2nd Edition

Marcus Weise
Diana Weynand

HOW VIDEO WORKS

From Analog to High Definition

Focal Press

How Video Works

Second Edition

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Diana Weynand

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Introduction 1

Since the development of broadcast cameras and television sets in the early 1940s, video has slowly become more and more a part of everyday life. In the early 50s, it was a treat simply to have a television set in one's own home. In the 60s, television brought the world live coverage of an astronaut walking on the moon. With the 70s, the immediacy of television brought the events of the Vietnam War into living rooms. In the 21st century, with additional modes of delivery such as satellite, cable and the Internet, video has developed into the primary source of world communication.

Video Evolution

Just as the use of this medium has changed over the years, so has its physical nature evolved. The video signal started as analog and has developed into digital with different types of digital formats, including some for the digital enthusiast at home. When television was first created, cameras and television sets required a great deal of room to house the original tube technology of the analog world. In today's digital society, camera size and media continue to get smaller as the quality continues to improve.

Today, a video image is conveyed using digital components and chips rather than tubes. Although the equipment has changed,

some of the processes involved in the origination of the video signal have remained the same. This makes the progression of video from analog to digital not only interesting to study, but crucial in providing a foundation of knowledge upon which the current digital video world operates. So much of today's digital technology is the way it is because it evolved from analog.

Analog and Digital

No matter how digital the equipment is that is used to capture an image, the eyes and ears see the final result as analog. All information from the physical world is analog. A cloud floating by, an ocean wave, and the sounds of a marching band all exist within a spectrum of frequencies that comprise human experience. This spectrum of frequencies can be converted to digital data, or zeros and ones. Human beings, however, do not process digital information, and eventually what a human being sees or hears must be converted back from digital data to an analog form. Even with a digital home receiver, the zeros and ones of the digital signal must be reproduced as an analog experience (Figure 1.1).

In the early days of television, video was captured, recorded, and reproduced as an analog signal. The primary medium for storage was videotape, which is a magnetic medium. The primary system for reproduction was mechanical, using a videotape machine. Videotape, which was developed based on mechanical concepts, is

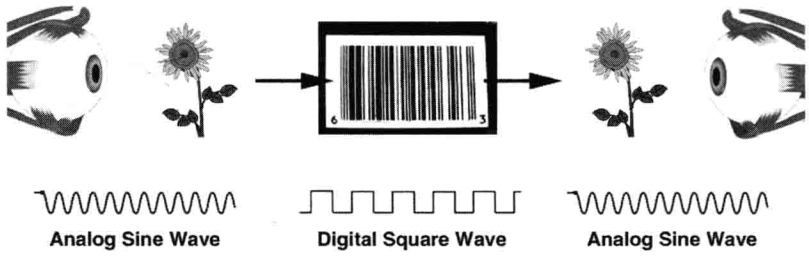

Figure 1.1 Analog and Digital Domains

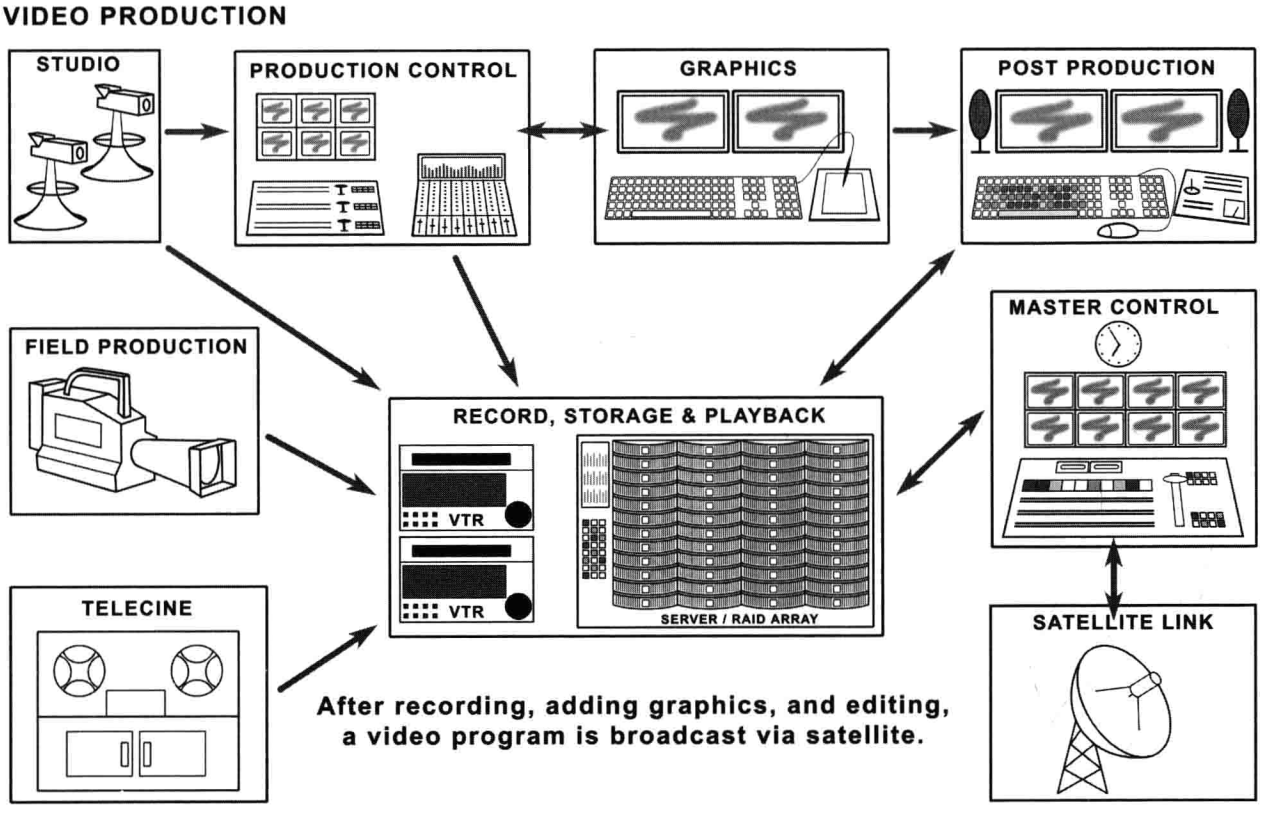

Figure 1.2 Video Production

a linear medium. This means that information can only be recorded or reproduced in the order in which it was created. With the advent of digital, the primary system for signal reproduction has become solid-state electronics, incorporating servers and computers. This change has created a file-based system, rather than the taped-based system of the analog era. File-based systems allow random, or nonlinear, access to information without respect to the order in which it was produced or its placement within the storage medium.

Video Applications

Facilities such as cable or broadcast stations, as well as production or post-production companies, are constantly transmitting and receiving video signals. They generally have a number of devices that can be used to capture and reproduce a video signal, such as cameras, videotape recorders (VTRs), videocassette recorders (VCRs), computer hard drives, FireWire drives, and multiple hard drives called RAID arrays, short for Redundant Array of Independent (or Inexpensive) Disks, which are controlled by computer servers. Figure 1.2 shows different ways in which VTRs or computers might be used to capture, transmit, or reproduce a video signal.

About This Book

To create a complete picture of the video process—and answer the question "How does video work?"—this book begins by examining the analog video signal. Digital video technology is a direct evolution from the analog system. Having the knowledge of the analog system provides a firm foundation before moving into a discussion of digital.

While this book is designed to cover the process of creating a video signal, storing it, and transmitting it in a professional environment, the same information and concepts apply to any video tool, including consumer equipment.

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