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Creating cinematic wide gamut HDR-video for the evaluation of tone mapping operators and HDR-displays

SPIE Electronic Imaging 2014

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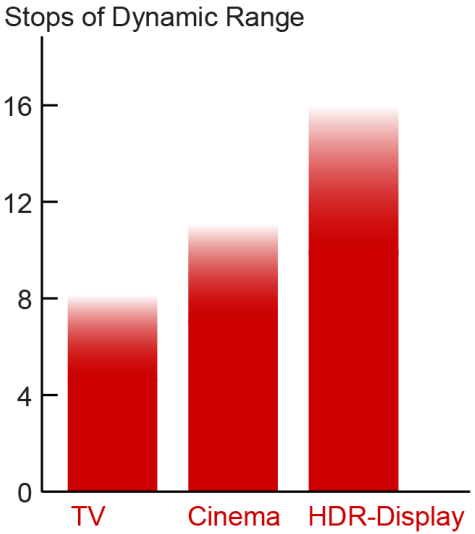
Outline of the Talk

- Motivation
- Methods
  - Mirror Rig
- Limitations
  - Ghostings
  - Flare and Straylight
- Results
- Future Work
- Conclusion

Motivation

- Brightness and dynamic range of consumer displays will probably increase over the next years:



http://variety.com/2014/digital/columns/when-it-comes-to-tvs-forget-4k-its-the-brightness-stupid-1201055191/ (received 19.01.2014)

Motivation

- Plenty of test image sets for still image manipulation
- No comprehensive data set for HDR-Video manipulation yet established.

Kodak, Kodim Image Sequence

'Lena' Image

Motivation

- Existing HDR video data sets show non-staged everyday scenes without cinematic staging and lighting

Krawczyk, G. , HDR Video Samples

Ungers, J., LiU HDRv Repository - Resources

Motivation

Image quality is not only determined by

- Signal quality of the image acquisition system

But also by

- Lighting
- Make-up
- Staging
- Framing
- Acting

Stefan in his office

'Lena' Image

Methods

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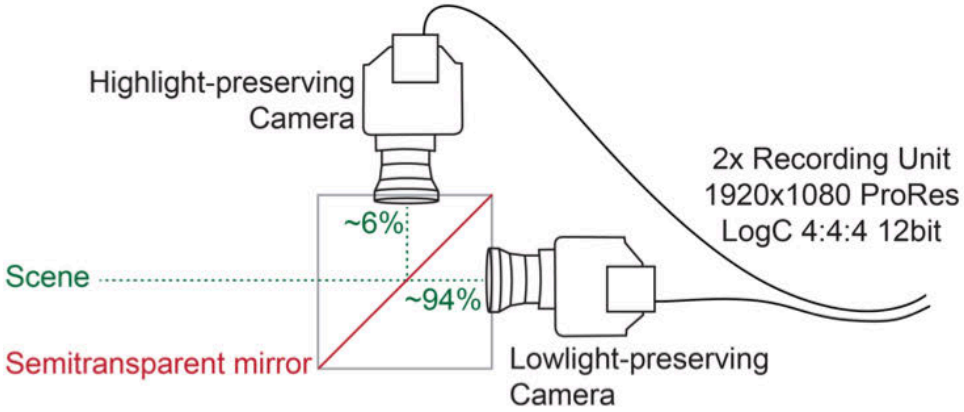
Use a mirror rig to enhance dynamic range



Methods

Image processing pipeline (In-camera processing)

