

QERL INTRODUCTION

Overview of Capturing Video and Audio from Start to Finish

Version 1.5.1 - Summer 2009

Lab Overview

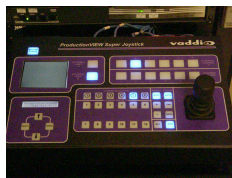
An introduction to the lab hardware and software. Match your data needs to the lab's capabilities to determine the appropriate method available to capture and export your interview sessions.

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Route audio to sync with video feeds and control PTZ cameras with joystick.

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HD Video & Audio Capture

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Researcher Checklist

Ready to begin collecting data? Use this checklist to make sure you have completed the orientation materials.

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Lab Overview

An introduction to the lab hardware and software. Match your data needs to the lab's capabilities to determine the appropriate method available to capture and export your interview sessions.

Research Lab Design

The research lab consists of four rooms. Riddick 214 & 216 are designed to facilitate capturing researcher-subject interview video with an overhead camera, (1 and 6 in Figure 1) capture video through the one-way mirror using a video camera supplied by the researcher, and a conference multi-directional mic capturing audio. Riddick 222 is designed to accommodate larger group interviews and provides the option to use four overhead cameras, (2,3,4,5 in Figure 1) a video camera from behind the one-way mirrors, and four microphones simultaneously. The type of space a researcher needs depends on the resolution of data required during analysis and the nature of the interview.

Standard Definition (SD) vs. High Def. (HD)

Aside from your research design, the room choice that makes the most sense may depend on the resolution of the video desired. Rooms

216 & 222 each contain one HD camera that can record either HD or SD video. Raw SD requires 15 GB of storage space per hour of video while HD requires 90 GB per hour. If you intend to capture Whiteboard work, then the SD resolution is suitable. However, if you intend to resolve text and student handwriting with pens, then HD is the way to go.

Audio Mixing

For interview sessions in Riddick 222, researchers have the option of mixing up to four audio signals captured from the conference microphones. We are equipped to condition each audio channel's gain and balance before the mixed signal is recorded along with the video.

Video & Audio Encoding

There are further encoding options to reduce the storage requirements of the captured interview session. EyeTV, the capture software for the Standard Definition video feeds provides several options for encoding the clip into different resolutions and formats recognized by Quicktime. Final Cut Pro, the capture software for the HD video feeds, also provides some of the same compression

