Modelovacie a renderovacie techniky

Zuzana Berger Haladová

Formáty pre HDR

HDR Formats: RADIANCE Format (.pic, .hdr)

Greg Ward's "Real Pixels" format

- **4 bytes per pixel, 1 for each channel**

(145, 215, 87, 141) =

(145, 215, 87) * 2^(141 -128) =

(1190000, 1760000, 713000)

(145, 215, 87, 103) =

(145, 215, 87) * 2^(103-128) =

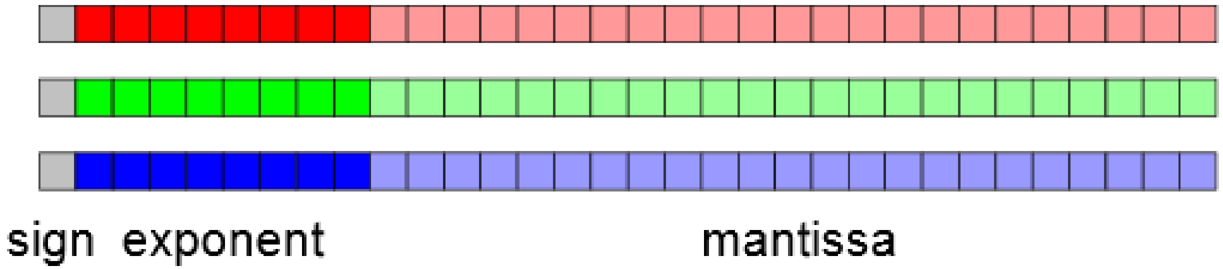
(0.00000432, 0.00000641, 0.00000259)

Ward, Greg. "Real Pixels," in Graphics Gems IV, edited by James Arvo, Academic Press, 1994

Formáty pre HDR

HDR Formats: Portable FloatMap (.pfm)

- **12 bytes per pixel, 4 for each channel**



Text header similar to Jeff Poskanzer's .ppm image format:

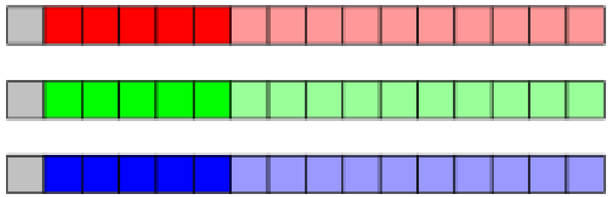
```
PF
768 512
1
<binary image data>
```

Floating Point TIFF similar

Formáty pre HDR

HDR Formats: ILM's OpenEXR (.exr)

- **6 bytes per pixel, 2 for each channel, compressed**

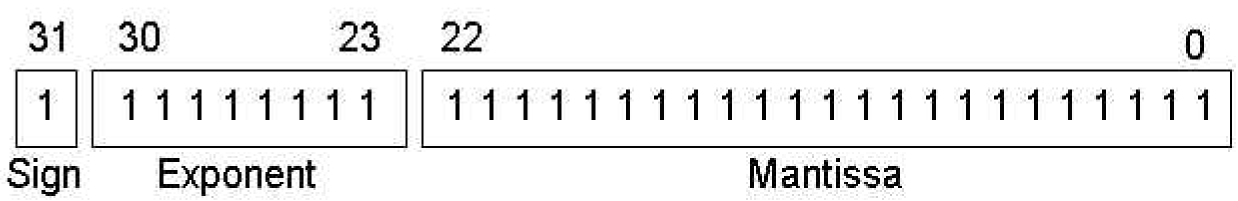


- With 16-bit floating-point numbers
  - the representable dynamic range is significantly higher than the range of most image capture devices
  - **9.6 orders of magnitude in 0.1% steps** (or 30 f-stops without loss of precision; 8-bit file formats have only 7-10 stops).
  - color resolution is 1024 steps per f-stop (only 20-70 steps per f-stop for most 8-bit file formats).
  - Several lossless compression options (RLE, ZIP), 2:1 typical
- Compatible with the "half" datatype in NVidia's Cg
  - Supported natively on GeForce FX and Quadro FX