Highlight pre-serving sensor illuminated by 6% scene luminance

Lowlight pre-serving sensor illuminated by 94% scene luminance

Methods

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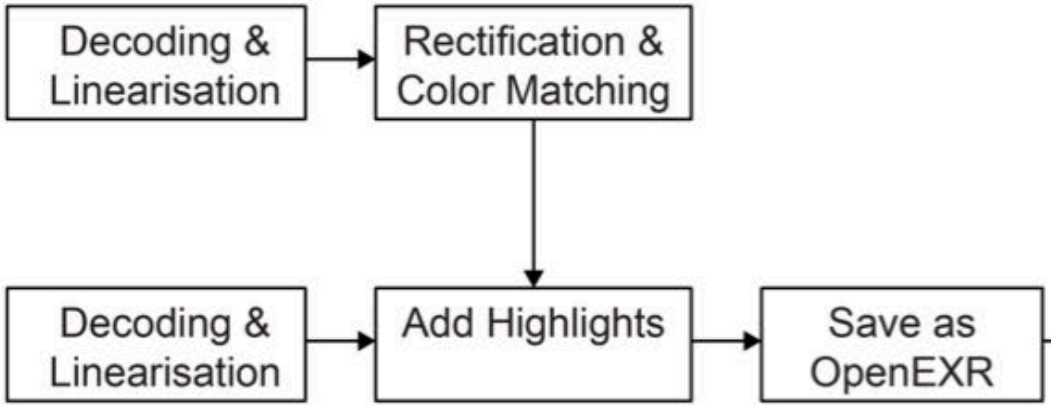
Image processing pipeline (Postproduction)



Lowlight Preserving Image

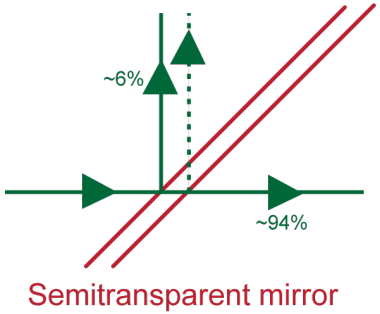

Highlight Preserving Image


Rectified Highlight Preserving Image

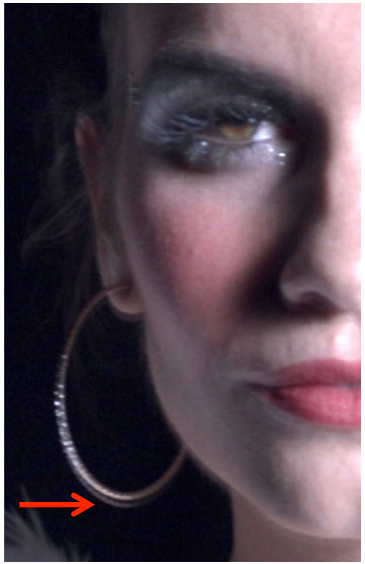
Combination

Limitations

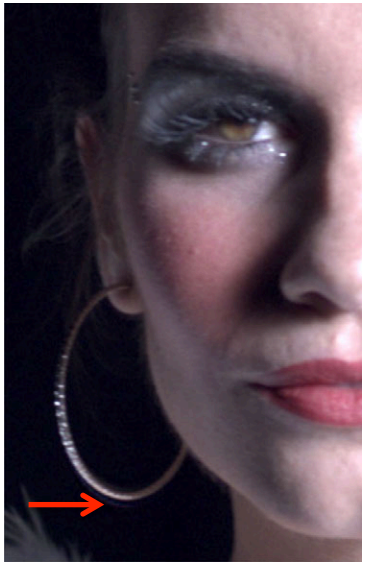
Double contours in long focal length shots



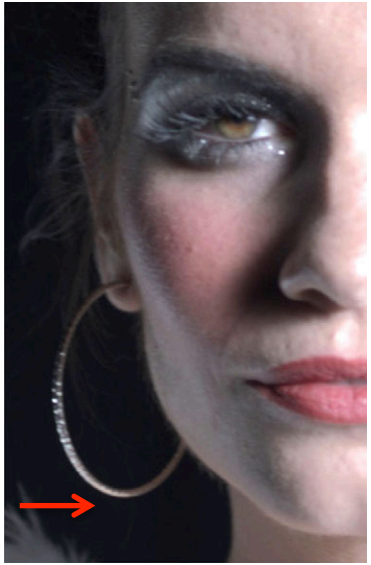
The reflection at the side of the mirror towards the Low light preserving Camera (94%) causes double contours in the Highlight perserving camera. (Dashed Line)



