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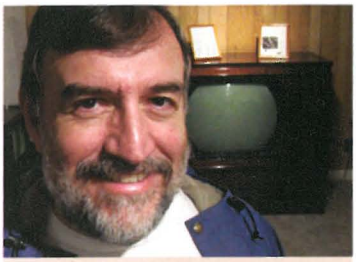
Broadcast Acquisition



Mark Shubin

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By Mark Schubin

The past year saw an increase in the range of imager sizes used for high-definition (HD) acquisition, new techniques for increasing resolution and sharpness, and increased frame rates. There was also progress in such other areas of acquisition as sound pickup, lighting, camera support, and in-camera storage.

The frame-size formats being used for HD image acquisition now range from 1/4-in. video (4.5mm image diagonal) in Panasonic's AG-HSC1 and Sony's HVR-V1 camcorders to 65-mm motion picture (60mm image diagonal) in the Vision Research Phantom 65. As before, cameras with motion-picture-sized imager formats and single imagers can use motion picture lenses directly.

The Dalsa Evolution, the NAC Memrecam fx K4, the Photron Ultima APX-RS, and the Vision Research Phantom HD are recent additions to the set of cameras with approximately 35mm motion picture frame sizes; the Weisscam HS-1 and older Weinberger Cine SpeedCam are only slightly smaller. Except for the Evolution, all of the cameras mentioned in this paragraph (as well as the Phantom 65) are high-speed image-capture systems.

Whereas ARRI, Dalsa, Panavision, and Red digital-cinematography cameras use 35mm motion picture frame sizes to allow the use of 35mm motion picture lenses (with 3mm motion picture depth of field), the high-frame-rate cameras use larger sensors for higher sensitivity due to their reduced exposure times (the NAC can capture thousand-line images at 1000 frames/sec, the Photron at 3000). At considerably lower speeds, but still at higher data rates than ordinary HDTV, the Grass Valley LDK-8000 can shoot 1080p HDTV at 50 or 60 frames/sec. At the International Broadcasting Convention in September, the European Broadcasting Union also demonstrated image coding of different HDTV formats based on 1080p images originally acquired at 50 frames/sec from a modified Sony HDC-1500 camera.

Cameras such as the new Silicon Imaging SI-2K series (and the older SI-1920) and the EasyLook Modula HD Cam use 35mm motion picture lenses even though they use only 2/3-in. imagers that capture only a portion of the image. Curiously, the i-movix SprintCam BC does the opposite, using 2/3-in. (11mm image diagonal) broadcast zoom lenses on the Photron's 24.6mm diagonal imager. The Photron imager, however; is square, and the i-movix output is 16:9, which reduces the needed image diagonal to approximately 13.8mm,

which, an i-movix spokesperson indicated, is covered by existing 2/3-in. format broadcast zoom lenses (with a mount adaptor compensating for the longer rear focal length for which those lenses are designed).

Canon added an auto-focus feature to its high-end broadcast lenses this year. Tiffen, which has long made optical filters used in front of and behind lenses, introduced Dfx software to closely emulate the effects of those filters, for assistance, in pre-production visualization or post-production processing.

The relatively low-priced, high-resolution (4520 x 2540) 35mm-frame-sized Red One camera, proposed last year, has not yet been delivered as of this writing, but two prototypes were sufficiently developed that they were used to shoot a "camera test" for *Lord of the Rings* and *King Kong* director Peter Jackson shortly before the 2007 National Association of Broadcasters (NAB) convention. The "test" turned into *Crossing the Line*, a short movie set during a World War I battle, complete with an aerial dogfight, a tank, explosions, and many actors in period costumes. The movie was projected at 4K resolution in a theater at the Red Digital Cinema exhibit.

Increased resolution like that of the Red One can allow finer detail to be perceived under optimum conditions. More commonly, it can offer increased modulation (contrast-ratio) transfer.

In multi-imager smaller-format (1/3 in. and smaller) HDTV cameras, it has been common to use a horizontal or diagonal spatial offset between the green imager and the red and blue imagers to increase resolution and modulation transfer. Thus, 960 x 540 imagers can be diagonally offset to derive a 1920 x 1080 luma image. In HDTV cameras with 1920 x 1080 imagers, it has been common to avoid such spatial offset, but Panasonic introduced it in the new AK-HC3500 camera to increase modulation transfer.

The number of sensors on an imager is only one factor affecting image sharpness. Another is lens aberrations. For the Ultra-Definition Television (7680 x 4320) of NHK (Nippon Hoso Kyokai, the Japan Broadcasting Corporation), Astro created a processor to correct lens chromatic aberration. Panasonic has adopted different forms of chromatic aberration correction for its AG-HPX500 and AJ-HPX3000 HDTV camcorders.

Those Panasonic camcorders use P2 (Professional Plug-in) storage on PCMCIA (Personal Computer Memory Card International Association) PC-Card form-factor cards based on SD (Secure Digital) solid-state memory cards. Previously, they recorded only signals encoded with the 100 Mbit/sec DVCPRO HD codec. Panasonic has announced a shift to "AVC-Intra," an intra-frame-only version of the H.264/MPEG-4 Part 10 advanced video codec. A 100 Mbit/sec version is said to offer higher quality than bandwidth-restricted DVCPRO HD; a 50 Mbit/sec version offers twice the capacity per card.

