The Digital Filmmaking Handbook

6

Sonja Schenk and Ben Long

The Digital Filmmaking Handbook

Sixth Edition

Sonja Schenk

Ben Long

Foreing Films Publishing | Los Angeles

The Digital Filmmaking Handbook, Sixth Edition
Sonja Schenk and Ben Long

Foreing Films Publishing

General Manager: Rainer Plain

Project and Copy Editor: Marta Justak

Technical Reviewer: Ben Nilsson

Interior Layout Tech: FF Inc.
Cover images: Jason Hampton, Paquita Parks, William MacCollum
Chapter head images: Jason Hampton (Ch 1, 6,7,8), Paquita Parks (Ch 16), William MacCollum (Ch 3, 9, 10)
All other uncredited photos: Ben Long and Sonja Schenk

Library of Congress Control Number: 2017908951

ISBN-13: 978-0-692-78211-8

ISBN-10: 0-692-78211-7

Foreing Films Publishing 3751 Motor Avenue, #1885, Los Angeles, CA 90034 USA

For product information and technology assistance, contact us at

Foreing Films Inc: publisher@thedigitalfilmmakinghandbook.com
For permission to use material from this text or product, submit all requests via email to publisher@thedigitalfilmmakinghandbook.com

Visit our website at **thedigitalfilmmakinghandbook.com**

ABOUT THE AUTHORS

Sonja Schenk is a Los Angeles-based writer, director, and producer. She directed the feature-length comedy, *The Olivia Experiment*, released theatrically in 2014, and has written several screenplays. Her films have been shown in film festivals and galleries across the country and internationally. Her producing credits include several prominent television series, including *The Bachelor*, *The Bachelorette, High School Reunion,* and others. She is also an internationally exhibiting fine artist, and she has contributed many articles on filmmaking and technology to various publications.

Ben Long is a San Francisco-based photographer, videographer, and writer. The author of over a dozen books on digital photography and digital video, he has been a long-time contributor to many magazines, including *MacWeek, MacUser, MacWorld UK,* and more. He is currently a senior contributing editor for *Macworld* magazine, a senior editor at CreativePro.com, and has created several photography instruction courses for Lynda.com. With experience in every aspect of video production, Long's video clients have included Global Business Network, Blue Note Records, and 20th Century Fox. His videos have played around the world, on Broadway, and up and down the Hudson River accompanied by acclaimed musician Don Byron. He also dabbles in computer programming, and has written image editing utilities that are in use in the Smithsonian, the British Museum, and the White House.

CONTENTS

Introduction

If there's one word that describes Hollywood, it's "innovative." The film industry is a business that migrated from Europe with a pit stop on the east coast and landed in California because of the climate. But even Los Angeles has rainy days sometimes, so then came stages, and silent films turned into "talkies" and so they invented "sound stages," because they needed to be built differently to block out the ambient sounds of the world outside. And there were many more decidedly unglamorous innovations such as sound-proofing materials, overhead rigging for lights, and banks of electrical patch bays for all the equipment. This need for innovation has driven a list of inventions that goes on and on over the last century.

Today, the entertainment industry continues this history of innovation, as producers and directors seek out new technology, such as VR, new forms of storytelling, such as web series, and new tools, like lenses that function in very low light, high dynamic range video, cinema-oriented LED lighting that comes in all shapes and sizes, and remote-controlled camera rigging that lets you move the camera with precision, whether its on a dolly, a jib arm, or a drone. In postproduction, collaborative workflows aided by cloud-based resources are challenging the sanctuary of the editing room. Whatever your area of interest, we've added new sections throughout the book to guide your way through the creative and technical challenges of this brave new innovative world.

What You'll Find in This Book

This book is organized into three parts, just like the process of making a film:

> **Preproduction (Chapters 2 through 5)** is the part of the process during which you make all the decisions necessary to start shooting: writing, technology basics, planning, scheduling, storyboarding, set design, and choosing a camera.
>
> P**roduction (Chapters 6 through 11)** is the principal shoot of your project: lighting, using the camera, shooting, and recording production sound, including a special chapter on advanced shooting situations, such as using DSLR cameras, drones and VR (virtual reality).
>
> **Postproduction (Chapters 12 through 19)** is the editing and finishing of your project. We'll give you an overview of the post process, workstations and equipment, organizing and media management, editing, sound design, color grading, titles, special effects, and both DIY and high-end delivery of the finished product—everything from streaming video to a digital cinema screening in a theater.

Finally, although we assume no formal training in video or film production, we might—on occasion—use film and video production-related terms. You'll find definitions for these terms in the glossary. Also, Chapter 3 is a digital video

primer that contains everything you ever wanted to know about the files that add up to a final film and then some. Consider it to be a reference for technical questions you may have at any point in the process.

But you might be surprised to learn how much you already know about digital filmmaking. Watching movies is the best way to learn the visual literacy required of a good filmmaker, and most people have seen plenty of movies.

Look for the "What to Watch" tips for suggested movies and TV shows to watch along the way. And in this edition, we're adding some "Recommended Apps" tips, for mobile apps that seem particularly useful to digital filmmakers.

Filmmaking is a challenging, exciting, and always instructive process. We wish you the best of luck in your filmmaking endeavors. Now, it's time to get started!

Mobile Apps We Like

We'll use this phone icon to quickly inform you about mobile apps we recommend. Most of the apps we recommend have "pro" versions and usually these are worth the extra cost.

What to Watch

We'll use this monitor icon when we have viewing suggestions for you. Think of it as the best homework assignment ever.

Who This Book Is For

Digital video is everywhere these days—on your television, your computer, your game console, and your smart phone. And the ways to acquire it abound, too: camcorders, cell phones, built-in cameras on your computer, and point-and-shoot cameras that just happen to record 4K. What used to be the rarified territory of "film geeks" is now the norm.

There's a reason for that. The fact is that the collaboration, imagination, and work involved in crafting even a short film are extremely enjoyable. Digital video technology makes it possible to make films for fun. And with web-based distribution, you no longer have to be a hobbyist filmmaker with no audience. You can actually present your finished work to the world for practically zero cost.

This book will teach you everything you need to know, whether your aim is to create a feature-length movie with the hope of screening in a theater, an industrial or corporate production, or a short film or music video simply for your own enjoyment.

This book is meant to be both a start-to-finish production guide and a reference for learning more about particular tasks. For more experienced users, we've included details on the latest technologies and strategies for refining a digital workflow to reduce your production costs and to enhance creativity. From sophisticated shot design to cutting-edge graphics, *The Digital Filmmaking Handbook* will show you how to create images and effects that are rarely associated with low-budget productions. For serious beginning filmmakers, this book provides a wide overview of the entire process of making a movie from the very first steps of writing a screenplay to shooting to the final screening. Full-blown video production is a huge affair that involves many different arts, crafts, and sciences.

No single volume can address the tremendous amount of training and expertise that is required to master all of these disciplines. However, we have tried to fill you in on the questions you need to ask, and the major problems and issues you will have to solve at each stage of your production. So even though this book doesn't cover, for example, 3D animation, our postproduction chapters should at least bring you up to speed on the issues you can expect to face when trying to create visual effects. These questions should help you interface better with the artisans and craftspeople who *do* have the skills for these various disciplines and point you in the direction of further self-education if that's your intention.

Whether your goal is an industrial project, a short subject for your website, or a feature- length movie for a film festival, *The Digital Filmmaking Handbook* contains everything you need to know to make your movies.

Watch a film you saw recently. Find a film you saw recently and watch it again. Instead of paying attention to the story, pay attention to how the film was made. This time, look at how it is shot, where the camera is, and why. Listen to how music is used (or not used). Notice if there are any graphics of special effects, and if there are any unusual editing choices. Try to imagine the creative choices the director made during each phase of filmmaking: preproduction, production and post. Now start thinking about your own film in these ways. Remember when a film is well made, you won't see "the strings." So, to learn from the work of a good filmmaker, you have to actively observe how the film was constructed.

What Equipment Do I Need?

This book assumes you will be using a Macintosh or Windows-compatible computer. Some familiarity with your operating system of choice is required, as well as a video camera of some kind. Guidelines for selecting equipment are provided throughout the book. We also assume that you are familiar with some basic computer terms, such as RAM, megabytes, gigabytes, and so forth. A glossary is included in the back of the book.

Companion Media Downloads

Look for this filmstrip to indicate that there is media for you to look at or download on the website for this book. The tutorial media for this book can be found at **www. thedigitalfilmmakinghandbook.com,** under the "Book Resources" menu and are organized by chapter. The color plates for this edition can also be found there.

In addition, sections of previous editions that feature older technology, such as videotape, and sadly, 35mm motion picture film are now available on the website.

The website also features blog postings, product reviews, and articles about new digital filmmaking developments, so check it out.

1
Make Your Movies

What's New?
Technological Innovations
What Kind of Movie Should You Make?
Questions to Ask Yourself

What's new?