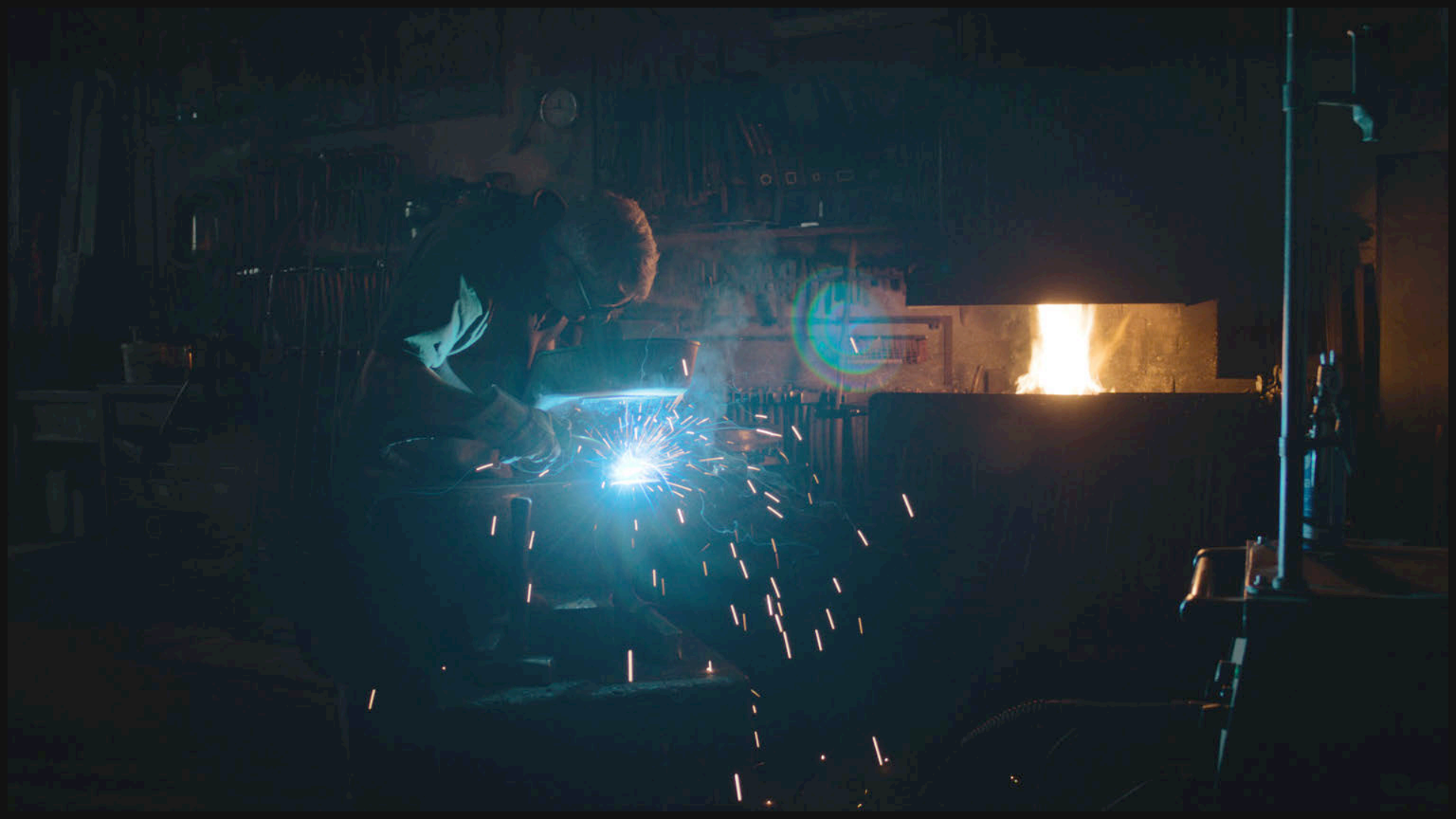
Highlight Preserving (HLP)



