TEXTURE AND LOOK OF THE IMAGE, HOW TO CONTROL IT.

A CCTC presentation
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CCTC
Committee for Creative Technologies in Cinematography

Co-chairmen:
Rolf Coulanges, BVK
Mick Van Rossum, NSC
Philippe Ros, AFC
Special thanks to Dave Stump, ASC
THE TEXTURE CONTROL IN THE WORKFLOW

1 - SHOOT & TEXTURE
2 - POST-PRODUCTION & TEXTURE
3 - EXHIBITION & TEXTURE
Some words for texture

For science

- Resolution
- Detailing

For perception

- Sharpness
- Accutance (Combination of detailing & Micro contrast)
Different words different meanings

- Detailing has not the same meaning between all manufacturers
Parameters

- **Camera** - type of sensor)
  - Recording format specificities
  - Setting (Gamma/sharpness/OLPF…)
  - Noise reduction
- **Lens**
- **Glass filtering**

- **Type of lighting**
- **Projectors** - type/diffusion
- **Make up**
- **Density of atmosphere: particles/fog/dust…**
- **Costume**
- **Set design/Background/Foreground**
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OLPF: Optical Low Pass Filter): blurs to keep away from aliasing
THE ROLE OF OLPF
The role of OLPF

Minimal aliasing
Strong aliasing
A marriage between two very different worlds

Anisotropic

Isotropic
2 - POST-PRODUCTION & TEXTURE

Parameters

- Type of recording formats
- DeBayer
  - Onboard ✓
  - Post-production ✓
  - Sharpness control ✓
- Gamma encoding/Color mapping
- Grading
- Focus/Defocus
- Noise reduction
- Texture creation - Grain (size/speed)
- HDR
- HFR (time resolution)
Parameters  (w/o parameters of distance)

**SCREENING**
- Resolution
- Speed - HFR
- Type of projector (Laser)
- Sharpness decision by manufacturers
- Type of screening: Projector/LED
- HDR/Color space

**BROADCASTING**  *Wild West!*
- Different types of transportation/compression
- Resolution
- Speed - HFR
- Types of displays
- HDR/Color space
- All parameters possible (Gamma, Cine Style, Sharpness, etc)
High Dynamic Range and High Frame Rate are influencing the perception of texture.

No serious studies have been done on these new topics.
CAMERA & LENSES

THE PARADOX
Parameters

- **Camera** - type of sensor
  - Recording format specificities
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Nowadays, choosing a set of lenses became the most important phase of tests.

The combination of camera and lenses became a new challenge

**Modulation Transfer Function (MTF)** for the lenses and **detailing** for cameras
But are we sure that we know all the parameters of texture given by the camera?

Camera and lenses: the interesting marriage
Reminder of ODCC 2015 conference on texture
<table>
<thead>
<tr>
<th>Cameras</th>
<th>Number of photosites</th>
<th>Recording (resolution)</th>
</tr>
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<tbody>
<tr>
<td>Sony F65</td>
<td>20 M</td>
<td>4 K</td>
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<tr>
<td>Red Dragon</td>
<td>19 M</td>
<td>4 K</td>
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<tr>
<td>Sony F55</td>
<td>11.6 M</td>
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<td>Canon C500</td>
<td>9.5 M</td>
<td>4 K</td>
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<td>Varicam 35</td>
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<tr>
<td>Black Magic 4K</td>
<td>8.2 M</td>
<td>4 K (Ultra HD)</td>
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<td>Alexa XT</td>
<td>7.5 M</td>
<td>3.4 K (Up-scaling to 4K)</td>
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(Raw Recording w/ Open gate)
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Choosing F65 for wide shots and F55 for close shots is usually a good solution for the marriage.
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These cameras deliver the same resolution

But they aren’t delivering the same texture and the same sharpness
NETFLIX

Requirements
Requirements

Netflix Originals: Features and Series
Production and Post-Production Requirements v2.0

Scope
Provide a set of technical requirements for production and post-production workflows to ensure that a high level of quality is maintained throughout the lifecycle of a project from capture to archival. This serves the purpose of future-proofing the content as the Netflix platform and viewing experience continues to evolve.

Camera Requirements

4K Resolution:
- Camera must have a true 4K sensor (equal to or greater than 4096 photosites wide).