Sony has announced a move to solid-state memory cards in a new generation of camcorders, XDCAM EX. The Sony "SxS (S-by-S)" cards are to be based on the newer, higher-data-rate PCMCIA ExpressCard form factor, and they are to be developed jointly with SanDisk. Ikegami and Toshiba jointly announced another solid-state camcorder-storage format, GFCam (giga-flash).

Grass Valley's previously introduced Infinity camcorder, which could record on either CompactFlash solid-state memory cards or Iomega RevPro removable magnetic-disk media, was shown with new imaging sensors. The 2/3-in.-format Xensium chips use CMOS technology, instead of the previous CCD, and contain 40 extra rows and 80 extra columns of black-reference sensors for a total of about 2.4 megapixels instead of the usual 2.2.

Sony's HVR-V1 camera uses 1/4-in. 1-megapixel imagers instead of 2-megapixel, but it does not use spatial offset between the green and red/blue imagers to compensate. Instead, the sensor grid is rotated by 45°, creating diamond-shaped instead of square sensors, a technique used previously in digital still cameras.

The rotation allows not only the sensors but also their vertices to contribute to the resolution. Each vertex is surrounded by two sensors vertically and two horizontally, which can be averaged to create video information. The same could be done in a more-common grid of square sensors, but in that case the derived information would increase only diagonal resolution; in Sony's "Clear-Vid" system, it increases horizontal and vertical resolution.

An unusual element in Panasonic's AG-HSC1 camcorder, which uses the same size imagers as the Sony HVR-V1, is its sound pickup. The camcorder captures five-channel surround sound directly. The surround-sound recording camcorder is smaller than even last year's Holophone surround-sound microphone. Soundfield also introduced new, small, single-source surround-sound microphones this year, notably the SPS200.

Although it is not yet a product, the Pace modification of pairs of Sony's HDC-950 cameras (an HDC-1500 version is planned) to shoot stereoscopically, received

a great deal of attention. The stereo convergence was controlled remotely through special mounts.

Camera mounts appear to have been influenced by the shrinking size and weight of many cameras. That has allowed at least six brands to offer telescoping jib or crane arms this year. There has also been an increase in the number of tower and remote-tracking camera-mount brands. For larger camera/lens combinations, Vinten's Vector 950 panning head offers a digital readout for repeatable balance settings.

As small, lightweight, and inexpensive as professional video cameras become, their numbers are still dwarfed by the number of mobile telephones with video-capture capability. Chyron's WAPSTR product, introduced in the past year, is one designed to allow still and moving pictures from mobile phones to be integrated into broadcast video.

LED lighting products continue to be offered by many brands. This year, Rosco's LitePad joined the earlier ARRI Sky Panel as a flat-panel, thermally cool, soft light source. Ocean Optics introduced the SeaChanger, a color changer for lights, based on rotating dichroic-filter disks instead of gels. It does not require fans for cooling.

Much simpler optics are used in the vfgadgets.com EyeDirect system. Essentially a periscope on its side, the system allows the inexperienced to look directly into a camera's lens and see human reactions. It is similar to the Interrotron used previously by director Errol Morris, but without need for additional electronics.

Two manufacturers also introduced new techniques for monitoring camera output signals. DK Technologies offered a "spinner" display of histograms instead of levels against time, and Leader's CineLite offers analysis of the brightest and darkest points in a picture, for maximum dynamic range during shooting.

Post Production

Phil Mendelson

Mendelson has over 35 years of experience in the entertainment industry in technical systems development, design, and operation. He has conceived, designed, and built several major recording studios and video facilities, and managed their technical performance.

Mendelson began his career as a public radio producer, production engineer, and on-air personality in his birthplace of Detroit, MI, while attending Wayne State University. Moving to Los Angeles in 1974 and transitioning to the music business as an audio engineer

By Phil Mendelson, Ascent Media Creative Services Group

Digital Acquisition and Dailies

The acquisition field has widened considerably, and now includes several cameras that produce some form of file-based data, rather than HD streams. Currently, there is no standardization in the format and handling of this data, which will present challenges in Post in the development of cost-effective systems that can adapt to any of these formats.

Dalsa, RED, and Arri are among the manufacturers producing data-based cameras.

S2, Codex, and Color Space all produce field recorders that can record the output of many digital cameras, including and especially HD stream output, though many cameras, such as those from Grass Valley, RED, and Panasonic all support on-board solid-state media.

The Codex and S2 recorders facilitate the transformation and backup of on-location recordings. The Codex, for example, can output preview quality de-bayered image sequences from the Dalsa camera, and transform them to a number of deliverables, such as digital media for review, and media to the cutting room. This will have the effect of moving more aspects of the Dailies process onto location.

Established color management tools such as the Grass Valley Luther and Filmlight Truelight systems can be used to facilitate consistent visualization practices and creative looks from location to dailies, through finish.