

SECOND EDITION

VIDEO COMPRESSION HANDBOOK

Andy **BEACH**
Aaron **OWEN**

SECOND EDITION

VIDEO COMPRESSION HANDBOOK

Andy **BEACH**
Aaron **OWEN**

Video Compression Handbook

Table of Contents

Cover

Title Page

Copyright Page

Table of Contents

Introduction

Preface

What This Book Is Not

What Is This Book About, Then?

Who Should Read This Book

About the Authors

Acknowledgments

Chapter One: Understanding Video and Audio

Elements of Video

Frames and Fields

Progressive Scan Video

Resolutions

Aspect Ratio

How Compression Works

Lossless and Lossy Compression

Spatial (DCT) and Wavelet Compression

Quantization

Interframe and Intraframe Compression

Table of Contents

High Dynamic Range

Audio Compression

Online Video Delivery

Conclusion

Chapter Two: Understanding the Language of Compression

Compression Parameters

Data Rates (or Bit Rates)

VBR and CBR

Frame Rate

Frame Types

Aspect Ratios and Letterboxing

Square and Nonsquare Pixels

Containers

Containers for Audio

Containers for Various Media Types

Codecs

A Time and a Place for Everything

Acquisition Codecs

Mezzanine Codecs

Delivery Codecs

Players

Desktop Players

Built-in Players

Third-Party Players

HTML5 Players

Conclusion

Chapter Three: Planning and Preparation

What Are Your Compression Needs?

Table of Contents

Final Delivery or Work in Progress?

Are You the Master of Your Destiny?

Long-Form or Short-Form Content?

What Is Your Final Delivery Target?

How Is Your Content Delivered to You?

How Much Content Are You Compressing?

Is Compression All You're Doing?

Quality or Timeliness?

How Knowledgeable Are Those with Whom You Work?

Equipment and Workflows for Different Scenarios

Encoding as an Editor

Encoding as a Compressionist

Automating the Encoding Process

Enterprise Systems: The Big Leagues

Essential Encoding Equipment

Hardware

Software

Productivity Tips

Minimizing Quality Loss Without Overdoing It

Stay Organized

Filenaming Conventions

Experimenting Can Be a Good Thing

Mezzanine, or In-Between, Files

Archiving and Transcoding

Conclusion

Interview with a Compressionist: Derrick Freeman

Chapter Four: Preprocessing Video and Audio

Spatial/Geometric Preprocessing

Cropping: Title and Action Safe Zones

Table of Contents

Scaling

Temporal Preprocessing

Easy Frame Rate Conversions

Telecine and Inverse Telecine

The Difficult Conversion

Color and Image Preprocessing

Luma Adjustments

Gamma Adjustments

Brightness and Contrast

Chroma Adjustments

Saturation

Hue

Noise Reduction

Legacy Video Issues

Deinterlacing Video

Image Aspect Ratio Correction

Pixel Aspect Ratio Correction

Audio Preprocessing

Adjusting Volume

Noise Reduction

Stereo Mixdowns of 5.1 Surround Mixes

Conclusion

Interview with a Compressionist: Bryce Castillo

Chapter Five: Compression Tools

Free and Low-Cost Tools

HandBrake

MPEG Streamclip

Middle-of-the-Road Tools

Table of Contents

Adobe Media Encoder CC

Apple Compressor

Enterprise-Grade Tools

On-Premise: Telestream Vantage

On-Premise: AWS Elemental Server

Cloud-Based Systems

Hybrid Cloud Systems

Conclusion

Interview with a Compressionist: Alex Zambelli

Chapter Six: Compression for Video-on-Demand Delivery

The State of Online Video

Video-Hosting Websites

Publishing for Yourself

Publishing as a Business

Web Application Video Ecosystem

Recipes for Encoding Video for the Web

Encoding for YouTube

Encoding for HTML5 Video

Encoding an ABR File for Video-on-Demand Delivery

Conclusion

Interview with a Compressionist: Doug Daulton

Chapter Seven: Compression for Live Delivery

Basic Live Streaming Equipment

Camera

Capture Device

Encoder

Video Streaming Host

Cloud-Based Transcoding

Table of Contents

Live Streaming Considerations

- Push vs. Pull

- Content Delivery Networks

- Challenges to Live Streaming

Social Media and Live Streaming

- Popular Live Streaming Platforms

Recipes for Live Streaming Video

- Streaming to Facebook Live via OBS

- Streaming to YouTube Live Using XSplit

Conclusion

Chapter Eight: Compression for Optical Discs

Whats a DVD?

Producing SD DVDs

- DVD Disc Types

- SD Codecs

- What the Heck Is a VOB?

Whats a Blu-ray Disc?

Producing Blu-ray Discs

- Blu-ray Overview

- Recording Blu-ray Discs

That Whole Bit Budget Thing

Recipe for Producing Blu-ray Discs

- Working in Premiere Pro

- Producing an H.264 Blu-ray-Compatible File in the Adobe Media Encoder

- Creating a Blu-ray Disc in Encore

Recipe for Producing SD DVDs

Conclusion

Interview with a Compressionist: Aaron Owen

Table of Contents

Chapter Nine: Compression for Digital Cinema and Broadcast

A Brief History of Package Formats

Dissecting a DCP

What Comprises a DCP?

Digital Cinema Naming Convention

More About CPLs

Encryption

Version Files

Creating a DCP

Workflow for Creating a DCP

Encoding Picture Assets

Preparing the Audio

Creating Subtitles and Captions

Wrapping Assets into a Package

Recipes for Creating a DCP

Example DCP: Recipe 1

Example DCP: Recipe 2

Closing Thoughts on DCP

Understanding the Interoperable Master Format

What IMF Is Not

IMFs Heritage

IMF Applications

Anatomy of an IMF and IMP

Supplemental IMPs

QC and IMP

Conclusion

Chapter Ten: Compression for Virtual Reality and 360 Video

VR Concepts

Table of Contents

What Is Virtual Reality?

What Is Augmented Reality?

What Is Mixed Reality and Extended Reality?

VR Hardware

Basic Handheld Kits

Premium Smartphone VR

Tethered Headsets

360 Video Overview

Monoscopic vs. Stereoscopic

Video Resolution vs. Perceived Resolution

Equirectangular vs. Cube Map vs. Pyramid Projection

Codecs

Streaming vs. Downloading

Device-Specific Targeting

Optimizing Your 360 Video

VREncoder

Conclusion

Index