





## **Archives and Digital Cinema**



**EDCine Brussels June 2009** 



### Digital projection of archive film

• Film production for the cinema has been much the same for nearly 100 years.



• Film is no longer widely used during post-production and has been replaced by the Digital intermediate process (*sound went that way many years ago*).



- Film may cease to be projected in cinemas within a few years.
- All cinema film will eventually be replaced entirely by digital media.
- It is expected that film will cease to be manufactured. Archives will no longer screen their films as they cannot be replaced (or will become very expensive).
- Digital projection offers a method of screening archive film programmes.



• Archives and cinematheques will always wish to screen films in the same way, and with the same visual impact, as they were seen originally.

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A page from the 1930 Academy of Motion Pictures Arts and Science document describing the "Academy leader" used to this day throughout the world.

However the Academy was actually describing something that was almost universal by that time already.

The front page of the 2005 Digital Cinema Initiatives specification for digital cinema, describes a system that did not yet exist for projection, using a file format that had not previously been used for projection – but had by November 2006.

#### DIGITAL CINEMA TODAY

- Digital Cinema Initiative DCI was created by Disney, Fox, Paramount Sony Universal and Warner Bros in 2002.
  - DCI's technical proposal as specification was published in 2005.
    - It used open architecture
    - Aimed for high quality

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- Aimed for high security
- Aimed for access control by distributor
- SMPTE adopted the specification and is currently working towards a bunch of SMPTE Standards for Digital Cinema (3D is still active, 2D is done).
- Meanwhile servers and projectors were developed and marketed following the expected DCI and SMPTE specifications.
- SMPTE standard will be adopted by April 2010. Transitional phases are in process, a so called Interop J2K format is in the field today.
- ISO TC36 will adopt the SMPTE Standards within the next 2-3 years

#### SOME TECHNICAL SPECIFICATIONS





#### WHAT IS A CINEMA FILM IMAGE?

- 16, 18, 20, 16-24, 24, 25, 32, or 48 frames a second (& even 19 & 26fps!)
- Black interval between frames (up to 40% of screen time)
- Dark room
- Screen brightness range 1,000,000:1 (Density range 0.10 4.00)
- And other characters
- The finest detail the eye can separate is 1second of arc (about 23M separate images across our normal field of view of 135 degrees)
- This roughly equals 3,000 pixels across a cinema screen seen from the "best seat" in a cinema

Film archives' principles for film preservation, restoration and access in the cinema: historical accuracy and authenticity.

- "Sufficient" resolution to reproduce the film information.
- The "appearance" of film, colour gamut and brightness range.
- Original aspect ratios
- Traditional "common height" projection principles
- Original frame rates

#### **COLOUR GAMUT**



#### **BRIGHTNESS RANGE**

- B/W Film print density range: 4.20 equivalent to 14 stops.
- "Premier" colour film density range: 5.00 equivalent to 17 stops.
- No digital projector can achieve this....yet.
- Daylight brightness range may be 1,000,000:1 or equivalent to more than 20 stops, a film density range of more than 6.00....or even more.

#### **Original Film Aspect Ratios**



**PROJECTION CONDITIONS** 

"Common height" projection, the traditional cinema principle for multiple formats.



#### **PROJECTION CONDITIONS**

"Common width" projection,

not traditional - occasionally used where projection equipment or screen size is limited, but now in some modern multiplexes.



#### **PROJECTION CONDITIONS**

DCI proposals included and allowed, all with different resolutions:



## **FRAME RATES**

#### **Original film frame rates up to 2008**

"Heritage" frame rates: 16, 18, 20, 22, 24, 20-24, 25, 30, 32, 40, 48, 60 fps (etc!)



March 2007:

The FIAF Technical Commission presented a case to SMPTE to retain all heritage frame rates for digital cinema projection of content originating from archive film.







# Digital projection of archive film SUMMARY

- DCI in 2005 proposed a narrow specification that is unsuited to authentic projection of a wide range of archive film.
- However by June 2009, only two principle problems for film archives still exist in the SMPTE D-cinema standard:
  - The traditional screening practice for multiple format programmes in cinemas
  - Projection of lower than 24 frames per second film.







#### **DCI - cinema specification - SUMMARY.**

- Open access files format, JPEG2000.
- Projected resolutions of 2K or 4K (pixels per horizontal line) only.
- Fixed and restricted frame rates to 24, or 48fps.
- 1.85: 1 "native" Aspect Ratio other aspect ratios fit inside this "frame".
- 'Common width' projection "preferred".....?
- Encrypted digital cinema package (DCP), optional, but required by major US studios.
- KEY required to access DCP, optional, but required by major US studios.
- Limitation on "life" of DCP, optional, but required by major US studios.
- Invoicing mechanism inbuilt to DCP, optional, but required by major US studios.
- DCI  $\rightarrow$  SMPTE  $\rightarrow$  ASA  $\rightarrow$  ISO