Every time we revise this book, it provides an opportunity to step back and look at the big picture. What has changed in the entertainment industry since the last edition? And it is worth noting that there is always a new defining trend in the industry. This time, the biggest change is that feature films have lost their place as the king of the hill. Digital video has expanded to such a degree that it is able to mean all things to all people.

Thanks to the internet, the idea of distribution has been blown wide open. The options include digital video distributors like Netflix and Amazon, traditional broadcasters with online presence, popular blogs, social media, and video hosting sites like Vimeo and YouTube. There's really no limit to the choices available to indie filmmakers right now. As a result, the types of projects that are being made by indie filmmakers are more varied than ever.

Photo courtesy of Motion Impossible

Figure 1.1

The rugged Mantis remote-controlled dolly from Motion Impossible.

Web movies

Chipping away from the bottom of the Hollywood hierarchy are all the myriad forms of web content, the defining quality of them being that they are short: 5 to 10 minutes, maybe even less. What's so different from short films of yore? They are often episodic, not standalone one-offs. Any marketing person can tell you that the amount of effort spent marketing recurring content isn't that much greater than that required to market a standalone film, and yet the pay off is much bigger. You have the ability to build an audience at the same time that you develop your idea, your brand, and, if you are new to filmmaking, your voice. Better yet, there are no real rules. That's because it doesn't cost much to make these videos. (It can cost a lot but it doesn't have to.) So you can write, direct, and star in your own project and no one has any say over what you do and don't do. Be aware, of course, that this is a double-edged sword. Without the old guard of gatekeepers, you're on your own. And since there's no real hierarchy, you also won't have those gatekeepers to lift you up above the hoard. So, you know, it's easier and harder at the same time.

Photo courtesy of Netflix.

Figure 1.2

Okay Netflix isn't exactly new and neither are smart phones. But video on demand services streaming content across a variety of devices are definitely changing the game for filmmakers.

Phone movies

Even farther down the list are the movies people are making on their phones. Their audience is found on Instagram and Facebook and other social media sites. Often these movies are less than a minute long. In a way, this is really a whole new genre— more than a photograph, less than even the shortest short film, often entailing only one shot and nothing in the way of traditional filmmaking technology. This revolution will not be televised, but it is already mobilized, literally, in that the most important piece of technology is the mobile phone. Smart phones offer both the means of production and the means of distribution, all in one tiny device that goes everywhere you do. Everybody can make movies at this level, from your grandmother to your little cousin. And yet, there are those people out there who have thousands, and even millions of followers. That's a whole new way to find an audience and one that can rival the size of most feature films and many TV shows.

TV series

Well, for lack of a better term, that's what we are calling the long-format narratives that are chipping away at the feature film hierarchy from the top. You know what we're talking about, it's that series you binge-watched last week. Back in the olden days when film was invented, the dominant form of narrative was the novel. Feature films are notoriously unable to capture all of the content of novels. Rather, they offer a simplified version of that sort of storytelling. Usually what got sacrificed was depth of character development, and also a certain sort of complexity in the plot, such as more developed side narratives or subplots. But today, television series have swooped in and taken up the mantle of long-form storytelling and the most popular series have dropped the old school network model where every week something sorta similar and sorta different happens (a new murder!). Instead, we get complicated narratives that unravel over eight to thirteen episodes and the result is that TV is more popular than ever. Ironically, it's really not TV anymore. But we still call it TV for now. Even if there's still often a murder mystery at the heart, it's usually just a jumping off point. And these long-arc TV series aren't limited to scripted entertainment, some of the biggest successes recently have been unscripted true crime series, like *Making of a Murderer* and *The Jinx*.

Aside from having maybe the funniest title ever, **I Love Dick** is a great example of how something more akin to a traditional indie film in terms of style and content can translate to an episodic TV series that's delivered over the web. (And yes, "Dick" is a character in the series.)

VR movies

There's another genre that's chipping away at the top of the film production pyramid: virtual reality. Those Hollywood tentpole blockbusters we mentioned?

They have notoriously been whittled down to a very specific type of movie, often tellingly described as a "ride," a "rollercoaster." These big action movies have more in common with amusement park attractions than they do with sophisticated storylines and characterizations of long-arc television series. And that's why the next generation is looking towards VR. With its potential to more thoroughly immerse an audience member in a fictitious space, it might prove am even more engaging "ride" than a regular movie. Is it going to be a fad that will fade, like 3D movies a few years back? Maybe, but VR is really a completely new thing that will require a new form of storytelling. The code on this one hasn't been cracked yet, but it's clear that a lot of people are investing a lot into the future of VR (Figure 1.2).

Photo courtesy of Sean Wagstaff.

Figure 1.3

Painting with Google Tilt Brush on a laptop with an Nvidia graphics card. Running at 90 frames a second in two streams (one for each eye) requires some serious computing hardware.

Movie movies

But what about indie films? They aren't going anywhere. But very soon, we will stop defining types of entertainment by the way they are distributed. Is it really TV when you watch it on your phone? Is it really a movie when you never go to the theater? Whatever you call them, these other genres are not just launching

pads to get into the "real" movies: they are all real movies, because this multiplicity is the future of moviemaking.

So what is YOUR movie? It could be a theatrical feature film, but are you really sure about that? Whatever the case, the fact is that filmmakers today aren't aiming at that one big film that gets them to the top of the heap. Instead, they plan multiple projects and enjoy the creative freedom that that entails. So what are you going to do? Don't think about the rules, just go out and *make your movies*.

Photo courtesy of Blackmagic Design.

Figure 1.4

The Blackmagic Ursa Mini Pro digital cinema camera.

Technological innovations

Sensors, computers, remote controls, wireless— the territory described with the phrase "digital filmmaking' keeps expanding. So what's new, in terms of digital filmmaking technology?

Cameras

A few years back, most camera manufacturers had only a couple cameras that the indie filmmaker would be likely to use. The rest were either consumer-oriented or just way too expensive. These limitations lead many filmmakers to shoot their films with DSLRs. Today, DSLRs are still around and they've gotten better for shooting motion pictures, with functional auto-focusing, improvements to viewfinders, and better audio capabilities. But now, almost everyone who makes cameras makes a video camera designed to compete against DLSRs. They offer all the perks (like interchangeable lens mounts and high-quality sensors) and the additional benefits of a camera body that's actually designed ergonomically for movement (Figure 1.4). It's safe to say that there's a type of digital video camera available for every type of digital filmmaking production mentioned in this chapter. In addition, there's a much wider selection of cinema lenses available as well.

Photo courtesy of Radiant Images.

Figure 1.5

A VR camera array with a gimbal-based 360-degree rigging from Radiant Images mounted on a Mantis camera rig from Element Technica.

Robotic camera rigging

Halfway between the jib arms of yore and a giant 3d printer head, robotic camera arms move with a speed and precision that makes you think of the early Terminator movies. On a more human scale (and budget), there are programmable dollys and sliders, every sort of gimbal-based camera rigging you can imagine (think Steadicam meets those acrobats spinning in hoops at the Cirque du Soleil), and all sorts of housings for the camera (underwater, handheld pistol grips, follow focus, etc). It's a brave new world out there and this once boring category of gear that includes tripods, monopods and jib arms is now the most innovative part of cinema gear manufacturing. Look for this trend towards robotics to continue with the goal being that a single person can operate a camera and make it fly.

Photo courtesy of DJI.

Figure 1.6

A DJI drone with Hasselblad camera.

Drones and their tiny camera friends

Speaking of flight, the drone is still the coolest toy on the block. Do you need one? It depends on what you do. Most indie filmmakers will end up hiring a drone operator to come to the set and bring their own gear with them. But if your films involve action sports, nature, or any other topic that benefits from beautiful low-flying aerials, drones are important. Two or three years ago, Go Pro was the only game in town when it came to small cameras that you could literally duct-tape to the underside of a car. Now there is a lot of competition in the world of these so-called action cameras. And some of them aren't even that

small, like the Hasselblad in Figure 1.6. There are now drones that can fly a 30lb camera. We discuss drones more in a new section of Chapter 10.

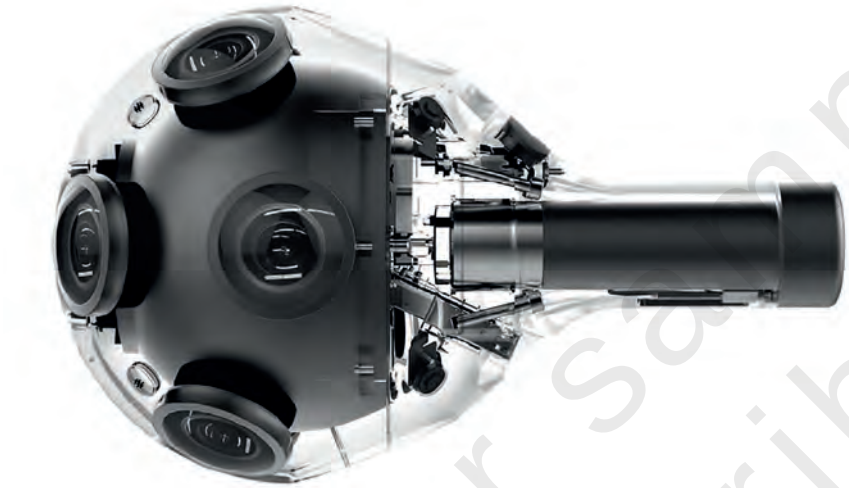

Photo courtesy of Nokia.

