Electronic Cinema What Did YOU See?

Everyone seems to be talking about electronic cinema. After the ShoWest demonstrations comparing two prototype electronic cinema projectors with a conventionally projected film print, many felt that electronically projected images were finally approaching the quality of 35mm film projection.

Sure, the film images seemed to have better color reproduction and flesh tones-and a bit more fine detail and sharpness. And there were questions regarding the cost and complexity of the digital equipment in the theatre-and the level of expertise required maintaining and operating it. But, ShoWest was a technical demonstration and so, to be fair, let's consider electronic projection and film projection from a technical point of view.

An Electronic Cinema SYSTEM?

With either technology, we need to talk about the images arriving on some type of medium. The images shown at ShoWest originated on film, but for electronic projection, they were painstakingly transferred to a digital (D5) tape.

Actually, D5 tape is too expensive and fragile to consider as a large-scale distribution format. A practical electronic cinema system would likely use satellite, fiber optic cable, or optical disk storage to send movies to theatres. Today, all of these require considerable data compression to be practical. At ShoWest, the data was uncompressed.

Compression entails 'throwing away' some image data. Most experts agree that current compression techniques (e.g., the type used for DVD) are not suitable for images intended for large screens. Development and standardization of an "open architecture" of compression adequate for large screen images must involve all segments of the industry and SMPTE, and may take years.

Security and Encryption

Electronic cinema proponents promise that electronic distribution and presentation of movies will nearly eliminate piracy by using sophisticated encryption technology. That implies that a film print is more easily pirated. In reality, making a high-quality pirated copy of a film requires the use of a 35mm telecine, and extensive access to the film. Aiming a camcorder at a theatre screen produces a poor quality, flickering image.

Many film prints also have a unique identification coded into the image to allow tracing the source of any pirated copies (This CAP-Code was developed by Kodak in 1982). Most of the time, higher quality pirated tapes originate from video transfers made for legitimate purposes that fall into the wrong hands, and not from prints in theatres. Serious piracy today is often from an electronic format, not film.

Encryption technology can deter electronic cinema piracy, but won't eliminate it. The most sophisticated encryption techniques can't be exported due to national security reasons. "Unbreakable" encryption codes for DVIX, DBS, PPV, cable television, etc. have already been cracked.

Maintenance

An electronic cinema system includes not only the projector, but many other components as well. Since the full system-in a commercially viable configuration-is not yet available, we can only speculate on what the final configuration and total cost will be.

Satellite, fiber optic link, or "hard" media such as optical disks may be used to deliver data. Not all theatres will have "line-of-sight" to a satellite, or access to a fiber optic feed, so a variety of delivery methods may need to exist simultaneously, each with its own infrastructure.

For satellite and fiber optic systems, "real time" delivery of compressed data is a goal. A two-hour movie will take at least two hours to download into local data storage at the theatre. This will likely be done "off-hours," when transmission rates are lowest, requiring pre-scheduling of the download.

If the download is missed or fails, the data will need to be retransmitted or sent another way. "Hard" media such as optical disks are a possibility, but data requirements for a full-length feature film far exceed the capacity of current DVD technology, so new technology probably needs to be invented.

Storage

Once the image data is in hand, it must be stored. Mass storage devices capable of storing TERABYTES (1000 times more data than a giga-byte) of data for each movie will likely be required in each theatre. And, when you add a system to 'back up' the data, you've got the storage capacity equivalent to several hundred home computers.

A powerful server (don't forget a backup here too) will control the distribution of all this data within the theatre, feeding each projector through a fiber optic network. All this sophisticated computer equipment will likely require a surge-protected regulated power supply, emergency backup power supply, special air conditioning, and HEPA air filtration system.

Electronic projectors are sophisticated opto-electronic devices. The current Texas Instruments DLP™ technology uses three proprietary SXGA DMD™ chips to modulate the red, green and blue light, each containing 1,310,720 microscopic moving mirrors, for a total of almost four million moving parts. Failure of even one mirror in a million will result in four"dead pixels" permanently imaged on the screen. The DLP chips and optical prism assembly must be kept cool using a water recirculator. Accidental "hot spotting" of the xenon lamp or failure of the cooling system could "fry" the heart of a $75,000 projector.

The current Hughes - JVC ILA, projector technology uses three analog high-voltage cathode ray tubes (CRTs) to excite proprietary liquid crystal modulators for each color, illuminated by a large xenon lamp and dichroic separation filters. Proper cooling is essential, and cooling air must be filtered with a HEPA filter to avoid dust buildup on the highly charged CRTs and optical components.

The ILA-12K projector is very large, weighs over 1600 pounds, and requires 60-ampere, 208-volt, 3- phase electrical service. Considerable maintenance time and costs should be part of the equation for anyone planning to pioneer the use of this technology. Networking terabyte-sized image files to dozens of screens and maintaining sophisticated computer and electronic equipment will require professionals with specialized background and training. If a mass memory device or file server goes down, all of your screens could go dark. If a projector is damaged, the repair bill could cost thousands of dollars.

Did You See Film At Its Best?

The format of the film print at ShoWest was 1.85:1 "flat." This was dictated by the need to match the "native" 16:9 format of current HD technology. Every good projectionist knows that 2.39:1 "scope" is a more efficient format than "flat" because of the larger image area on the film, giving a bigger, brighter and sharper image on the screen. About 30 percent of films are made in "scope," but they account for well over half of the boxoffice dollars each year.

Electronic cinema projectors can show 2.39:1 aspect ratio movies, but at reduced light levels and with poorer sharpness when compared to their native 16:9 aspect ratio. In other words, the demos shown at ShoWest showed film in its least efficient format, so it could match electronic cinema in its native format. Film shown in 2.39 "scope" would have been even better, and the premier 70mm format would have been unexcelled.

So What Did YOU See?

So what did you see? I saw that electronic projection has come a long way in the last 10 years. I saw electronically projected images that were bright and sharp on moderately sized screens. But I also saw lots of work before we have an electronic projection SYSTEM that can compare technically - and in so many other ways - to what we have with a film projection SYSTEM today.

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