Recording Format:
- Must be set to the camera’s RAW (unprocessed, pre-debayer) format,
  - Minimum of 12-bit log (or 16-bit linear)
  - Maximum compression ratio of 6:1
- Must be set to the camera’s wide or native color gamut.
- No looks or color corrections should be baked into the camera RAW files.
- Files must maintain all metadata (i.e. Tape Name, Timecode, Frame Rate, ISO, WB, etc.)

Aspect Ratio / Framing:
- Aspect ratios greater than 2.00:1 must be evaluated and discussed with Netflix for approval.
- Framing chart must be shot before principal photography begins, and processed through the dailies pipeline which will be shared with editorial, post-production, and VFX.

Secondary Cameras:
- Any cameras other than the primary camera (crash, POV, drone, underwater, etc.) must be approved by Netflix.
- Test footage should be shot and provided to dailies and post-production to ensure compatibility with primary camera.
<table>
<thead>
<tr>
<th>Approved Cameras</th>
<th>Effective Pixels</th>
<th>Recording Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canon C300 Mk II</td>
<td>4K: 4096 x 2160</td>
<td>Canon RAW</td>
</tr>
<tr>
<td>Canon C500</td>
<td>4K: 4096 x 2160</td>
<td>Canon RAW</td>
</tr>
<tr>
<td>Panasonic VariCam 35</td>
<td>4K: 4096 x 2160</td>
<td>V-RAW</td>
</tr>
<tr>
<td>Panasonic VariCam LT</td>
<td>4K: 4096 x 2160</td>
<td>V-RAW</td>
</tr>
<tr>
<td>RED Dragon</td>
<td>6K: 6144 x 3160</td>
<td>REDCODE RAW (up to 6:1)</td>
</tr>
<tr>
<td>RED Weapon</td>
<td>8K: 8192 x 4320</td>
<td>REDCODE RAW (up to 6:1)</td>
</tr>
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<td>4K: 4096 x 2160</td>
<td>F55RAW</td>
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<td>Sony F65</td>
<td>4K: 4096 x 2160</td>
<td>F55RAW F55RAW-LITE</td>
</tr>
<tr>
<td>Blackmagic Design Ursa Mini 4.6K</td>
<td>4.6K: 4608 x 2592</td>
<td>CinemaDNG RAW (up to 4:1)</td>
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<td>CinemaDNG RAW (up to 4:1)</td>
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Requirements

- Confusion between photosites and pixels
- Cameras like RED Weapon or Sony F65 are at the same level of than a C300 MKII or an URSA
- Alexa (Open gate) is not mentioned
- Lenses aren’t mentioned
Two questions on control of texture

1 - How cameras with such difference of sensors can deliver the same sharpness?

2 - Can we really choose lenses without understanding the difference of perception of sharpness between these cameras.
What is at stake:

Conveying emotion & meaning
A first step already given by camera manufacturers (ARRI, RED, PANAVISION, CANON, PANASONIC)

Access to control of sharpness on RAW materials in post and to some codecs
An interesting step for the texture has been given by SONY several years ago to create gamma encoding.

The CVP FILE EDITOR customized Gamma curve.
Another important step given by ARRI

1 - A real access to control of sharpness on ProRes (Alexa Mini, Amira)

2 - Comparison tests allowing to judge the quality of a camera regarding sharpness
A first step given by Arri

Following slides

WORKSHOP AT ARRI MUNICH:
HOW TO CONTROL THE TEXTURE OF THE DIGITAL IMAGE

Special Thanks to Harald Brendel and his team of engineers

Imago website:
CONTROL OF THE TEXTURE

In post for 4K Raw

CONTROL OF SHARPNESS
CONTROL OF THE TEXTURE

In camera for 4K/UHD ProRes

CONTROL OF SHARPNESS

ALEXA MINI

AMIRA

AMIRA

Report on the meeting at ARRI Munich July 13th 2015
With the minimum of Detail

The noise is due to the zoom in the image, but we can see the difference on the structure of the sharpness.
Medium settings of Detail

The picture number 5 is the default in the camera, this is the level we are accustomed to find on an Alexa camera. Settings in the ARC (ARRIRAW Converter) are F=100 S=100
ARRI SCALER PARAMETER FEMALE FACE