Figure 1.7

360-degree Nokia OZO VR camera with 8 lenses shoots 2K video at 30fps.

Virtual Reality

We already mentioned VR above, in terms of creative content and storytelling. But VR involves all sorts of new technology: 360 degree camera-housings, special drives and playback gear, and video cards that can support high-frame rates playing in two streams—one for each eye, to give the 3d effect (Figure 1.7). VR could be the topic of a book itself, but we've added sections that cover all aspects of making a VR production throughout this book.

VR Info

Look for this icon to identify special new sections about Virtual Reality production and post-production.

Technology Graveyard

For each edition of this book, just as new forms of technology are added, other forms of technology get relegated to the website. This edition is no exception. Say goodbye to any discussion of the DV video format, which caused a revolution in independent filmmaking in the 1990s. DVDs are only standard definition and so we must say goodbye. BluRay disks are fading fast as well. And we will also be saying goodbye to 35mm film as a finishing medium. Film has been obsolete for shooting and editing for some time, but people were still printing and projecting on film for theatrical movies. But now even that is more or less over, so RIP 35mm motion pictures, you changed the world.

What Kind of Movie Should You Make?

Every project, no matter what it is, will have its own unique set of challenges. That's part of the thrill of filmmaking. Every film is a different learning experience with a different set of variables. No matter how experienced you are, you have an opportunity to learn something new from every project.

If you are reading this book and trying to figure out what type of project you should make, here are some of your options:

Video shorts for the web. Thanks to websites like YouTube, everyone has the opportunity to create and distribute short videos for potentially millions of viewers. And there are many other websites that seek more specialized content: travel videos, sketch comedy, music performances, to name only a few. Even the big studios create shorts for the web, in the form of trailers and film clips, to promote their high-budget feature films. On some level, every filmmaker who reads this book will find they need to create at least one video short for the web related to their project, whether it's a trailer, a promotional clip, segments broken down into webisodes, or the whole thing. For that reason, we have a section in Chapter 18 to walk you through the process of getting your video on the internet.

Short films. For many, a short film is the ideal first film project. It has all the elements of a full-length feature film, but on a much smaller scale. You'll learn about every stage of the process, from screenwriting to shooting to editing and finishing, but the task won't be quite so overwhelming, and it definitely won't be as time-consuming and expensive. If you've never made a scripted film of any kind before, this is the way to start. But do your homework first. There is an audience for short films in festivals and on the web. Typically, short films are under 30 minutes in length, but many believe they are best when they are

below 10 minutes. After all, the average half-hour sitcom only has about 20 minutes of actual content, so if your "short" is longer than that, it starts to not feel like a "short." Making a great short film is like writing a great short story, it's a different animal than a full-length movie and has its own unique challenges. For those who decide to make a short, every chapter of this book will be relevant to your project.

VR projects. Virtual reality has been around for about twenty years, but only recently has it started to achieve critical mass. Filmmaker Alejandro Gonzalez Innaritu broke new ground this past year at Cannes with his documentary-like VR exhibit, "Carne y Arena" ("Flesh and Sand"), where viewers experienced a seven-minute immersive film about migrants trying to get across the U.S. border. VR projects at this level are very expensive because there are no existing venues for VR films, so they require a dedicated space and lots of gear. But everyone who has every played around with VR knows that you can get a cardboard headset from Google for $15. And no matter how low your budget, you still have a great chance of breaking new ground with this as yet fluid medium.

Corporate and industrial projects. These types of projects may not be what you dreamed of when you decided to become a filmmaker, but let's face it, they are plentiful, and they almost always involve receiving a paycheck for your work. What's more, they'll require the same skill set and problem-solving challenges of any of the other personal filmmaking projects you may be working on. Corporate videos are driven by an agenda that is usually given to you by your boss(es). They have a narrative, but it's usually about a product or a business or an event, rather than a character. Every chapter of this book is relevant to corporate and industrial videos, but take a special look at Chapter 2, "Writing, Scheduling, and Producing," where we discuss the nuts and bolts of these types of projects.

Webisodes. Webisodes are usually an ongoing story that unfolds in segments that are under 10 minutes in length. Sometimes, these segments add up to a longer story, such as the web classic "Dr. Horrible's Sing-Along Blog," and sometimes they are more like a sitcom, like "High Maintenance," which got picked up by HBO. As of this writing, there are many webisodic video projects out there, but the form has yet to be truly defined. This is an exciting opportunity for new filmmakers. Every time a new type of storytelling evolves, the door opens to create a new crop of success stories. There are no real rules yet, but writing, shooting, and finishing webisodes involves all of the elements discussed in this book. In addition, we feature a special section on finishing for web distribution in Chapter 18 that's of crucial interest to webisodic filmmakers.

Television pilots. In a perfect world, all television pilots would be pitched, ordered in advance, and paid for by a network. But that's not always the case, especially for innovative or non-scripted TV series. Instead, producers (that's TV-speak for "directors") take a gamble and shoot their own pilot episode. Then they present that material in the form of a *pitch reel* or a finished cut of the first episode of the series, aka the *pilot.* It's called a pilot because it flies out ahead and leads the series—unless it crashes and burns. If you consider the range of shows on TV—from daytime talk shows to reality TV shows to sitcoms to hour-long dramas—and that's just the tip of the iceberg—then you know that the choices and options are almost limitless. But whatever the genre, your TV pilot will need all the resources covered in this book. When TV production differs greatly from film production, this book tries to address those differences.

Documentaries. The filmmaking equivalent of "non-fiction" or "journalistic" writing, documentaries today have a strong audience. If you think of some of the most exciting and controversial films of the last decade, they are often documentaries. Films like *Citizen Four*, *Supersize Me*, and *An Inconvenient Truth* have had a demonstrable effect on our perception of the world around us. This is the power of documentary filmmaking. Documentaries are shot in a way that is very different from scripted films, but they share many of the same creative challenges— structuring a story, crafting a style in terms of how the film is shot, refining the structure in the editing room, designing the sound, intensifying emotions with music, and enhancing the film with graphics. All of these things are as necessary for documentaries as they are for scripted films. Like a good biography, just because it's real doesn't mean it's not art. In Chapter 9, "Directing," you'll find a section on the unique concerns of shooting for documentaries because this is an area where making a documentary is significantly different than making a scripted film.

Scripted feature films. Whether you agree with it or not, or like it or not, at the time of this writing, scripted feature films are still what many people think of when you say you are a filmmaker and they still hold a position of power in Hollywood, even if other forms of entertainment have chipped away at their cultural dominance. What does that mean for you? It means that if you are a director and you have directed a live action feature film, you are eligible to direct any project lower on the Hollywood pyramid, which is everything else. (We didn't say you had to like this or agree with it!) And the same goes for writers, cinematographers, actors, editors, composers, graphic designers, visual effects artists, the list goes on. Having that feature film credit will open doors, guaranteed. Making a feature will require great resources, especially if you are going to do it independently. But there's no question that it will be a rewarding experience.

Questions to Ask Yourself

If you're seriously thinking of embarking on a digital filmmaking production, you're about to begin a very complicated process. The more you know before you start, the more smoothly things will go for you. Before you dive in, you should know the answers to these questions:

What is your final product? Projected theatrical release? Home video? Broadcast television? Webisodes? Corporate/educational use? (Chapter 3, "Digital Video Primer," and Chapter 18, "Screening & Finishing," can help you understand the technical specifications for these different formats.)

What peripheral products will you be creating? Work-in-progress screeners? Email-able trailers? Press kits? No matter what your final project is, you will need to export it to several different formats.

What equipment do you already own or have access to that you can use to produce your project? Consider this question carefully, as some older equipment—both computer and video equipment—might be more of a hindrance than a help.

How much time and money do you want to spend? Remember that postproduction can often cost as much or more than production.

If you take the time to make some hard decisions before you shoot, you'll save time and money throughout the process. Even if you can't find all the answers up-front, you should at least know all the questions.


http://www.theoliviaexperiment.com/?page_id=46
Sheet Music
icnotes.com
Google Maps
Outdoor livi...door dining.
1
14c
3
18:39:56:18
1
24
2/19/11
INTERIOR
Olivia Experiment
S. Schenk
Wm. MacCollum
Microsoft Word

3
Digital Video Primer

Digital Video for Filmmakers
Components of Digital Video
Working with SD and Analog Video
Digital Image Quality
Understanding Digital Media Files
Digital Video Formats
VR Media Formats
Unscientific Answers to Highly Technical Questions

What is the best way to shoot my project? Should I shoot 24p? What is the difference between HD and digital cinema? Should I shoot 2K or 4K? What type of digital video will look most like film? What are codecs? What do I need to know about audio? What is raw? What do all those other acronyms and numbers mean? In this chapter, we're going to introduce you to the fundamentals of digital video technology. Consider this chapter a reference for the terms and concepts you will encounter on a day-to-day basis during your production process, as well as throughout the rest of this book.

