Appendices to
Equipment issues regarding the collection of video data for research

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APPENDIX A: DETAILS REGARDING TRANSANA

One of the most popular video transcription tools in the education field is TRANSANA, a free software product maintained by David K. Woods at the Wisconsin Center for Education Research. This product has been utilized with good success by members of our group in the past, and we thus chose to make our recording system compatible with TRANSANA.

Although not recommended by the authors, it is possible to work directly from video DVDs (or Video CDs).[1] Since each DVD recording has the same file name, data recorded on multiple discs can easily be confused. This can be used to one's advantage when viewing multiple camera angles of the same class stored on multiple DVDs however, as the transcription and associated time stamps will automatically align. Viewing different classes on different DVDs will require a strict file management process. When more complicated or comparative analysis is required the data file can of course be copied to a hard drive and renamed.

The current version of TRANSANA also does not show an audio waveform file for MPEG2 (or many other file formats). We have not found this to be an issue with our transcription.

A seemingly trivial yet often frustrating note is that, in the TRANSANA open dialog box, 'All supported Media Files' is not equivalent to 'All Files,' which must be selected to open the DVD video files which end in .VOB.

APPENDIX B: ALTERNATIVES FOR VIDEO INPUT INTO A COMPUTER

At the heart of the recording system is the mechanism for transferring audio and video data into a personal computer. The other factors in the system will be dependent upon, or intertwined with, this decision. Although we determined DVD video recorders to be currently the best fit for our assumed system requirements, we explored many other technologies, some of which may be preferable to research groups with other demands. This list is not comprehensive, but may serve as a useful basis for your research.

A. Personal video recorders (PVR)

Often combined with DVD video recorders, these consumer boxes exist in both set-top and portable forms. They would, for our purposes, function similarly to a DVD video recorder, but instead write compressed data to an internal hard disk drive. We have not investigated the ease or feasibility of reading the compressed video data from a set-top apparatus, but the most portable units are designed for easy connection to a computer via USB2 and save files in a standard MPEG4 format, and video resolution can reach a usable 640x480 pixels. This may be a good option for those choosing not to permanently archive on DVDs.

B. DVD camcorders

Some of the latest consumer camcorders record directly onto a form of the industry-standard video DVD. Until recently, all of the cameras use have used smaller 8cm diameter discs as opposed to the standard 12cm. While these smaller discs generally play back on all DVD players including computer drives, they hold only about one hour of video and are quite expensive.

C. Digital video (DV) camcorder direct into computer

Although of high quality, a full uncompressed DV stream from a consumer camcorder uses massive quantities of drive space (13 GB/hour). Although hardware encoding or software encoding on the most advanced personal computers now allow real-time import and compression, as of yet we have not found a single-computer solution capable of handling multiple cameras. There are software products which can automate the task of input, compression, and archiving. Although impressive, these products at best take 50% longer than real-time. The task of maintaining and operating multiple computers in parallel is non-trivial.

D. DV camera direct to hard disk drive

Devices exist which capture from a DV camera directly to a hard disk drive, without a computer. After recording, the drives can be connected to a computer to analyze the data. Unfortunately, these drives often capture uncompressed DV which occupies tremendous amounts of space and pragmatically would require further compression and archiving. These systems are not commonly available in the consumer market but use accepted standards and are straightforward to operate.

A few models can also compress DV video in real-time to various formats. These professional devices are costly, but should yield high quality data since their compression formats are intended to be used by non linear editing software, prior to consumer distribution. These devices also have the capability of capturing in High Definition, with the proper camera. We have not tested file compatibility of these devices, but they may be a good solution if extensive editing is required.

E. Analog video into computer

Although also requiring one computer for each camera, consumer market analog to digital hardware converters have become affordable, readily available, and do not require exceedingly high-powered computers. Some of these options were examined, and although claiming real-time input and compression, an additional step is required to archive the data in a usable industry-standard format.

Some solutions have external DVD-burning hardware integrated into the video capture device. Although being 'one-touch' these are not real-time, again consuming approximately 50% longer than real-time. This could prevent recording if the computer is still processing and writing a DVD from the previous session.