Formáty pre HDR

Tutorial: Floating point to binary

http://kipirvine.com/asm/workbook/floating_tut.htm



Exponent (E)	Adjusted (E + 127)	Binary
+5	132	10000100
0	127	01111111
-10	117	01110101
+128	255	11111111
-127	0	00000000
-1	126	01111110

2^-2	1/4
2^-1	1/2
2^0	1
2^1	2
2^2	4
2^3	8
2^4	16
2^5	32
2^6	64
2^7	128
2^8	256
2^9	512
2^10	1024
2^11	2048
2^12	4096
2^13	8192
2^14	16384
2^15	32768
2^16	65536

Globálny TM- Tumblin & Rushmeier

$$1 \text{micro-lambert} = \frac{1}{100 \cdot \pi} \frac{cd}{m^2}$$

- **Stevens & Stevens function**
  - Brightness (B) – measured in brils
    - 1bril is the sensation of brightness from a fully adapted eye viewing a 5 degree target of 1 micro-lambert for one second.

$$B = 10^{\beta} L^{\alpha}$$

$$\alpha = 0.4 \log_{10}(L_a) + 2.92$$

$$\beta = -0.4(\log_{10}(L_a))^2 + (-2.584 \log_{10}(L_a)) + 2.0208$$

- L_a the luminance of the adaptation level
- L luminance, B brightness in brils

$$L_d = L_w^{\alpha_w / \alpha_d} 10^{[(\beta_w - \beta_d)/\alpha_d]}$$

it is assumed that the real world adaptation level $L_{a(w)}$ is

$$\log_{10}(L_{a(w)}) = E[\log_{10}(L_w)] + 0.84$$

where is E is the statistical average over the image, and

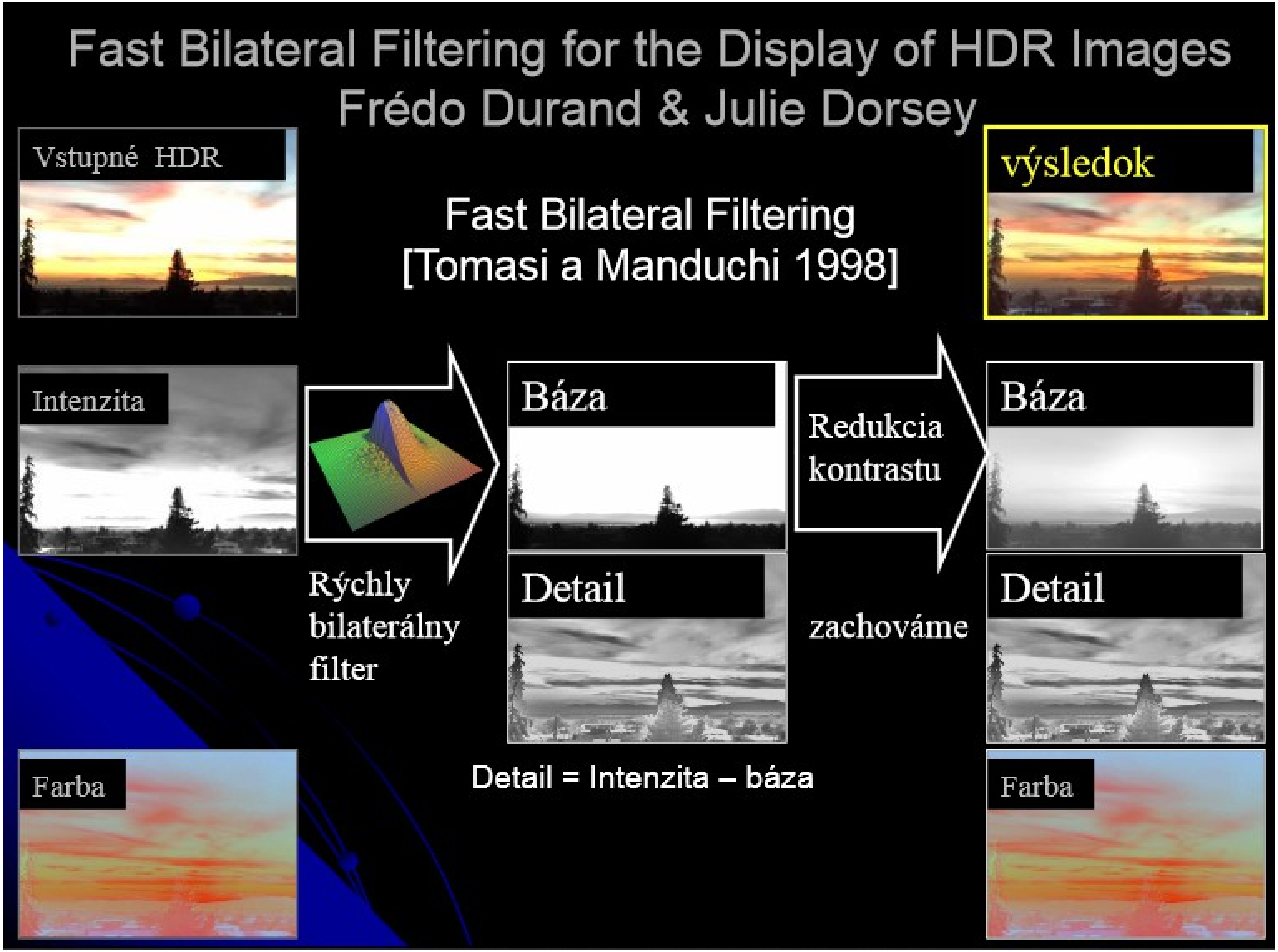
$$L_{a(d)} = L_{d,\max} \approx 100 cd/m^2$$