By now, you should have a script and have started to work out what your budget and your shooting schedule will be. And you should have started to make decisions about the way you want to shoot your project. The big question for most filmmakers at this point is whether to shoot 2K or 4K digital cinema. But of course there's a bit more to it than that.

Digital Cinema

Digital cinema is a type of high-resolution digital video that is aimed specifically at making films, as opposed to television. In fact, 2K digital cinema is only slightly larger than 1080 HD, and 4K digital cinema is twice as big as 2K (Figure 3.1). Both HD and digital cinema are groupings of video specs, rather than one single type, so you can expect both of them to change and grow in the future.

Digital Video for Filmmakers

Today almost all movies and television shows are shot, edited, and distributed digitally. Although some studios still use 35mm motion picture film as an archive medium, only a select handful of A-list directors are able to insist that they shoot their movies on film. For the rest of us, digital filmmaking is the only option.

Now that the entire Hollywood film industry has gotten behind digital video, technological advances continue at an astonishing rate. Ultra high-resolution 4K digital cinema has become a viable shooting option and 2K has replaced HD even for low-budget indies (Figure 3.1). Even though a frame of 2K digital cinema is not that much larger than a frame of 1080 HD, the differences in the capabilities of the cameras that shoot in digital cinema formats are striking.

Figure 3.1

A frame of 1080 HD video (upper left), 2K digital cinema (upper right) and 4K (bottom). 2K digital cinema is not significantly larger than 1080 HD video, but 4K is twice their size.

Hulu series **The Handmaid's Tale** was shot with an Arri Alexa Mini at 4K UHD Pro Res with a special aspect ratio of 2.0:1. Like many series, it was delivered in multiple formats: 4K, HDR, and HD.

HD

The term HD (high definition) itself does not actually refer to any one particular type of digital video. Rather, it's a set of digital video formats and specifications. When digital filmmakers talk about HD video, they are usually talking about the two most popular subsets, 720 and 1080.

Super 35mm sensor

Micro 4/3 sensor

Super 16mm sensor

2/3" sensor

Figure 4.5

Comparison of super 35mm, micro 4/3, super 16mm, and 2/3 image sensors.

If bigger sensors capture better images, why aren't digital cinema cameras equipped with full-frame sensors? The most basic reason is because the look of footage captured by sensors based on the size of 35mm motion picture film is considered visually pleasing to most filmmakers. It looks like what we think of when we think of movies. Also, because of the shallow depth of field that comes with larger sensors, it can be harder to stay in focus. This is less of an issue for still photographers, but for cinematographers who must often rely on a second person to pull the lens into focus as the shot changes, staying in focus is already hard enough. And on top of that, aesthetically speaking, it's possible to have a depth of field that is too shallow—for example, when shooting a close-up, and the eyes are in focus, but the end of the nose is soft.

☑ Shallow Depth of Field

One of the defining trends in modern still and motion photography is the prevalence of shallow depth of field. When shooting with shallow depth of field, things in the background will be out of focus, which helps bring more attention to the subject in the foreground. To achieve shallow depth of field, you need a camera with a larger image sensor and the right lens with the right lighting conditions. We'll talk more about how to achieve this look in Chapters 7 and 10.

Compression and Raw Video

The first place that your digital video gets compressed is in the camera. Every camera uses a compression algorithm, or codec, to turn the analog subject into a digital signal, and that process affects image quality greatly. In Chapter 3, "Digital Video Primer," we discussed compression in great detail and provided a list of acquisition formats including raw and log modes.

All cameras acquire raw video and then use a codec to compress it into a more user-friendly format that includes information such as white balance, sharpening, and color and contrast adjustments. These compressed video files are smaller and usually ready for editing straight out of the camera. Raw files have more information and are therefore bigger but also more flexible. You can shoot raw and decide later on the white balance, the color, and the contrast, a process called color-grading. (See Chapter 13, "Preparing to Edit," and Chapter 16, "Color Grading," for more on this.)

But even though all cameras acquire raw video, not all cameras give you the option of getting raw files out of the camera, so if you know you want to work with raw video, you'll have to make sure the camera you select has that option.

Most lower-budget indie filmmakers will find that 8-bit, 4:2:2 or 4:2:0 compression is acceptable for their needs. And high-end digital cinema cameras usually offer a range of choices between raw 4K or higher media and 2K codecs.

It's been said that making a movie is a lot like going to war, and while you most likely won't be risking life and limb during your production, as a producer or director, you will be managing a large group of people, all with diverse talents and goals. In addition, you'll be trying to balance these talents and goals against budgetary constraints, scheduling problems, inclement weather, temperamental actors, and any number of impossible-to-predict problems. Each one of these problems and issues will end up slowing down your shoot and that will translate directly into a financial impact. The best way to steel yourself against these problems is with meticulous, thoughtful planning.

There's no correct way to plan, and different types of shoots require different degrees of planning. In Alfred Hitchcock's *Vertigo*, there is a scene in which Jimmy Stewart spies on Kim Novak as she shops in a San Francisco flower store. Observers of the shoot reported seeing Hitchcock meticulously plan and arrange all of the cars that were passing by the window in the background of the shot. Color, shape, speed, order—he planned and calculated it all. Hitchcock was also an avid storyboarder, utilizing his accomplished draftsman skills to create detailed illustrations of exactly what shots he would get.

At the other end of the extreme are directors like Woody Allen, who don't storyboard at all, but choose to plan and block their shots on-set with the actors. However, even if they don't storyboard, these directors still do meticulous planning by working with their cam era and production crews to prepare sets and costumes, determine a "look" for their work, and much more.

As a director, you're responsible for everything the viewer sees on-screen, whether it's good or bad. With a little preparation, you can improve your odds that the viewer is seeing something good.

Your main tool for preparing for your shoot is the storyboard. Because storyboarding requires you to perform the first serious visualization of your project, the storyboarding process forces you to answer some questions that you might not have dealt with during the writing of your script. From choosing locations, to the look of your production, to how your project will be edited, storyboarding is where you'll make many practical decisions about how you'll shoot your script.

Storyboarding

Storyboards are comic book-like representations of the images in your production (see Figure 5.1). How well they're drawn and what they look like doesn't matter, just as long as they convey to you and your crew a reasonable approximation of how the composition, framings, and edits in your production will play out. The amount of detail in your storyboards will depend on the type of scene you are creating. For a scene of three people talking around a dinner table, your storyboards will probably be less detailed, and will serve more to help

you plan framing and cutting. For a special effects-heavy shot of a spaceship flying into a spaceport on an alien planet, your storyboards will include more detail to help your art department and visual effects crews plan and prepare for their work, and to help you make sure that what you shoot on location can be accurately merged with effects that will be created months later after your sets are long dismantled.