F. Digital tapeless camcorders

These video cameras record onto a flash-memory device and are more closely related to digital still cameras than a typical DV camcorder. For some transcription uses, image quality and recording time on many models may be acceptable with the largest memory cards. Every device examined, however, lacked a microphone input port. Some models have analog video and sound input for recording from a VCR or similar. This, in theory, could be utilized to take in the output of a standard video camera, bypassing the flash-based camcorder's lens and microphone entirely. This may make a usable transportable system, although perhaps inelegant to have one camera feeding video into another. Note that the cost of flash media likely precludes its use for permanent storage so an additional archival step would still be required.

These devices seem to be technologically converging with portable Personal Video Recorders, regardless of recording on compact flash media or small hard disk drives. Some portable PVRs offer optional camera accessories (also without audio input).

G. Security surveillance systems

Systems designed for professional recording of activity in, for example, a store, bank, or casino, easily deal with multiple cameras, permanent archival, unattended operation, accurate time stamps, and long recording times. In their most basic form, they are also relatively affordable and straightforward. Adding color video, multiple-track audio, and digital archiving quickly escalates the complexity and cost of the systems, however. Provisions also exist for remote camera movement, a variety of camera positionings, long cable runs, and recording only when there is sound or movement. All but the most basic systems will require working closely with a firm specializing in the field. These systems could potentially be the best solution for those who could fully utilize a complex permanent installation and are accordingly willing to make the financial and manpower investments.

APPENDIX C: INSTALLED AND/OR MULTIPLE CAMERA SYSTEMS

Permanently locating the recording system in a specific room gives consistent recording quality and makes recording from multiple cameras easy.

DVD video recorders lend themselves well to multiple camera installations. Multiple cameras can record onto a single DVD, or each camera can feed into a separate DVD recorder with individual audio tracks. Today's DVD recorders can record only two audio tracks (left and right stereo) per disc.

Parallel systems, with each camera recording onto its own DVD, can be reasonably closely synchronized by using recorders on the same remote control frequency and close physical grouping of the DVD recorders.

Seriously consider using analog video and professional microphones for an installed, multiple camera system. The cost of professional microphones can be decreased by using a single studio mixer with multiple input and output channels, placed near the DVD recorders, and the cost and complexity of multiple Firewire hubs and extenders is avoided. The audio mixers typically provide many more options than required for these purposes, so some sort of cover or guard to prevent accidental changes may be wise.

Monitoring a multiple camera system with individual televisions and headphones is unwieldy. To reduce physical space and complexity, monitoring with video and/or audio switchboxes is highly recommended, particularly for audio as multiple sets of headphones quickly become confusing.

Devices also exist which can simultaneously display multiple video devices on one screen, switch between them, or provide picture-in-picture of two different views. These are often sold for use with security camera systems and some have standard RCA inputs and outputs.

These video splitters can also be placed between the cameras and the DVD recorders to record multiple camera views onto a single DVD. This is extremely useful if some students must have their backs to one of the cameras, and also allows splicing in of other video devices capturing blackboards, presentation boards, computer screens and the like.

APPENDIX D: TRANSPORTABLE SYSTEMS

Systems which can be moved from room to room present additional challenges. Not only will physical size and weight be an issue, but also the number of separate devices and number of cable connections. We believe that ease of use and setup remain more critical than minimal size, and this extends to setup as well as actual operation. A single-camera setup makes the most sense in this situation, but a multiple camera system is not impossible if one is willing to deal with a proportionally higher number of cables and connections.

We believe that DVD recorders are still one of the best choices. A full-size set-top DVD recorder can be built into a transportable suitcase or cart along with a small LCD TV

monitor and storage for the camcorder, cables, and microphones. A semi-portable DVD recorder designed for direct recording from a camera does exist, but seems to lack a remote control. This would be useful for reducing size and weight of a single-camera portable system, but would not reduce the number of components or ease of setup vs. a typical full size set-top DVD recorder.

Portable systems have the same issues as installed systems, but if the camera must be reconnected to the DVD recorder with each use, a single digital Firewire cable becomes very attractive. With a camera detached for transport, four cables will need to be run each time the system is set up: power and Firewire cables into the camera, microphones into the camera, and a single power lead from the suitcase to a wall outlet.

A larger wheeled cart which holds the camera as well as the recorder would eliminate some of the cabling difficulties at the expense of mobility. If physical security of components is a concern this may prove the best solution.

We also recommend a small uninterruptible power supply (designed for a computer) to retain the DVD recorder settings while in transport. This is important for ease-of-use if the DVD recorder defaults to input source and record mode settings other than those needed. If power is lost during a recording, it is likely that all data on that disc will be lost.