Then the recalculation of L_d to the display units n $(0 < n < 1)$,

for the display with the gamma – correction γ can be performed as

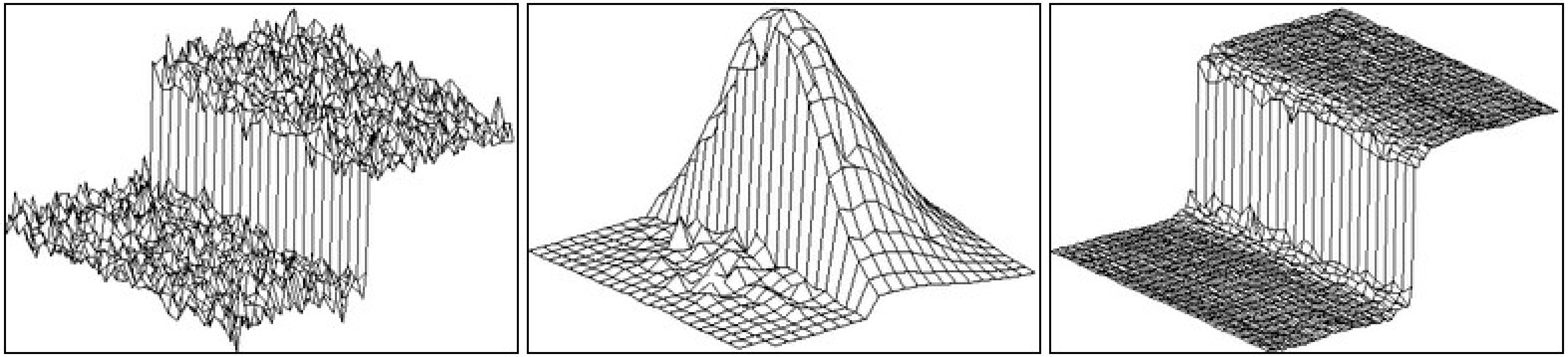
$$\mathrm{n} = [(\mathrm{L_d} / L_{d,\max}) - (1/C_{\max})]^{1/\gamma} \qquad C_{\max} \approx 35 \text{ max contrast for CRTs}$$

Lokálny TM- Durand



Lokálny TM- Durand

$$I^{\text{filtered}}(x) = \frac{1}{W_p} \sum_{x_i \in \Omega} I(x_i) f_r(\|I(x_i) - I(x)\|) g_s(\|x_i - x\|),$$



http://homepages.inf.ed.ac.uk/rbf/CVonline/LOCAL_COPIES/MANDUCHI1/Bilateral_Filtering.html