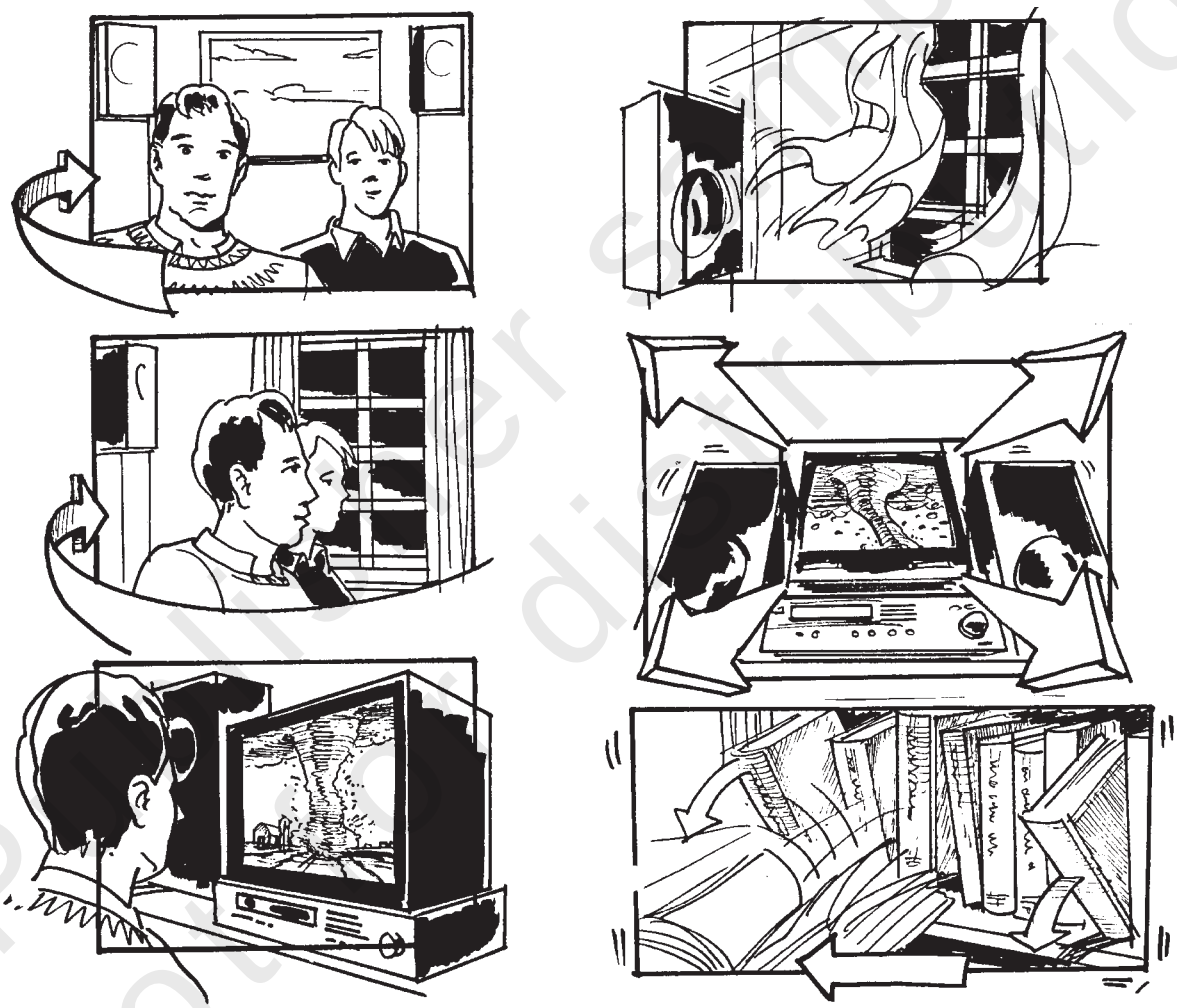

Figure 5.1

A picture can be worth a thousand words when drawn by a great storyboard artist.

camera manufacturers label their lenses with a magnification factor—2x, 3x, and so forth. However, a few other things happen to your image when you zoom.

Focal Length Defined

Focal length is the distance from the lens to the camera's image sensor(s), usually measured in millimeters.

As you go to a longer focal length (zoom in), your field of view gets narrower. The human eye has a field of view of about 50 to 55°. This is considered a "normal" field of view (see Figure 7.6).

More important, though, is to pay attention to the way that a lens magnifies different parts of your image and how it compresses depth overall as you zoom in and out.

At wider focal lengths (that is, when you are zoomed out), objects that are closer to the lens get magnified *more* than objects that are farther away. Telephoto lenses, on the other hand, magnify all objects in a scene equally, no matter how far away they are.

Use a Video Assist Monitor

Feature film directors connect video assist monitors to their cameras so that they can see what the camera operator sees through the viewfinder. A video assist monitor makes it much easier to focus and frame your shots. To see a true 4K image, you'll need to use the 4K output on the camera and the 4K input on the monitor. (For more on monitoring video on the set, see Chapter 10.)

Focal Length Equivalency

Many people are familiar with the focal lengths of lenses used in 35mm still photography. But whenever you use a camera with an image sensor that is smaller than 35mm film, the focal lengths are designed at a different scale. In other words, a 50mm lens on a super 35mm sensor camera will look different than that same lens on a super 16mm sensor camera. You can use a focal length multiplier to figure out the focal length equivalency of different lenses. Focal length equivalency is commonly discussed in terms of the crop factor. If your camera has a 1.6x crop factor, such as the Canon 7D, a 50mm lens will act like an 80mm lens. Refer to the manufacturer's documentation to get the focal length multiplier for your camera/lens

22mm

50mm

480mm

Figure 7.8

These four images were shot using four different focal length lenses: very wide, wide, normal, and telephoto. The camera's position was adjusted to keep the framing similar. Notice what happens to the tree in the background.

allow you to selectively record a particular person or event. Moreover, because a directional mic can be farther from the recording subject than an omnidirectional mic, they are better suited to some feature production sets, where keeping a mic close to the subject is difficult. Some directional mics are more directional than others, and which type to choose depends on your shooting task.

Most directional mics are sensitive to sound in a cardioid pattern (so named because it looks vaguely heart shaped—see Figure 8.4). A cardioid microphone is more sensitive to sound coming from the front of the mic, and typically attenuates, or drops off, sounds around the sides of the mic. Typically, a cardioid pattern is wide enough that a cardioid mic placed more than seven or eight feet from its subject will pick up unwanted sounds.

A supercardioid mic has a tighter pickup pattern than a cardioid and is similar to the pickup pattern of the human ear. Supercardioid mics provide good results when used at a distance of 6 to 15 feet from the subject.

Finally, hypercardioid mics have an even narrower pickup pattern that rejects most sounds that are "off-axis" from the direction the mic is pointed. Hypercardioids are, in fact, so directional that they can be somewhat difficult to use. If they stray even a little from their subject, they will not pick up the desired sound. You'll need a diligent mic operator to use a hypercardioid mic.

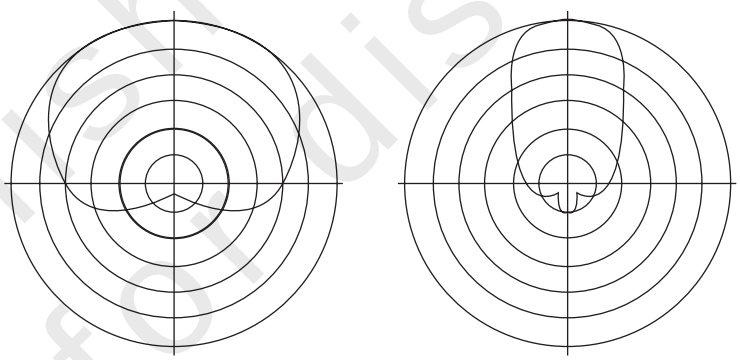

Figure 8.4

The cardioid patterns for an omnidirectional and a supercardioid mic.

Contrary to common sense, it's the holes on a microphone that make it more or less directional. Take a look at a typical handheld or clip-on omnidirectional mic. You'll see that most of the holes in the microphone's case are in the very top of the mic, with just a few holes around the sides. Now look at a typical hypercardioid mic, and you'll see a very long tube riddled with holes along its entire length. What's the deal?

The holes in a directional mic cause the sounds coming in from the sides of the mic to cancel each other out, leaving only the sounds from the front (and sometimes, back). In fact, you can turn a hypercardioid mic into an omnidirectional mic simply by covering up the holes along the sides (see Figure 8.5).

Photo courtesy of Azden.

Figure 8.5

Extremely directional mics such as this one from Azden are ideal for mounting on a boom or fishpole or, in a pinch, mounting on the top of your camera. It is the holes in the side of the mic that give its directional qualities.

If you can't afford multiple mics or arrange for a boom operator on your shoot (more on this later), and you need to shoot dialogue scenes, then an omnidirectional mic will be the best choice. Ideally, though, you'll want a mic with a supercardioid pattern and the personnel and equipment to use it right. Later in this chapter, we'll discuss how to mic your scene.

Most microphones come with a coverage chart that indicates the directional pattern of the microphone and how different parts of the field of coverage respond to different frequencies (see Figure 8.6). Although interesting, don't lose any sleep over trying to understand these charts. Most mics are clearly rated as cardioid, supercardioid, or hypercardioid.

Finally, parabolic mics are extremely directional mics that use a large parabolic dish to gather and focus sound onto the head of a unidirectional microphone. Parabolic mics are sensitive to sounds over 200 feet away and are not practical for most feature shoots.

lined script during the shoot (see Figure 9.3). Nowadays, that's done via software, and ScriptE is the industry standard.

Continuity

During a shoot, continuity is the process of keeping track of dialogue changes, matching camera angles, actors' positions, and wardrobe and props so that the footage from shot-to-shot and day-to-day will cut together. You can use a digital still camera to take photos to keep track of continuity.

Sync On Set is a web and mobile app that helps you create script breakdowns, track continuity photos, and collaborate with multiple crew members to build a shared database during the shoot. It requires an online account.

When a script is prepared for production, each scene is given a scene number. In turn, each shot in that scene is given its own shot number. Generally, the master shot is named according to the scene number; for example, scene 23, and each take is numbered consecutively: 23-1, 23-2, 23-3, and so on. The next shot in the scene, say a close-up of the lead actor, would be called 23a, and so on. This information is recorded on the slate and also on the notes kept on the shooting script by the script supervisor, usually handwritten on the facing page of the shooting script itself (see Figure 9.3). Usually, the best takes are marked with a circle around the shot number. These circled takes are the shots that the director thought were the best takes during the shoot.

For complicated scenes, a script supervisor's notes might include diagrams of the set, still images for continuity, and more. In addition, the script supervisor lines the script, drawing lines with arrows to show the portion of the script that each shot covers. Be aware that these lines indicate the dialogue that was *actually* covered during the shot, as opposed to the director's idea of what should be covered. So if an actor is cut short mid-take for some reason, it will be noted in the script supervisor's notes.

