TnT Paranormal Investigators LLC

Bumps in the Night!!!!

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Tools of the Trade

Video Camera Technologies

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As Paranormal researchers, we gather data, and some of the most compelling (although rare) is video data and there are numerous ways to gather these using video cameras. This is an overview of some of the terms and technologies used with video recordings.

FrameRate - Video, in its simplest definition, is a series of still images streamed together one after another, for film the standard is 24 frames per second (fps) and for video it's 30 fps. These framerates are fast enough that your eye/brain blend them into a smooth continuous stream that is pleasing to watch. Many security systems will sacrifice framerate for lower storage costs and drop down to 15fps or even 5/10 fps, which will be a more 'choppy' video but take a fraction of the needed storage, which allows longer recording for the same amount of storage.

CCD – Today's cameras use a CCD image sensor (Charge-Coupled Device) to convert an image into an electronic signal that can be transmitted and/or stored. The size and resolution of the video are determined by this CCD device and as with most things, better video = higher cost.

Analog/Digital - Video cameras are generally either **Analog** cameras which transmits signal out via video cable as NTSC (or PAL/SECAM) composite signal or records that signal to tape (e.g. VHS), or **IP (Digital)** Cameras which convert the CCD data to digital format and either stores it directly (e.g. Camcorder which saves to disk, memory, or even tape) and/or transmits remotely using Ethernet (wired or wireless).

Lens - The function of the camera's lens is to collect light and focus it into the camera's imaging sensor. Many security cameras (commonly used for investigating) use a fixed-focal-length lens, which, like your eye's lens, covers a constant angular field-of-view. Many camera lenses are available with different focal lengths, which will provide different field-of-views such as wide-angle, medium-angle, or narrow-angle lenses but not all cameras support swapping lenses.

Resolution – Stated as the number horizontal lines for analog cameras and typically range from 300-700 lines of resolution. Digital camera resolutions are generally MUCH higher and are stated in Megapixels (MP) which are total number (in millions) of Pixels (Picture Elements) that make up the image. Cameras can range from <1MP to 5MP(2600x1950) to 100+MP. Keep in mind that the higher the resolution the larger the video file will be as well as higher camera cost.

Light levels – Light is measured in lux and range from 0 (no light) to 400 (office lighting) to 100,000 in direct sunlight or higher. Since paranormal research is commonly done in low/no light environments it's important that the video cameras capabilities match that environment. In most cases, you will want an IR capable "Nightshot" camera that can "see" in total darkness. This is done with a camera with a CCD sensitive to the IR spectrum but will need external illumination, which is generally built into the camera as a segment/ring of IR LEDs in the camera housing that can be seen as a 'red' glow by the human eye. Cameras are commonly rates as a 30' or 100' which is the distance that the IR illuminators reach. Often, additional IR illumination is used by adding remote IR lights or IR floodlights to 'light up' the area being recorded.

Encoding – When video is 'digitized' it can come in many formats which will encode and compress the video stream. The common formats are

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MJPG, MPEG4, and H.264. The MJPG format is faster and cheaper BUT yields fairly inefficient compression, which yields larger video files. H.264 is preferred and yields much smaller files but generally only available on higher quality (more $$) cameras. Keep in mind that there are file formats (e.g. AVI, WMV, M4V, etc.) that combine audio, video, and other streams together.

Storage - In a multiple camera recording setup, DVR (Digital Video Recorder) or NVR (Network Video Recorder) are used. A DVR takes multiple (4/8/16/32) analog video streams, encodes/compresses them and stores them to an internal disk drive. An NVR works in a similar manner but takes in digital streams (already encoded and compressed by the IP camera) and stores them also to an internal disk drive. The main difference is that the DVR needs to encode the video and has higher hardware requirements so supports fewer cameras, but the NVR does not have the HW limitations so can (and often is) just software running on a PC with a network connection to access the cameras. The below table shows the storage requirements needed for 24 hours (4 cameras x 6 hours each) of video and vary based on Resolution, Compression, and framerate (fps).

		Disk Storage Needed (GB)		
Resolution	Compression	5 fps	15 fps	30 fps
352x240	MJPG	4	12	24
352x240	MPEG4	1	3	5
352x240	H.264	0.4	1	3
704x480 (4CIF)	MJPG	15	50	95
704x480 (4CIF)	MPEG4	4	10	18
704x480 (4CIF)	H.264	2	4	8
2048x1536 (3MP)	MJPG	146	440	870
2048x1536 (3MP)	MPEG4	41	100	165
2048x1536 (3MP)	H.264	14	35	58

In conclusion, this was an overview of the terms and technologies that apply to most still/video cameras used today. If you have additional question or comments, please drop us a line at our website and/or Facebook. We'd love to hear from you.

Additional references:

http://en.wikipedia.org/wiki/Charge-coupled_device

http://en.wikipedia.org/wiki/Lux

http://en.wikipedia.org/wiki/Pixel