HLP w. DeConvolution



HLP Combined with Lowlight Preserving Image

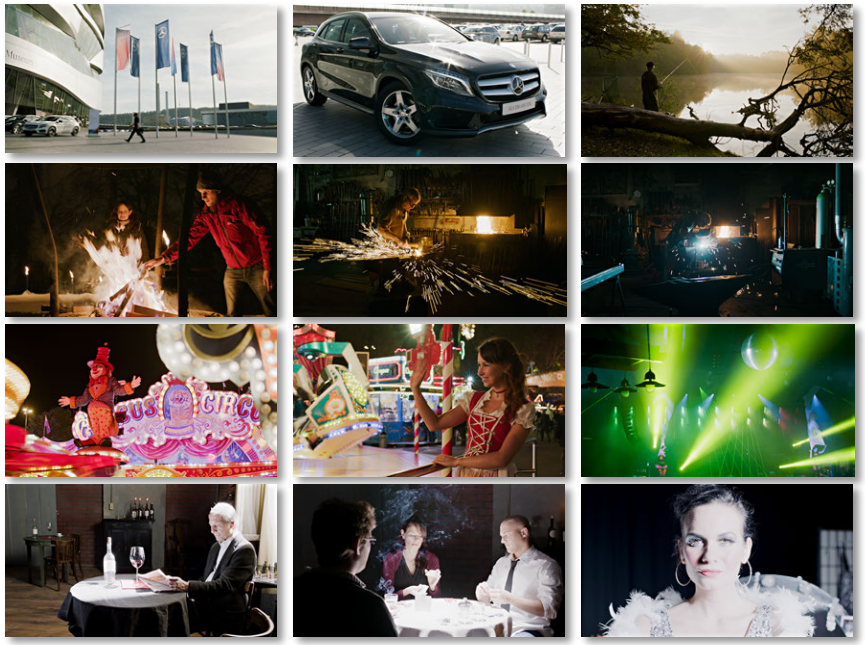


Staging HDR challenges

- Cinematic look of movies or commercials
- Characterful lighting design in studio-scenes
- Documentary sceneries represent difficult lighting situations

Four categories

1. Sunlight Scenes
2. Low Key Scenes
3. Wide Gamut and Moving Lights
4. High Contrast Skintones

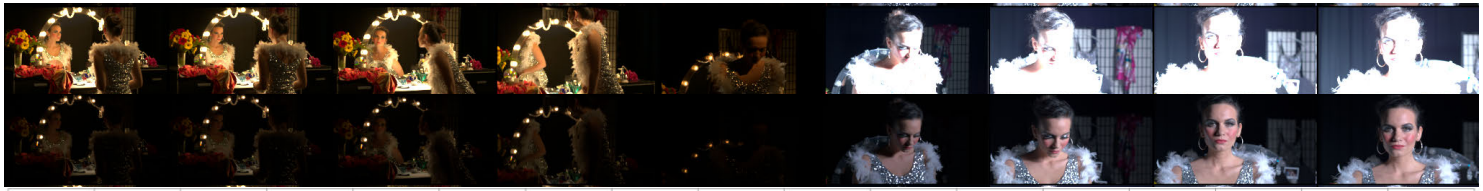


Presentation of the Material

- Note:

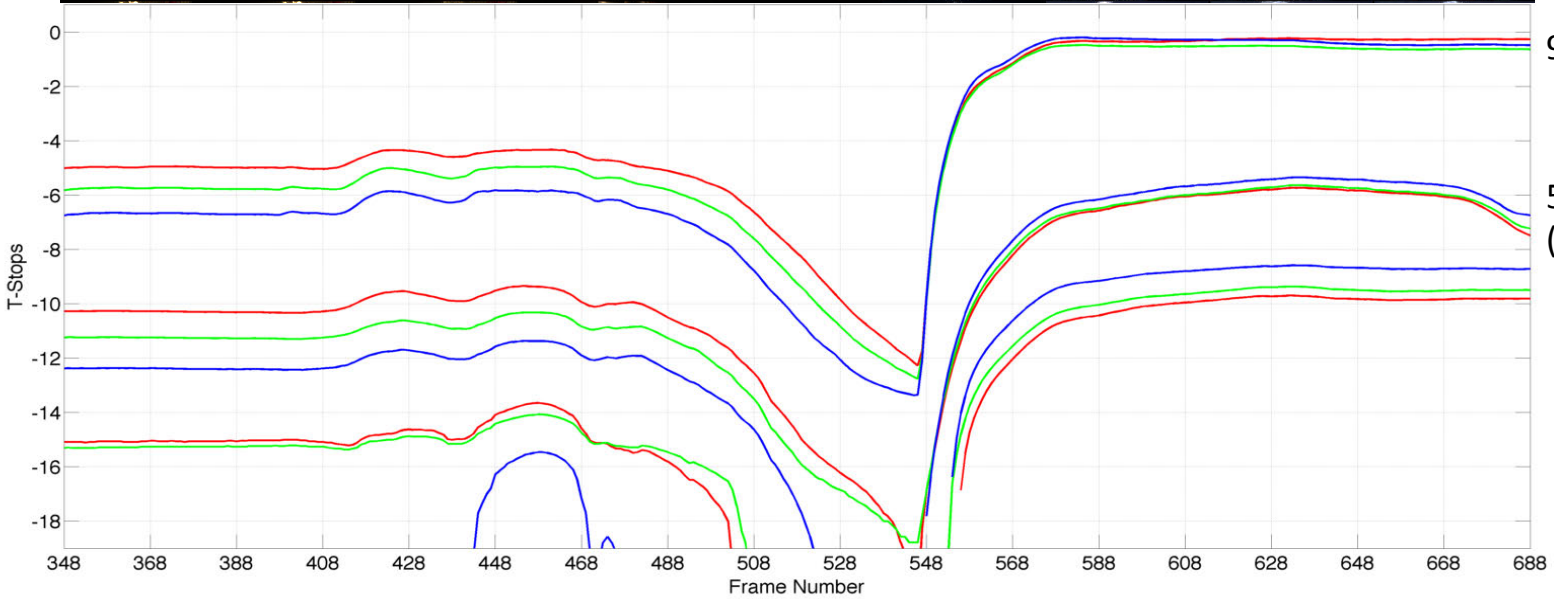
- The interactive presentation of the HDR-video test set is not included in this presentation.

Results



0 Stops

-5 Stops



95% Quantile

50% Quantile (Median)