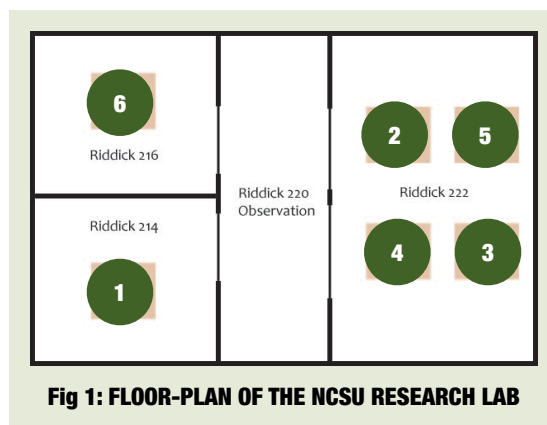


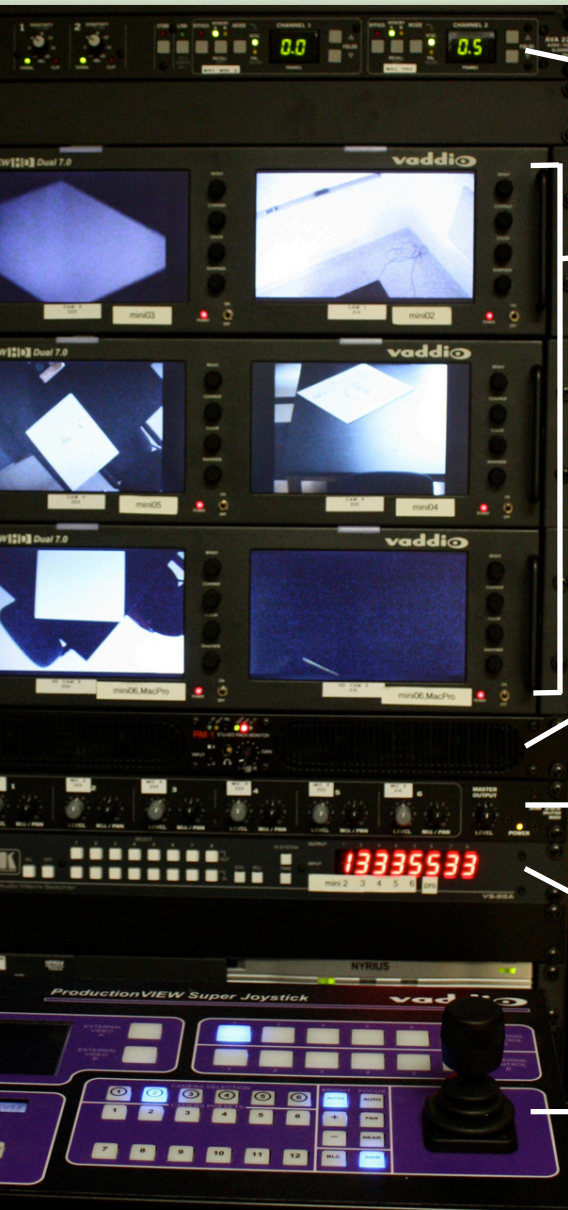
Fig 1: FLOOR-PLAN OF THE NCSU RESEARCH LAB

options. We will recommend specific encoding decisions that is recognized by Quicktime players on both Mac and PC.

Exporting Data

Once the interview session has been captured and encoded to an acceptable format, the researcher will transfer the data to a portable USB 2.0 external hard drive. Transfer rates depends on the characteristics of the hard drives, and may take up to 25 minutes per hour of HD video. Once the transfer is complete, delete the captured interview data from the QERL computers.

THE RACK



Audio Delay for HD Video & Audio Synchronization

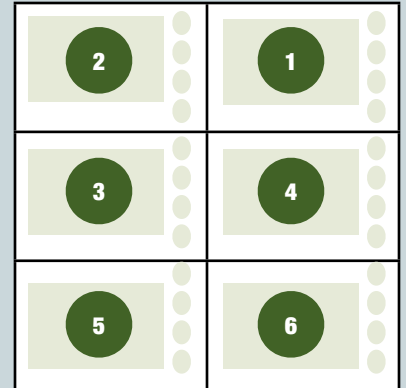
Due to the intense resolution processing by the CCD in the HD camera, some delay between the audio and video signals is inevitable. This component artificially delays the audio from any microphone heading to the Mac Pro to sync up at the same time as the video feed. **DO NOT TOUCH!**

Video Monitor Bank

A bank of six video monitors displays the view of each camera. The monitors, labeled 1 - 6 correspond to cameras in Riddick 214(1), Riddick 222 (2,3,4,5), and 216(6). Cameras 5 and 6 provide both High Definition and Standard Definition video feeds. Note that monitors 5 and 6 will always display the HD feed.

These LCD monitors will not burn stagnant pictures into the screen, so it is okay to leave these on for extended interview sessions without damaging the monitor.

Matching Monitor to Camera Location



Audio Monitor Speakers

Use Left and Right Channel speakers to preview any individual microphone channel or a mixed audio signal from a combination of microphones.

Audio Mixer

Adjust the gain and balance of each microphone alone, or relative to other microphones to create a mixed signal.

Matrix Switcher

Take any microphone signal (top row of white buttons) and route to any capture-capable computer (bottom row of white buttons). The same audio signal from one microphone can be routed to a single computer or all computers at the same time. In this picture, microphone 3 is routed to three computers as well as the monitor speakers on the rack.