Clearly, script supervising isn't necessary for every shoot, but the longer your project and the more complicated the shoot, the more likely you will make continuity or coverage mistakes on the set without a script supervisor and the more valuable this information can be later on in post.

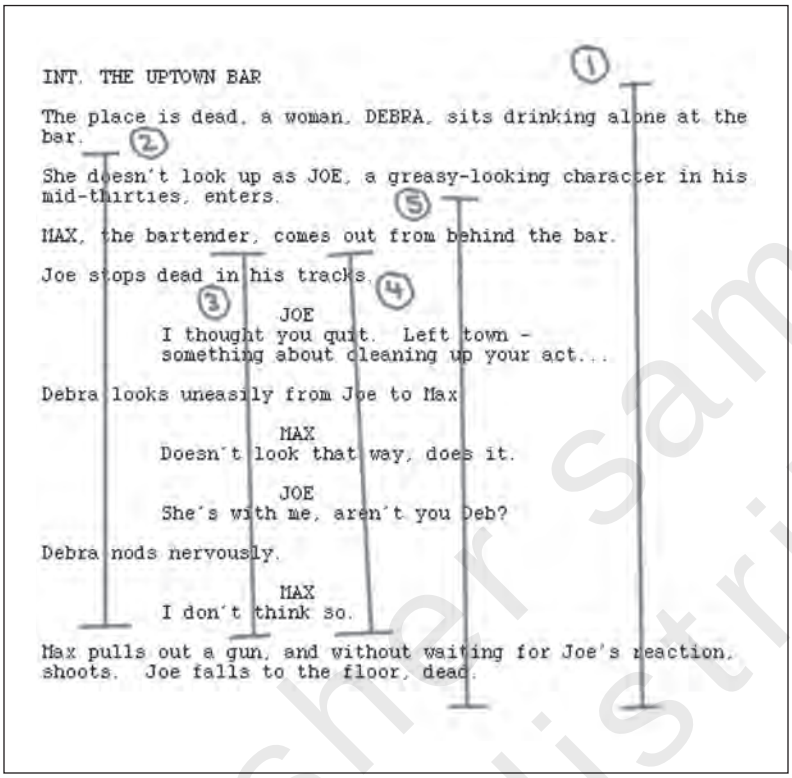

Figure 9.3

A lined script and script supervisor's marks.

Documentary Field Notes

For documentaries, there is no such thing as a script supervisor; however, there is usually someone on the set to take field notes. Field notes are not as formalized as script supervisor notes, but they contain the same sorts of information: content, technical notes, and so on. If the shoot involves multiple takes—such as the taping of an on-camera host—the takes are numbered, and the director selects circled takes, just as they do on a scripted project. With documentaries, separate "takes" don't always exist—rather the camera operators simply cover the scene as best they can without stopping the camera unnecessarily. The field notes serve to describe what happened and to give the timecodes of key moments so that later on, people working in postproduction can quickly find important material.

Jibs and cranes provide high- to low-angle movement for swooping shots, and they are especially popular for establishing shots. Almost every talk show set includes an indoor jib for all those shots that fly over the audience and land down on the set with the hosts. Jibs can be huge or small and portable. Like a slider, a small jib can add up and down movements and give you extra height, sort of a halfway step before the extreme height of a drone or a crane. A crane is just that, an actual crane like they use for construction projects. Some cranes specially made for filmmaking have a platform that can support a full camera setup and operator, others allow you to suspend the camera from them with a gimbal-based rig that is remote-controlled. Many filmmakers today opt for drones instead of cranes, but cranes offer control and repeatability that is hard to achieve with a drone. Cranes and jibs are especially good at starting and ending with a static shot which is almost impossible to do with a drone.

Photo courtesy of That Cat.

Figure 10.10

Silent Cat slider from That Cat.

Aerials and Drones

Sometimes the gear is so cool, it's easy to forget that the important thing is the shot that it can deliver. Until recently, aerial footage was usually shot by helicopter. Renting a helicopter is expensive and FAA rules limit how low a helicopter can fly, which restricts your shots to very high altitudes. Helicopters are great for big, wide shots of large vistas but not as good as a crane for things closer to the ground. Drone technology, by comparison, lets you get those altitudes that are too high or too expensive to get with a crane, but too low to be shot with a helicopter or plane. Because of their small size, drones can even fly indoors, giving you the option to do complex indoor tracking shots without having to rent expensive cranes and rigs.

No matter how you acquire it, aerial footage is almost always better when shot by a skilled operator. With novice aerial footage, you run the risk of ending up with a long stream of imagery and no usable shots. The common fix for this problem in post is to add motion effects. A boring shot slowed down can look dreamy, a rough camera move can disappear when sped up a thousand times (or more) in a speed ramp. But when drone footage is shot well, by an operator who knows how to compose flying shots with beginnings, middles and ends, aerial footage can be truly breathtaking (Figure 10.11).

Figure 10.11

A shot like this would be impossible to get without a drone.

There are two types of drones out there – drones with built-in cameras (Figure 10.12) and drones that allow you to add your own camera. Drones with built-in cameras are typically smaller and easier to fly than larger drones. Larger drones, though, can carry heavier payloads, which allows you to mount high-end digital SLRs or video cameras to them.

Small drones with built-in cameras are capable of getting fantastic footage, but they all sport fixed-focus lenses (some of them with very wide fields of view) and small sensors which give them inherently deep depth of field. However, drones like the DJI Phantom and Mavic series are incredibly easy to fly, thanks to their sophisticated software and GPS-assisted flight controllers. The camera gimbals on these drones are extremely good, allowing you to shoot stable footage in strong winds, or while flying very quickly. With the latest models offering 4K video, you can get great results from these drones which cost as little as $1,000.

post and serves no purpose on the set. If you want a special effect on one camera, such as the look of Super 8 film, do it in post.

Multicam with a Go Pro

Probably the most common form of multicam shooting for smaller productions is the combination of a regular video camera and a small action camera like the Go Pro Hero. Often the action camera will be somewhere challenging— taped to the chassis of a car or up on a drone— so you can't always record audio or slates that match the other camera. These shots are typically synchronized the hard way, by eye, in post. But there are some manufacturers who make special timecode generators designed to work with Go Pros.

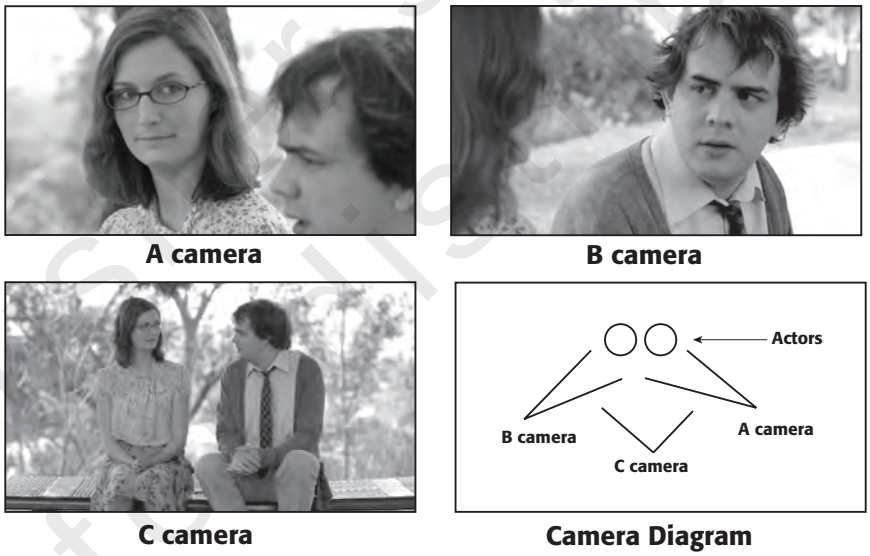

Figure 10.25

Three angles from a multicam shoot and a camera diagram.

Challenges of Multicam Shoots

Synchronizing two or more cameras is actually the easy part. What's a little more challenging is lighting and framing shots with multiple cameras on the set. Typically, lighting for multicam shoots is designed for 360-degree shooting. That usually means there is a grid on the ceiling with lights hanging from it to keep the

lights out of your shots. Shooting outside is a little easier since you can use natural daylight and not worry about lights getting in your shots.

Framing for multicam is tricky as well. Typically, you want all your cameras to cut together. That means they all need to be on the same side of the stage line and that each camera needs to be shooting at an angle that is sufficiently different from the others so that cutting between them doesn't result in a jump cut (Figure 10.25). A traditional television studio is designed similarly to a stage in a theater. The stage line is literally the line at the edge of the stage between the audience and the actors. The cameras never cross this line, and as a result, there is no risk of, in this case literally, crossing the stage line. Documentaries, reality TV shows, and sporting events are less rigorous about the rules regarding the stage line, in part because the nature of what they are shooting does not fit into clean, defined areas of "stage" and "audience." You will need to decide what rules apply to your project and frame your shots accordingly.

