Digital Video Conversion
For the Small Shop
OUTLINE

• Introduction
• Experiment Concept
• Experiment Examples
• Explanation of Results
• Recommendations
• Questions
INTRODUCTION

• Reasons for experiment and presentation
  – Digitizing is what we do
  – Personal evaluation of best conversion methods
  – Video is a very complex subject
  – Engineering/ Mathematics/ Computer Science
BEFORE WE START....

Lets take a minute talk about our previous knowledge of

• Video Production
• Video Conversion
EXPERIMENT CONCEPT

• Converting VHS to DVD
• Utilizing consumer level products
• Choosing three different methods
• Analyzing results
WHY CONVERT

- Inherently self detrimental
- Low life expectancy
- Obsolete players
VHS DEGRADATION

• Playback causes damage
  – Loss of magnetism
  – Loss of emulsion
  – Tape stretching
LIFE EXPECTANCY

- Low life expectancy
- 10-15 years
- Optimal condition
  - Particle free
  - 60-70 degrees
  - 30% to 70% constant RH
VHS OBSOLETE!

• Most electronics stores only carry a few VHS players.
• Quality players are becoming harder to find
Now that we know why, How do we do it?
CONSUMER PRODUCTS

• VHS to DVD Recorders
• Conversion boxes
• Camcorders
VHS TO DVD RECORDERS

• One touch dubbing
• Record as well as playback
• Reasonably priced $80-$400
CONVERSION BOXES

• Compact
• Transfers any analog signal to digital
  – VHS to Camcorder
  – VHS to DVR
  – VHS to Computer
  – Wide price range $17-$1500
CAMCORDERs

• Conversion
• Record
• Playback
• Back up on digital tape
• Several models and prices
• Can be output to other devices
  – TV, VHS, DVR or Computer
CONVERSION METHODS

• DVD Recorder / Sony RDR-VX515
• Conversion Box/ Canopus 100
• Lower priced Camcorder/ Canon ZR700
• High Priced Camcorder/ Canon GL1
ANALYSIS PROCESS

• Use each method to convert VHS to DVD
• Analyze DVD footage for
  – Picture quality
  – Color quality
  – Digital Artifacts
DVD RECORDER
EXAMPLE
CONVERSION BOX
EXAMPLE
LOW PRICED CAMCORDER EXAMPLE
HIGH PRICED CAMCORDER EXAMPLE
COMPARISON

Canopus

Sony Recorder
COMPARISON

Canopus

Sony Recorder
COMPARISON

Canopus

Sony Recorder
COMPARISON

Canopus
X-30, y-20 = R149, G140, B157

Sony Recorder
X-30, y-20 = R140, G143, B153
CAMCORDERS

Canon GL1  Canon ZR700
CAMCORDERS

- Canon GL1
- Canon ZR700
CAMCORDERS

Canon GL1

Canon ZR700
CAMCORDERS

Canon GL1
X-30, y-20 = R177, G181, B190

Canon ZR700
X-30, y-20 = R172, G172, B184
ALL FOUR

<- Canopus
Sony Recorder ->

<- Canon GL1
Canon ZR700 ->
ALL FOUR

<- Canopus
X-30,y-20 = R149,G140,B157

Sony Recorder ->
X-30,y-20 = R140,G143,B153

<- Canon GL1
X-30,y-20 = R177,G181,B190

Canon ZR700 ->
X-30,y-20 = R172,G172,B184
Digital Artifacts
Prediction Errors that occur during video compression which is inherently "lossy"
WHY LOSSY COMPRESSION

• Storage has not yet reached the level needed to store the amount of bits needed to be a lossless copy of a moving image original.
A digital equivalent of a single film frame needs to be scanned at around 3000 ppi. A single negative scanned at the closest size of 3400 ppi would give a 28.8 MB image file when saved in tiff format. To transfer this information to a strip of motion picture film, one would need 24 fps x length. So a 2 hour silent film would be 24 fps x (60 sec x 60 min x 2 hrs) = 172800 images. At 28.8 MB per image that would require 4976640 MB or 4.9 TB for storage.
DONT FORGET LOSSY

90 minutes of raw video footage from a mini-dv tape equals approximately 16 gigabytes of storage space.

Single layer DVD’s 4.7 gigs = 70% compression ratio
Dual layer DVD’s 8.5 gigs = 47% compression ratio
Compressors use an algorithm to analyze the pixels of an image in a Zig-Zag method.

This data is then used to predict the proceeding images.
This is an image showing how motion prediction is accomplished during the compression process.

**“I” frames**
are analyzed independently for data content.

**“P” frames**
can contain image data and motion data.

**“B” frames**
can contain image data and motion data.

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**MPEG display order**

- Forward prediction of P–frames
- Forward prediction of B–frames
- Backward prediction of B–frames
MORE EXAMPLES

Now that we know a little bit about how video is compressed, let's look at some comparisons.
RAW COMPARISON

Canon ZR700 DVD

Canon ZR700 RAW
RAW COMPARISON

Canon ZR700 DVD
X-30, y-20 = R172, G172, B184

Canon ZR700 RAW
X-30, y-20 = R170, G170, B182
RAW COMPARISON

Sony Recorder
X-30, y-20 = R140, G143, B153

Canon ZR700 RAW
X-30, y-20 = R170, G170, B182
RAW COMPARISON

Sony Recorder

Canon ZR700 RAW
RAW COMPARISON

Sony Recorder

Canon ZR700 RAW

400% enlargement
RECOMMENDATIONS

• Use a camcorder with A/V inputs
• Store at least three copies
  – Original
  – Mini-dv
  – DVD
THINGS TO REMEMBER

• Find bench test/technical reviews
• Having more than one format is important
• Remember to plan for the future
  – Bluray and HDDVD hold 6-10 times more than single layer DVDs
Questions Anyone?