With the maximum of Detail

ALEXA MINI & AMIRA

Sharpness

F200 - S000

F200 - S100

F200 - S200
From the minimum of Sharpness and Detail to the maximum

The picture number 5 is the default in the camera, this is the level that we are accustomed to find on an Alexa camera. Settings in the ARC (ARRIRAW Converter) are F=100 S=100
CONTROL OF THE TEXTURE

In camera for 4K/UHD ProRes

CONTROL OF

NOISE REDUCTION
The photos below come from zoom in screen captures.
FIRST CONCLUSIONS

• The role of sharpness is a key point in the control of the texture
• Choosing a lens without access of sharpness control on the camera is leading to some important limitations or confusions
New parameters?

Not really, the first HD ENG cameras starting with the Sony F900 provided through the PAINT MENU a lot of control on the perception of sharpness

<table>
<thead>
<tr>
<th>PAINT</th>
<th>DETAIL</th>
<th>LEVEL 1</th>
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<tbody>
<tr>
<td></td>
<td>MASTER</td>
<td>WHT</td>
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<td>LEVEL</td>
<td>-50</td>
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<td>LIMITER</td>
<td>-99</td>
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<tr>
<td>CRISP</td>
<td>-70</td>
<td>H/V RATIO</td>
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<td>H FREQ</td>
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<th>LEVEL 2</th>
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<tr>
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<td>KNEE APERTURE LVL</td>
<td>0.0</td>
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<td>KNEE APERT</td>
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</tbody>
</table>
Texture and structure of the pixels

- These parameters, quite complex gave cinematographers a control of the structure of the pixels.

- This control helped in the past to match 35 mm and HD.

- Do we need similar controls?

- Or could new algorithms create other ways to deal with the static pattern of the digital image?
New methodologies? New parameters?

- Changing the OLPF? (Time consuming and risk of aliasing)
- Each camera need a refocus after the use of OLPF
- What level of refocus?
- Who is deciding about the level?
- Engineers or/and cinematographers?
These parameters defined in fact the structure of the pixel

And as a result one of the parameter of the texture
Lenses Manufacturers strategies
Lenses Manufacturers strategies

- Lenses manufacturers are working hard on the control of sharpness, bokeh and texture.
- The new larger sensors (Red, Arri, Sony) as well as the new lenses for these new cameras will lead to new strategies to control the unwanted oversharpeness.
Lenses Manufacturers strategies

- “Clever” lenses (Panavision)
Level and control of sharpness

Back to

The texture and the structure of the pixels
The texture and the structure of the pixels
Level and control of sharpness

• Are we sure that we are still in accordance with the resolution standards?

• And are we sure that there’s no other way to combine lenses and cameras?
CONTROL OF THE TEXTURE

Level and control of sharpness

- Sharpness parameters are defined by skilled engineers.

- But are these parameters fit with all the aesthetics wishes of filmmakers?
Consequences

• If cinematographers don’t have these parameters reachable, they often have to fight against the machine.

• The combination of “sharp” cameras and soft lenses or vintage ones give interesting results
Conclusions

• Cinematographers/colorists always find strategies to deal with oversharpness

• We have all the means to improve the creative aspects of cinematographers craft

• We just need to have some more doors open
Example: Cinematographers Strategies to deal with oversharpness

FILM

“CARTAS DA GUERRA”
Imago Website

Technical and artistic references from Focal about DPC II seminar

Film

“CARTAS DA GUERRA”

Director: Ivo M. Ferreira

Producer/Editor/Workflow designer: Sandro Aguilar

Cinematographer: João Ribeiro (AIP)

Colorist/Post-production adviser: Paulo Americo da Silva –
JOÃO RIBEIRO:

"Camera: Sony A7s, (imposed by the production) it was the first time I film with a “photo camera”.
I was really scare, so what I pass to my crew was:
“we have to do a film where nobody can say we use this type camera”

“The fact that is not heavy, you have to be very educated with that, and tend not to put it everywhere, but just in the correct place for each shot”
Zoom into the image in black and white without film grain
Zoom into the image in black and white with film grain which literally fill the lack of information in the image (low-level of bit allocation).
Without film grain
Requests to camera manufacturers

ODCC Sunday session
THANK YOU!

Philippe Ros AFC