

D-Cinema -- coming soon to this movie theater

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Digital films of outstanding picture quality are set to attract movie fans back to the cinema. At the International Broadcast Convention IBC in Amsterdam on September 7-11, Fraunhofer research scientists are presenting important components of an all-digital film-production chain.

Fascinating picture quality, excellent colors, no shudder, no scratches, no noise – digital cinema offers extra-special movie enjoyment. In Guildford near London and in Chicago, moviegoers can visit the first D-Cinemas and enjoy films in 4K quality. 4K stands for a resolution of 4096 x 2160 pixels or 8 megapixels.

By way of comparison: A conventional TV picture has a resolution of 0.4 and high-resolution HDTV a resolution of 2 megapixels. At present, however, there are not many films available in 4K format: Spiderman 3 and Ocean's 13 were the first big movies to be made in 4K resolution. "It will be some time before the entire chain of movie making, from filming, post-production and distribution to projection, has been converted to digital technology," states Hans Bloß, spokesman for the Fraunhofer Digital Cinema Network.

"To make films for D-Cinema you need a high-resolution digital camera," explains Hans Bloß. "The ARRI-D20, which we have developed in cooperation with movie equipment manufacturer ARRI Cine Technik, represents an initial step in this direction." The camera is already being used for HD productions. The three-part film "Africa, mon amour" was shot using a D20. "The D20 enabled us to film all the

color tones correctly even in extreme lighting conditions,” says Frank Küpper, Production DoP.

A new omnidirectional camera system will even be able to shoot live panoramic pictures with an angle of nearly 150° and a resolution of up to 5K. This is made possible by the special design of the system, in which five HD cameras are integrated in a rack with a mirror. The mirror deflects the optical path of the individual cameras so that the picture is captured from a common viewpoint but in different directions. The camera pictures join seamlessly together to present a panoramic view of up to 150°. “These high resolution panoramic pictures are interesting for the transmission of soccer matches, for example. In a public viewing situation the audience could experience the game as if they were in the stadium,” explains Peter Kauff of the Fraunhofer Institute for Telecommunications, Heinrich-Hertz-Institut, HHI. The concept will be shown at the IBC. The system has a modular structure, enabling the rack to be fitted with up to twelve HD cameras. This means that even 360° images can be produced.

Gigantic volumes of data arise in the production of digital movies – about 20 to 50 gigabytes just from filming individual scenes, and up to 20 terabytes uncompressed for a whole movie (with a shoot ratio of 10:1). To store all this information on set, an easily carried high-performance recorder is required. Fraunhofer research engineers have developed the portable Megacine. The recorder can store images in the new Digital Cinema (DC) format or in High Definition (HD). The unit has a capacity of one to two terabytes – this means that image data can be recorded for up to one hour in uncompressed DC quality. In the MegacineJ2k version, a JPEG2000 hardware encoder has been added to expand the range of formats. This enables all the advantages of the scalable data format, such as various resolution levels etc., to be used in further processing.

35mm film is transported in film cans, and digital film in the Digital Cinema Package (DCP). The DCP contains all the requisite information, from film data and sound to subtitles, either encoded or unencoded. The encoded DCP is distributed to the movie theaters on physical media, such as hard disks, or by satellite. “The IIS is developing software tools for producing and checking DCPs,” explains Siegfried Foessel of the IIS. These include a J2K plugin for the production of SMPTE-compliant JPEG2000 files as well as DCP authoring and validation software, which all facilitate the creation of a digital film package.

Research scientists at the Fraunhofer Institute for Computer Architecture and Software Technology FIRST are working on high-resolution multi-projection systems which can be used for special events in movie theaters as well as in theme parks and at other venues. Films can even be projected onto curved surfaces. A software system developed by FIRST engineers automatically calibrates the required projectors so that the images from the individual units are placed over each other with pixel precision. “Perfectly synchronized projections onto surfaces of any shape are now possible,” explains Kay-Ingo Ahlers.

The movie theater of the future will not only need brilliant pictures, but also excellent sound in order to stay well ahead of home cinema. IOSONO® makes for an impressive experience in sound. “The innovative sound system creates a perfect natural spatial impression throughout virtually the entire area in which it is reproduced. The audio reproduction system makes it possible to produce a natural sound field in every room and on every seat, where the listener sits in his or her own sound sphere and experiences music, dialog and effects from the right perspective,” states Prof. Karlheinz Brandenburg, Head of the Fraunhofer Institute for Digital Media Technology IDMT, outlining the advantages of IOSONO®. The new technology has already been deployed in movie theaters, including the 4D Experience Cinema in Munich, home of the Bavaria Film Studios.

But how can the digital movies be archived? In the EU project EDCINE, research scientists at the IIS are cooperating with European partners on the development of a concept for digital film archiving.

Slowly but surely, the individual components for a digital production chain are being put together. It will only be a few years before a film can be completely shot, processed, distributed and screened digitally. When this happens moviegoers will no longer have to travel to London or Chicago to experience a special class of cinema.

Source: Fraunhofer-Gesellschaft

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