Also challenging for multicam shooting is finding a position so that the boom operator doesn't appear in any of the shots. For this reason, wireless mics are a must on multicam shoots.

Shooting VR Projects

Shooting a VR project is kind of like a multicam shoot turned inside out. Instead of a bunch of roving cameras, you have a single point with multiple cameras shooting out from it (Figure 10.26). This single-point mimics the point of view of a person, and just like in real life, a person viewing a VR video can look around and see a 360-degree view of the location or set.

The first thing to determine in a VR shoot is the placement of this single point of capture. Is it the point-of-view of a character? Does it move? It is at eye level? Is it handheld? How much of the area overhead or on the ground does it need to capture? Knowing the answers to these questions will help you determine how many cameras (or video streams) you will need for your shoot and it will also help you determine what sort of camera rigging is required. Capturing more streams of video means that the resulting 360-degree video will be more detailed and complete, with less problems stitching it together later in post.

Drag-and-Drop Editing

With drag-and-drop editing, you use the mouse to drag shots into the timeline window from a bin. Once there, you can rearrange shots by dragging them into the order you prefer. Drag-and-drop editing is often the best way to build your first rough string-up of a scene. You can arrange and select multiple shots in a bin and then drag them into the timeline all at once.

Three-Point Editing

Three-point editing lets you define the part of a source clip that will be used in your edited sequence, by selecting a beginning (in-point) and an ending (out-point) within the clip (these are the first two points), and then selecting where the clip will begin or end in your edited sequence (the third point). This allows you to build an edited sequence more precisely than you can with drag-and-drop editing. After setting the in- and out-points, press the Edit button and the selected part of your source clip will be placed on the timeline at the selected destination.

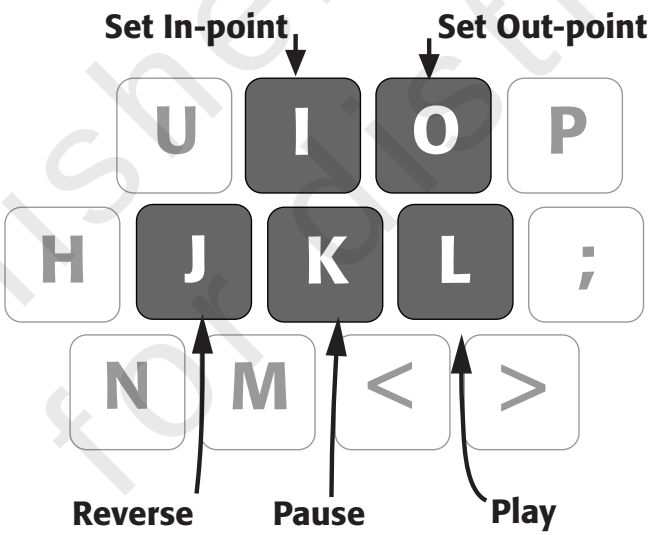

Figure 12.2

Keyboard, or JKL, editing provides a simple, one-handed editing interface.

JKL Editing

If your program provides JKL editing controls, the J on your keyboard will play your video in reverse, the K will pause, and the L will play forward. This simple mechanism allows you to shuttle quickly around a video clip to find an in- or out-point. Since you can usually select an in-point with the I on your keyboard and an out-point with the O, JKL turns your standard keyboard into an efficient, one-handed edit controller (see Figure 12.2).

Insert and Overwrite Editing

Whether you're using drag-and-drop, three-point editing, or switching between the two, your editing package should provide for insert and overwrite editing modes. These two options allow you to choose *how* your footage is added into an already-cut sequence.

When you are inserting, all of the footage after the in-point is pushed down the timeline to accommodate the footage that is being added. In other words, the new footage—whether audio, video, or both—is inserted into the timeline.

Conversely, overwrite leaves all clips in place, but writes the new clip over any existing video or audio (depending on which tracks are targeted), as shown in Figure 12.3.

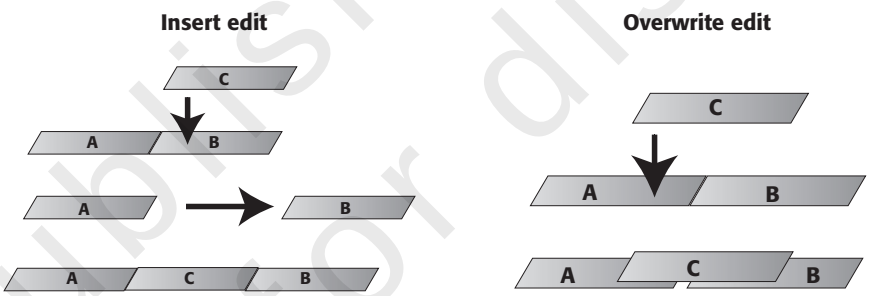

Figure 12.3

Insert edits allow you to add a shot between two existing shots (left), while overwrite edits allow you to easily add a shot to cover an edit, like a cutaway (right).

Trimming

After you have a decent rough cut of a scene, it's time to fine-tune it. For example, you might want to add beats of silence between certain lines of dialogue to show a character's hesitation, or you might want to extend a shot of a

Figure 14.5

Markers let you make notes on a specific frame in your shot.

STEP 4: BUILD THE FOUNDATION OF YOUR CUT

Now you've watched all the shots, and you have probably developed some opinions along the way. Hopefully, you've taken notes or marked the takes you liked using markers. As you watched the raw, you probably noticed that there was a bit of a plan in place, in terms of the coverage. The scene is intended to begin with James dancing in the mirror and then cuts to Sherrie as she enters. They dance and end up at the mirror, where Sherrie grills him about her daughter.

Here is a list of the coverage for the scene:

Wide-master-LR.mov is the wide master shot, which covers all of the action in the whole scene.

Med-master-LR.mov is the medium master shot. This shot favors "James" and covers the entire scene with a medium-wide 2-shot.

Sherrie-single-LR.mov is a single on Sherrie as she enters, and it only covers the beginning of the scene.

James-single-LR.mov is a single on James up to Sherrie's entrance, and it also only covers the beginning of the scene.

Cutaway-feet-LR.mov is a cutaway of that actor's feet during the salsa dancing portion of the scene.

Two-shot-LR.mov is a two-shot of James and Sherrie's dialogue in the mirror.

As you can see, there are two master shots of the scene—the wide master and the medium master. Even if you have an idea in your head of how the scene should be cut together, the wide master shot provides an easy way to create a very simple cut of the scene. You'll have all the action and dialogue in one shot.

Double-click on the wide master shot to load it into the source display. Press Play and find the start of the scene. Set an in-point by pressing the "I" key and then set an out-point at the end of the scene by pressing the "O" key. Click on the "Overwrite" button in the center of your screen, and the master shot will be added to a new sequence in the timeline (see Figure 14.6). Note that the new sequence will appear in your bin as "Untitled Sequence." Give it a name and save your project.

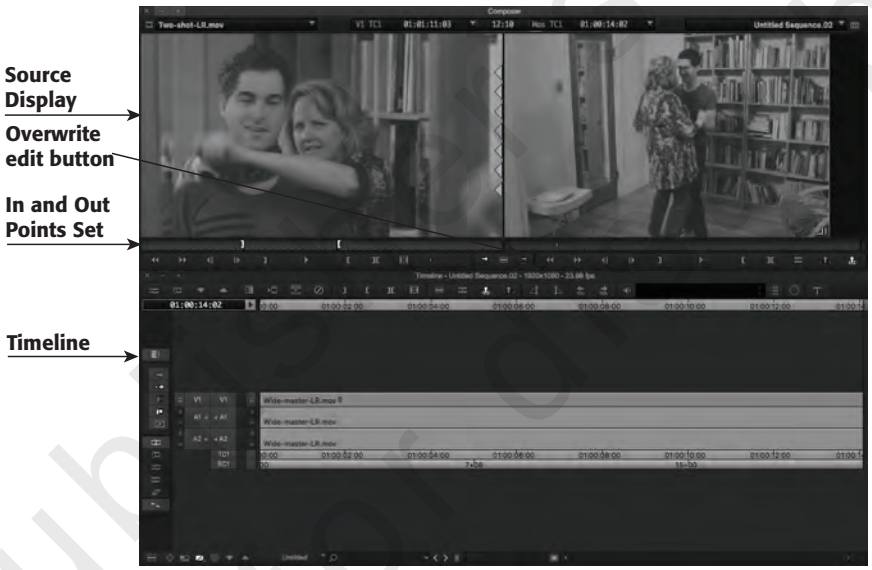

Figure 14.6

Load the wide master shot into the source display, set an in-point and an out-point, position the cursor in the timeline, and press the Overwrite button to create the foundation of your scene in the timeline.