Joystick Camera Control

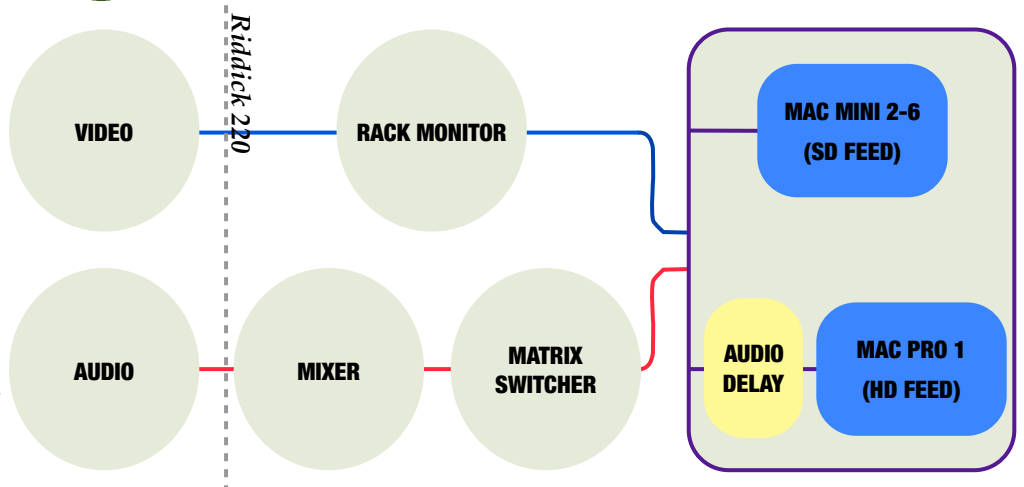
A joystick provides pan-tilt-zoom (PTZ) control over all cameras, as well as programmable presets for fast automated transitions to researcher-defined camera orientations.

From Action to Capture

From the moment audio and video are captured by the microphone and camera, the feeds travel to the Riddick 220 Rack.

Video. Feeds run first to the six rack monitors which pass the video signal through to the computers. HD video meets the audio signal at Mac Pro 1. SD video meets the audio signal at Mac Minis 2-6.

Audio. All audio feeds are conditioned at the mixer and the output signal is sent to the matrix switcher where any of the audio feeds can then be rerouted to any single or multiple computers. Audio feeds routed to HD video passes through an audio delay before being captured by a Mac Pro. The delay is already set.





SD Capture with EyeTV

The EyeTV software will capture, edit, and export interviews in an all-in-one program.

EyeTV takes the SD signal with the audio from the mixer and combines the two during capture. The recording process is intuitive and as easy as pressing the recording button on the EyeTV Remote. Once the full interview is captured, EyeTV provides options to adjust the clip's audio and visual properties. You can adjust sound levels, brightness, and contrast. Documentation will not be provided on editing clips.

After manipulating the recorded interview session, EyeTV provides several preset options to encode the media for storage. These presets are specially configured for specific media devices intended for playback, or for video editing programs such as iMovie or Adobe Premiere. The NCSU media and UNITY labs have these programs available for researcher use during normal lab hours. The encoding process is very time intensive and may take hours. See the back page of this document for more information on the encoding options available for SD video.



HD Capture with Final Cut Pro

Final Cut Pro is a professional capture and editing program with endless features.

Due to the nature of capturing data intensive High-Definition format, and the third party vendors that support such an endeavor, Final Cut Pro is the software package that we use to manage the massive amount of data processed per minute during the capture process.

To make life easier for researchers who may not be familiar with Apple products, we've produced a step-by-step guide to ensure a successful recording session. With the ability to store basic software defaults, the process is simplified such that the software does not stand in the way of the task at hand -- recording an interview.

The Final Cut Pro step-by-step guide shows researchers how to log clips for capture, capture clips, monitor the audio feed from the Mac Pro, and export the clip in a desirable Quicktime format. Additional options of creating a sequence out of the captured clips are available for the advanced user, however there may be time constraints due to scheduling other researchers in the lab. The NCSU Media Center has Final Cut Pro available in their studio, and an appointment is required to reserve time.



Remote Recording with Mac OS 10.5

One of the many advantages of a lab running Mac OS 10.5 is the ability to remotely control any Mac.

All of our computers in the lab are maintained with the latest operating system and updates. One of the features we have is the ability to remotely control any computer through the Virtual Network Connection protocol and the Screen Sharing application. Researchers with Macs running 10.5 or a VNC client like Microsoft's Virtual Network Client can use their laptop in the interview room to remotely start or stop recording as well as monitor the camera's field of view.

Although the Rack allows full remote operation, each interview room is equipped with remotes to control the pan/tilt/zoom of all cameras. So while the interview is in progress, the interviewer can monitor all camera feeds while they are being captured in Riddick 220 and control the cameras via remote. The lab is designed such that a researcher can conduct an interview while interacting with the subject, and remain confident that the camera is well positioned to record the actions and speech of the subject. No additional hands are required to operate audio/visual controls. If you have an assistant, it will probably be easier if they control the cameras from the Rack.

ENCODING Clips

After the session has been captured to the hard drive, it will need to be encoded to a format readable by the computer you intend to use for data analysis.

