1.1.1. TYPES OF VIDEO CAMERA

There are two types of video cameras. There is the **portable camera** and the larger **studio model camera**. The studio camera is always mounted on a tripod and dolly for rolling, where as the smaller portable united can be hand-held or mounted on tripod if needed.

The main purpose of a video camera is to change the scene viewed through the lens into an electronic signal to be transmitted to the VCR. This conversion takes place in the camera tube or in semi-conductor chips in newer cameras.

The video camera has certain features. For instants a **focus ring** is used to create a sharp image. The **zoom** feature allows you to move closer or further from an object while standing still. The **aperture** setting or **iris**, allows you to adjust the size of the lens opening for various light conditions. There is also a **viewfinder** that allows you to see what the lens is seeing. Many newer cameras have auto focus as well as automatic aperture.

A tripod is a separate attachment. This is used if your video camera is too heavy and if your picture doesn't come out very clear. A dolly is a tripod with wheels, which enables you to move with the object

The formats of video cameras include, VHS, VHS-C, 8mm, Hi8, Mini Digital Video Mini DV, DVD and Digital 8 .

VHS

The **Video Home System** better known by its abbreviation **VHS** is a consumer - level video standard developed by Japanese company JVC and launched in 1976.

A VHS cassette holds a maximum of about 430 m of tape at the lowest acceptable tape thickness, giving a maximum playing time of about 3.5 hours for NTSC and 5 hours for PAL at "standard" SP) quality. Other speeds include LP and EP/SLP which double and triple the recording time, for NTSC regions. These speed reductions cause a slight reduction in video quality from 250 lines to 230 analog lines horizontal; also, tapes recorded at the lower speed often exhibit poor playback performance on recorders other than the one they were produced on. Because of this, commercial prerecorded tapes were almost always recorded in SP mode. The VHS format is the oldest type of camcorder. This type of video camcorder is fast becoming outdated, because you can only play back the video on a VHS VCR system. VHS camcorders are not nearly as clear as digital video camcorders that offer clear video with 540 lines of resolution.VHS video cameras only offer 240 lines of resolution. They also weigh more and are much more bulky, that DV camcorders. You cannot find these video camera being used because their technology is now outdated.

VHS-C

The VHS-C format offer 240 lines of resolution, just like VHS. These analog camcorders come in a smaller size that the VHS camcorder models, but use the same technology. The video tapes used in VHS-C camcorders are much smaller in size than VHS, just in a smaller camcorder design. VHS-C is considered old technology and not used today in newer models.

8mm

If you are looking to record more than 1 hour, then 8mm camcorders are perfect. These video cameras can record up to 5 hours of footage and they offer better video quality those VHS cameras. In order to view video from your 8mm video camcorder, you need to connect the camcorder to input jacks on your TV or your VCR system.

Mini DV

Mini DV, short for mini Digital Video off the clearest and most vivid colors out of all the types of camcorders on the market, and they're small in size only 4 inches in width and height. Mini DV camcorders can fit in the palm of your hand, making them very easy to handle and transport. And if you like editing your video footage you can connect DV camcorders to your computer system. Transferring the video is a snap with the FireWire connection. Once the footage is in your computer's

hard drive you can burn it to DVD, add it to your web site or email small clips to friends and family.

Digital8

Digital8 camcorders offer the best of both worlds, Hi8 and DV. You can use 8mm and hi8 videotapes combined with the best image quality found in digital camcorder formats. Digital8 camcorders are larger and heavier than Mini DV camcorders, but they are also cheaper in price. The Digital8 system offers 540 lines of crystal clear resolution.

DVD Camcorders

The newest form of digital video cameras is DVD camcorders. These camcorders are small in size, just like Digital8 and Mini DV camcorders. The big difference compared to other camcorder systems is that DVD camcorders use record able DVD discs such as DVD-R or DVD-RW. The big benefit to DVD video cameras is that they can be played on your home DVD player, and of course the quality is the best you can find.

Most machine vision cameras use charge-coupled device CCD image sensors. Charge from each line of pixels is transferred down the line, pixel-by-pixel and row-by-row, to an amplifier where the video signal is formed. CCD cameras are available in a wide variety of formats, resolutions, and sensitivities. They provide the best performance for most applications.

Complementary metal-oxide semiconductor CMOS) sensors are becoming available for some applications. Because they are made using the same processes used to fabricate computer chips, they can be produced very inexpensively. Low-cost CMOS cameras are already used in toys and in web cams. Unlike CCD sensors, which must be read out one full line at a time, CMOS sensors can be read pixel by pixel, in any order. This is useful for time-critical applications where only part of the image is of interest. At present, the noise performance of CMOS sensors is inferior to CCDs.

Interfaces

There are two types of camera interfaces in use, **analog** and **digital**. In an analog camera, the signal from the sensor is turned into an analog voltage and sent to the frame-grabber board in the vision-system computer. EIA, RS-170, NTSC, CCIR

and PAL are all common analog interface standards. Analog cameras are inexpensive, but subject to noise and timing problems.

Most new machine vision cameras use a digital interface. The camera digitizes the signal from each pixel and the data sent in digital form directly to the computer. Camera Link and Firewire are two popular digital interface standards. The digital signal is not subject to noise and there is a perfect correspondence between each pixel on the sensor and in the image. Digital cameras support a wide variety of image resolutions and frame rates. Since the signal is already digitized, a simple interface board replaces the frame-grabber.

Color Cameras

Most color CCD cameras use a single sensor with an array of color filters printed over their pixels. Adjacent pixels sense different colors, so the resolution at each color is lower than for a similar monochrome sensor. Some high-performance cameras use a color-separation prism to send light to three separate CCDs. These cameras provide full resolution at each color. Lenses for these "3-chip" cameras must have sufficient back working distance to allow room for the prism.

Line-scan Cameras

Line-scan cameras have a single row of pixels, 1k, 2k, 4k or more pixels long. They record images one row at a time. Often the object moves past the camera to provide the second dimension e.g., a web of paper being inspected during manufacture). Line-scan cameras provide high-resolution images at very high data rates. Long live-scan sensors require large-format lenses to cover their length. In addition, because each line of pixels is exposed only for a very short time, line-scan cameras require intense lighting and large aperture lenses.

Camera Formats

The size of an image sensor is called its **format.** The name of a format does not correspond to any dimension. Historically, a one-half inch format is the size of the sensing area of a Vidicon tube, which is one-half inch in diameter. It is important to choose a lens that covers the camera format. For a given field of view FOV, the camera format determines the required magnification.