STEP 5: ADD SOME OTHER SHOTS

Now that you have the spine of your cut in place, you'll build up the scene by adding coverage. The first order of business is to add the shot of Sherrie entering the scene. Double-click on Sherrie-Single-LR.mov and set in- and out-points (I and O on the keyboard) for the part of the shot you want to insert into your master shot.

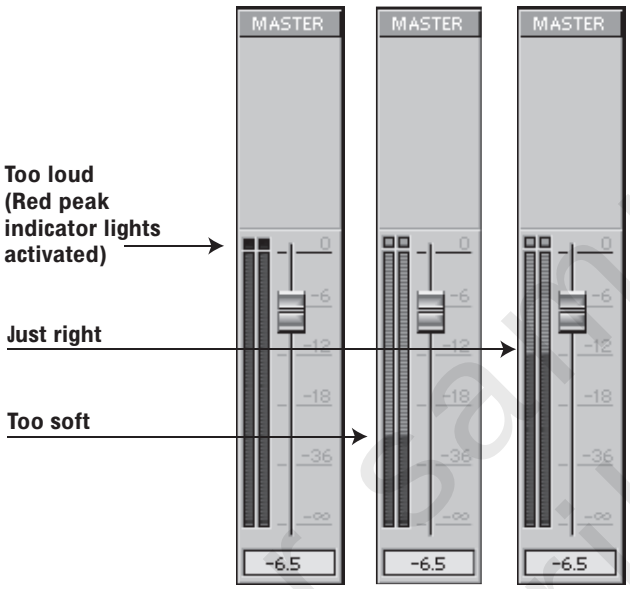

Figure 15.1

Digital audio meters provide a visual display to indicate the loudness of your sound.

Clipping and Distortion

You might be wondering what that red area on the audio level meter is. To simplify, it shows sounds that are very loud. Basically, it's perfectly natural that these sounds—a door slamming, for example—go to the top of the scale, or peak. But with digital audio, the red area should be avoided at all costs, because digital audio that is too loud gets clipped. Instead of distorting, they will simply get cut off. If, for example, the sound of a man yelling peaks, the high frequencies will get clipped, but the lower frequencies that aren't as loud will remain. The result will be a very strange sounding yell (see Figure 15.2).

Where's That Hum Coming From?

If you hear a hum when you play audio, it might have been recorded onto your original source audio; however, there's also a chance that it might be coming from your system itself. Faulty cables, loose connections, and power supply problems can all add a hum to your audio signal. Before you try to correct a hum with EQ, make sure that your system isn't the culprit.

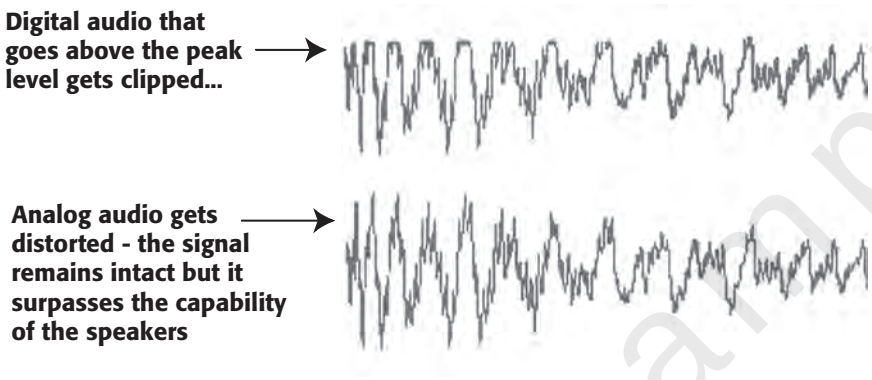

Figure 15.2

Digital audio that goes above the peak level gets clipped. The part of the signal that is too loud simply doesn't play.

Using Your Editing App for Sound

You will probably be able to perform most edits—audio cuts as well as cross-fades and simple effects—using the sound editing features of your editing software. Most editing packages provide a waveform display that makes it simple to zoom in on a sound to trim and cut, or to eliminate or replace problem areas (see Figure 15.3). As we said earlier, editing packages also usually include most of the audio filters you'll need for creating simple effects and for sweetening audio.

To determine if you'll need any additional sound editing software, you should examine your editing application to see if it has certain audio editing essentials:

Multiple tracks and playback. Most pro-level sound editing packages provide support for an unlimited number of audio tracks. Although your final master might only have four to eight tracks, being able to have extra tracks makes it easier to keep your project organized.

Level controls for each track. Any respectable, high-end editing package will have this feature, usually in the form of a simple line across the audio track that can be dragged up and down, and edited with control points.

audio mixing board A piece of hardware that takes several audio signals and mixes them together, allowing for the combination of different sources. Mixers usually include some type of equalization control.

audio sampling rate The number of samples per second that are used to digitize a particular sound. Most DV cameras can record at several audio sampling rates. Higher rates yield better results. Measured in kilohertz, 44.1kHz is considered audio CD quality, and 48kHz is considered DAT quality.

AVCHD A high-definition acquisition and mastering codec developed by Sony and Panasonic and compatible with Blu-ray Discs.

AVC-Intra A high-definition acquisition codec developed by Panasonic for use with their P2 line of cameras.

Avid DNxHD A set of codecs designed for use in digital video editing applications, particularly Avid Media Composer.

Avid DNxHR A set of codecs designed by Avid for high-resolution video like 4K

AVR Avid Video Resolution, a series of low and high-resolution codecs included with older Avid editing systems.

Axial One of several linear hardware-based online editing systems.

balanced audio A type of microphone connector that provides extra power. Sometimes needed if you want to have microphone cable lengths of 25 feet or longer.

balancing light sources In a lighting setup with several different light sources, the process of making the color temperature of all the lights the same, either to match daylight or tungsten light. Usually, this is done with CTO or CTB lighting gels.

bandwidth The amount of digital information that can be passed through a connection at a given time. High bandwidth is needed for high-quality image transfer.

barn doors A set of hinged door-like flaps that attach to the front of a light and serve to control where the light falls.

bars and tone A combination of color bars and 60Hz audio reference tone, usually recorded onto the head of each videotape. Used for calibrating video and audio levels.

bayonet mount A type of locking mechanism that allows you to fit a lens to a camera body. The lens can be easily and quickly attached and is held securely in place by two pins. See also **PL Mount**.

bin A film-editing term that refers to the place where the shots for a scene are stored. In software editing systems, bins can also be referred to as *folders*, *galleries*, or *libraries*.

Index

B

C

D

E

F

G

H

M

N

O

P

Q

R

S

T

U

V

W

Y

Z

The Digital Filmmaking Handbook | Sixth Edition

Filmmaking involves much more than just buying a camera and a computer and **The Digital Filmmaking Handbook** covers everything you need to know, whether you're making a feature-length movie, a series of webisodes, a VR project, or even your first short film. This one-stop digital filmmaking resource will guide you from your initial idea to getting your finished project "in the can." It will show you how to create shots and effects that are rarely associated with low-budget productions.

What's New?

- Web-based distribution has finally cracked open the field and there are really no limits to the type of films you can make—from long-arc television to webisodic content to traditional feature films, it's easier than ever to find an audience for your movie.
- Virtual Realty is making serious headway into the entertainment industry, so we've added special sections about VR productions throughout the book.
- The rate of technological innovation in digital filmmaking is astounding: more and better digital cinema cameras, accessible 4K production and post, lots of new lenses, and computer-controlled camera rigging from sliders to robotic jib arms to drones.

It's a brave new world out there and we're here to help you navigate it.

Digital video has come to mean all things to all people and the types of projects that are being made by indie filmmakers are more varied than ever.

So why stop at a single film? Go ahead, you know,

Make Your Movies.

The Digital Filmmaking Handbook is a top-rated bestseller. It's been in print for 17 years. It offers 600 pages of regularly-updated information on all aspects of filmmaking.

(Some people buy this book for the glossary alone.)

Category: Film/Video
U.S. $49.99

FOREING FILMS Publishing

About the Authors

SONJA SCHENK is a director, producer, and writer based in Los Angeles. She directed the comedic feature film *The Olivia Experiment*, which was released theatrically in 2014. Her executive producer credits include the television programs *The Bachelor, The Bachelorette*, and *High School Reunion*. She began her career as a video artist and completed her MFA in film at USC. She has edited documentaries for HBO, the BBC, Channel 4, Canal Plus and FX, and also the indie feature *Britney Baby, One More Time*, which screened at the Sundance Film Festival, the Rotterdam Film Festival, and many others.

BEN LONG is a San Francisco-based photographer and writer. The author of more than a dozen books on digital photography and digital video, he has been a longtime contributor or contributing editor to many magazines and is a Senior Contributing Editor for *Macworld* magazine. He is the author of two-dozen courses on photography and video production for Lynda.com. His photography clients include 20th Century Fox, Blue Note Records, Global Business Network, the San Francisco Jazz Festival, the Pickle Family Circus, and jazz musicians Don Byron and Dafnis Prieto. He has taught and lectured on photography around the world.

digitalfilmmakinghandbook.com

ISBN 9780692782118
54999
9 780692 782118