The raw data captured by EyeTV and Final Cut Pro feeds is a proprietary format. That is, unless you have this software on your own work computer, you will not be able to view the captured files in their raw format. Encoding the clips conditions the audio and video such that the clip can be read by your favorite media browser. Encoding can also compress the media so it doesn't take up as much room on your hard drive.

Choose your encoding settings by reading the available options on page 5. Here are the settings most used by PERD researchers:

- H.264 (Quicktime) SD/HD**
- Apple Pro Res 422 for HD**

The options for encoding are extensive and our group tends to prefer H.264 for SD video and Apple Pro Res for HD video. Apple Pro Res is a proprietary encoding, currently playable with Quicktime. The Pro Res codec is considered intermediate, meaning not meant for the end user so it retains much of the raw data for editing purposes.

Encoding compresses data one of two ways: reducing the resolution of the video or maintaining the resolution but capturing fewer frames per second in favor of "key frames." The encoding process is a time intensive process and may take as long as the real-time duration of the video to complete.

Data Management

Moving data securely and efficiently from the Lab to your office using low-cost market solutions.



After the encoding job is complete, the researcher will need to move the clips to an external hard-drive. The hard drive should have a USB 2.0 connection and will plug into a front port on Mac Pro 2. From Mac Pro 2, the researcher will connect to each Mac Mini used to capture data through a software switching program and transfer the encoded clip to the Mac Pro's desktop.

With the encoded clips now on the Mac Pro 2 desktop, the researcher can drag all their clips to the icon representing the external

hard drive, transferring all data to the external hard drive. After ejecting the hard drive from Mac Pro 2, the researcher can carry the data to another computer for further editing or review. Finally, the researcher deletes all recordings from Mac Pro 2 and any other computers used in the recording process to maintain subject confidentiality.

It is *highly recommended* to immediately back up all data on the external hard drive using redundant hard drives AND creating

R E S E A R C H E R C H E C K L I S T

Are you ready?

To prepare for your interview session at QERL, you have some homework to do. Answer the following questions, which will help you decide what kinds of training are needed.

Interview Protocol

1. Are you going to move the camera (zoom,pan,tilt) during the interview? If "flying solo," you will need to bring a laptop computer with a VNC client such as Microsoft's Remote Desktop Connection, or Mac OS 10.5 with built in Screen Sharing application. If you have an assistant, the assistant can control the camera while in the Observation Room.
2. Do you require HD or SD video?
3. Are you interviewing a group of subjects or a single subject?

Encoding Settings

4. Will you edit the video after leaving QERL? If so, what software will you use? If not, what program will you use for video playback? Do you have Quicktime? See page 5 to determine your encoding setting.

If you know the answers to these questions, then you are ready for a self-paced training of the equipment and lab procedures. Email the contact person below for further instructions or questions.

Contact Jenny Allen to schedule your training session.

jenny_allen@ncsu.edu

513 - 0359



TO DO

1. Contact Jenny Allen to schedule a self-paced training guide and to borrow a QERL External Hard Drive, if one is needed.
2. Determine what kind of video quality you would like (HD/SD)
3. Determine the encoding codec (page 5).
4. Determine what kind of room you need (single ceiling-mounted camera vs. several ceiling-mounted cameras)
5. Come in for a self-training session.

NCSU STEM Initiative

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	Encoding	Platform	File Size	Playback Software	Editing Software
Standard Definition 640x480	H.264	Mac Windows	~1000 MB/Hr	Quicktime Player VLC	iMovie Final Cut Pro Quicktime Pro Handbrake (Transcoding)
	MPEG-4	Mac Windows	~500 MB/Hr		
	DV 720x480	Mac Windows	~13000 MB/Hr		
High Definition 1920x1080	H.264	Mac Windows	~42000 MB/Hr	Quicktime Player VLC	iMovie Final Cut Pro Quicktime Pro Handbrake
	MPEG-4	Mac Windows	~600 MB/Hr	Quicktime Player VLC	iMovie Final Cut Pro Quicktime Pro Handbrake
	Apple Intermediate Codec	Mac	~43000 MB/Hr	Quicktime Player 7.5 or later	Final Cut Pro iMovie 09
	Apple ProRes 422	Mac Windows	99000 MB/Hr	Quicktime Player 7.5 or later	Final Cut Pro