb VBR 2 Pass
High quality, low bandwidth VBR transcoding of DV content (max bit rate = 7)

Video Summary:
Codec: MainConcept MPEG Video
Quality: 5.0 (high quality)
TV Standard: PAL
Frame Rate [fps]: 25
Field Order: Lower
Aspect Ratio: 4:3
Frame Width [pixels]: 720
Frame Height [pixels]: 576

Bitrate Encoding: VBR, 2 Pass
Minimum Bitrate [Mbps]: 1.5000 (low quality)
Target Bitrate [Mbps]: 4.0000 (low quality)
Maximum Bitrate [Mbps]: 7.0000 (high quality)
M Frames: 3
N Frames: 12

Audio Summary:
Audio Format: PCM
Codec: PCM Audio
Sample Size: 16 bit
Frequency: 48 kHz

Multiplexer Summary:
Multiplexing: None

Adobe Media Encoder settings used to produce video in WMV format suitable for transmission across a network

Format: Windows Media (WMV)
Preset: WM9 PAL download 256 (approx 90Kb / Sec)

General Summary:
Output: Compressed
Average Kbps: Variable

Video Summary:
Codec: Windows Media Video 9
Encoding Passes: Two
Bitrate Mode: Variable Unconstrained
Allow interlaced processing: Off

Audio Summary:
Codec: Windows Media Audio 9
Encoding Passes: Two
Bitrate Mode: Variable Unconstrained

Metadata Summary:

Audiences Summary:
Corporate LAN or cable modem/DSL (256 Kbps)
Decoder Complexity: Auto
Frame Rate [fps]: 25
Pixel Aspect Ratio: Square Pixels (1.0)
Frame Width [pixels]: 320
Frame Height [pixels]: 240
Keyframe Interval [seconds]: 5
Buffer Size [seconds]: Default
Average Video Bitrate: 202.00 (low quality)
Audio Format: 48 kbps, 44 kHz, stereo VBR

DVD-Video production settings in Adobe Encore DVD 1.5

Adobe Encore DVD transcode settings used to produce video in DVD (PAL) format suitable for writing to DVD-Video disk

Note: No transcoding needed for MPG2 and M2V/WAV files generated directly by the Adobe Media Encoder plug-in within Premiere Pro. Leave transcode settings as automatic.

Format: MGG2-DVD
Preset: PAL DV 4x3 High quality 4Mb VBR 2 Pass
High quality, low bandwidth VBR transcoding of DV content (max bit rate = 9)

Video Summary:
Codec: MainConcept MPEG Video
Quality: 5.0 (high quality)
Frame Rate [fps]: 25

Field Order: Lower
Bitrate Encoding: VBR, 2 Pass
Minimum Bitrate [Mbps]: 1.5000 (low quality)
Target Bitrate [Mbps]: 4.0000 (low quality)
Maximum Bitrate [Mbps]: 9.0000 (high quality)
M Frames: 3
N Frames: 12

Audio Summary:
Audio Format: Dolby
Codec: Dolby Digital
Audio Layer: Dolby Digital Stereo
Bitrate [kbps]: 192
Frequency: 48 kHz