The demands of a transportable system do make other technology solutions more attractive, even if requiring an additional postprocessing or archival step. Three show notable promise for a transportable system.

• A DVD based camcorder could be ideal if the audio inputs and file formats of full-size DVD camcorders prove usable. This single-device solution would be the most convenient.

• A hard-drive or flash memory based, MPEG4-capturing, portable personal video recorder coupled to an analog camera could be a very promising, and quite small, system. Although files would need to be transferred to a computer and then archived or burned onto a DVD at a later date, file sizes would be smaller than any other solution. The device is physically small enough to be mounted to a tripod along with the camera in one unit, reducing or eliminating cabling connections between components. This field, spurred by growth in both the personal digital audio player and the digital still camera markets, is rapidly advancing and shows great promise for the future.

• An analog video capture device into a computer with a DVD writer can produce near real-time DVD video discs. At this writing, we are not aware of any capture systems which fit internally into a laptop computer, and thus three separate devices are needed, reducing real-world transportability. Additionally, 'near real-time' is not the same as real-time, and waiting at the end of class to disassemble the system – or to begin a new recording – is not always feasible. The DVD-writing process cannot usually be interrupted or paused.

APPENDIX E: SPECIFIC EQUIPMENT INFORMATION

While we have discussed issues and equipment in general terms, we realize specific equipment recommendations and costs are helpful in planning and determining which avenues to pursue. Presuming a DVD recorder-based system, we have divided the basic recording hardware into four groups: consumer and professional microphones both with analog and digital video subgroups. Monitoring and miscellaneous equipment will be significant expenses if used as a transportable or in a multi-camera system. Estimates for these are also given.

Below are specific equipment recommendations based upon our priorities and requirements as discussed above. Costs are roughly estimated for the United States at the time of this writing and are certain to change significantly. Models and manufacturers are merely examples showing a reasonable starting point in the cost/feature spectrum. You must conduct your own research.

A. Consumer microphones, Digital video:

- DV Camcorder, $500 per camera. Defeatable AGC is desirable but not required, at an additional $500 per camera
- DVD Video Recorder with Firewire input such as Philips DVDR-75, $450 per camera
- Stereo Consumer Microphone, $80 per camera

B. Consumer microphones, Analog video:

- Camcorder, $500 (per camera). Defeatable AGC is desirable but not required, at an additional $500 per camera
- DVD Video Recorder such as Philips DVDR-70, $300 per camera
- Stereo Consumer Microphone, $80 per camera

C. Professional microphones, Analog video

- Inexpensive video camera with S-video output, $300 per camera
- DVD Video Recorder such as Philips DVDR-70, $300 per camera
- Inexpensive mixer with XLR inputs and phantom power, 2 channels per camera, $200-$400 for use with all cameras
- Professional Microphones, $100-300 each with two per camera

D. Professional microphones, Digital video

- DV Camcorder with defeatable AGC such as Canon Optura 40, $1000 per camera

- DVD Video Recorder with Firewire input such as Philips DVDR-75, $450 per camera
- Camcorder XLR adapter with phantom power such as Beachtek DXA-6, $250 per camera. A mixer could also be used and mounted close to cameras
- Professional Microphones, $100-300 each with two per camera
- Firewire cables, hubs, and repeaters, $10-200 dependent upon cable length

E. Multiple camera system components

- Wide angle lens with or without zoom through capability, $30-75 per camera
- Security camera quad splitter with RCA inputs for monitoring multiple cameras, $250 for up to 4 cameras
- Television for monitoring, $200. Only one needed if a quad splitter, above, is used
- Firewire cables, hubs, and repeaters, $10-200 per camera dependent upon cable length
- Cables, audio switcher, and miscellaneous, $150 or up to 4 cameras

F. Transportable system components

- Consider a semi-portable DVD Recorder such as the Sony DVDirect VRD-VC20 in place of a full size recorder, $300
- Wide angle lens with zoom through capability such as Raynox DVR-5000, $75 per camera
- Small LCD television for monitoring, $200 per camera
- Cables, monitoring headphones, protective cases, and tripod, $350 for a single-camera system
- Small Uninterruptible Power Supply, $75

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[1] D. Woods, "VCD video with the .dat extension," http://www2.wcer.wisc.edu/Transana/Discussion/00000079, 2002.