5% Quantile

Results

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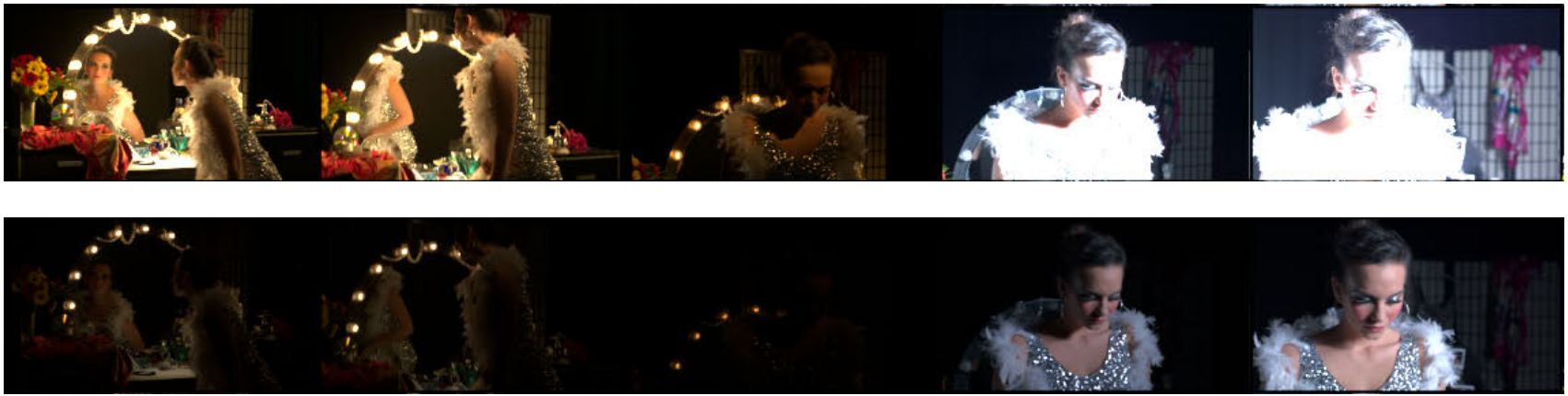
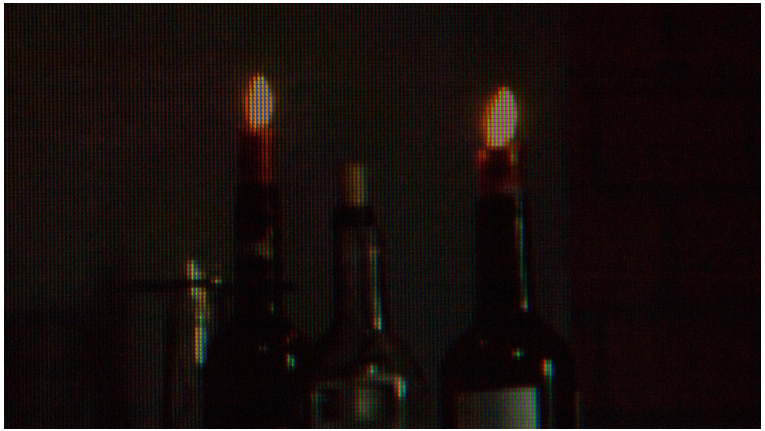
- High temporal contrasts present challenges for video tone mapping operators

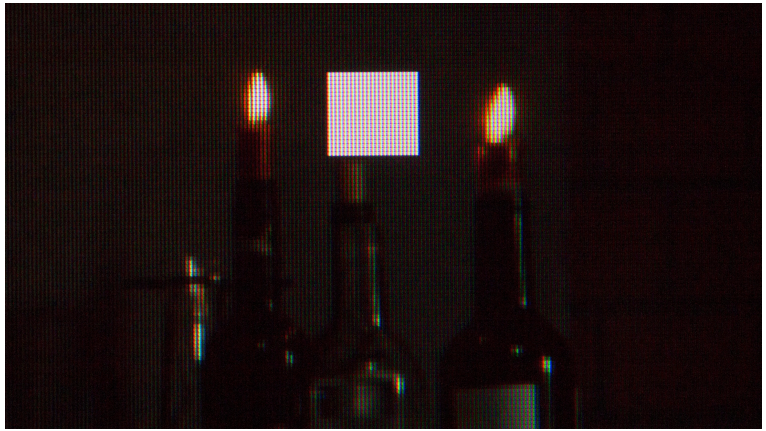


„Showgirl“ Offset between first and second row before delinearisation to sRGB: 5 Stops / 1:32

Results

- Different display technologies show different weaknesses





Example: Deficiencies of variable backlight monitors

Future Work

- Material appearance is improved through capturing a wider dynamic range e.g. specular highlights

- Reproduction of bright light sources and saturated highlights closer to human perception

- High contrast images provide new esthetics for image design

- HDR is a new enrichment for cinematic storytelling

Conclusion

- We created a new HDR-Video dataset.
- Cinematically staged scenes facilitate image quality assessment.
- High temporal and spatial contrasts provide a challenge for tone mapping operators and HDR-displays.
- Freely available for academic use. Download at the project website: http://www.hdm-stuttgart.de/~froehlichj/hdm-hdr-2014/

Thank you for joining our talk!

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