Modelovacie a renderovacie techniky

HDR – Domáca úloha 1.

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Júlia Kučerová

Programming Assignment (1)

- HDR Stitcher
  - Input : 3-5 LDR images
  - Output : HDR image
    - Output format : OpenEXR
      - OpenEXR is a high dynamic-range (HDR) image file format developed by Industrial Light & Magic for use in computer imaging applications
      - http://www.openexr.com

LDR images – different exposure values

HDR image

HDR image tone mapped

Image mixing

- Complex solutions
  - Recovering High Dynamic Range Radiance Maps from Photographs [Paul E. Debevec, Jitendra Malik, 1997]

- Easy pseudo-solution
  - Linearly interpolate and stretch the intensity interval

$$\frac{1}{N}\sum_{i=0}^{N-1} A_i 2^{H-L}$$

- N – number of images
- A_i – color of i-th image
- 2^{H-L} – interval stretching (2^8 LDR, 2^{16} HDR)

Freeimage

- Library:
  - http://freeimage.sourceforge.net/
  - Free, opensource
  - supports lot of graphics image formats
    - **Support for High Dynamic Range images**
  - ANSI C interface
    - Can be used in C, C++, VB, C#, Delphi, Java

Freeimage (1) – File access

- FIBITMAP* image;
- image = FreeImage_Load(FIF_JPG, ”image.jpg", 0);
- FreeImage_Save(FIF_JPG, image, "output.exr");
- FreeImage_Unload(image);

Freeimage (2) – Pixel access

- FIBITMAP* bitmap = FreeImage_AllocateT(FIT_RGB, width, height);

- RGBQUAD * color = new RGBQUAD();
  - color -> red
  - color -> green
  - color -> blue

- FreeImage_SetPixelColor(bitmap, x, y, color);
- FreeImage_GetPixelColor(bitmap, x, y, color);

Freeimage (3) – HDR pixel access

- EXR format

- use structure FIT_RGB FIRGBAF*
  - 4 x float(32 bitov)

- FreeImage_SetPixelColor : up to 32 bits
  - Access it as a pointer / array
  - Bitmap[x].red = …

Freeimage (4) – HDR pixel access

- BYTE *bits = (BYTE*)FreeImage_GetBits(exr);
- unsigned pitch = FreeImage_GetPitch(exr);
- FIRGBAF *pixel = (FIRGBAF*)bits;
  - Pixel[x].red = …
- next line … loop it
  - bits += pitch

Freeimage (5) – important functions

- int FreeImage_GetWidth(FIBITMAP * image);
- int FreeImage_GetHeight(FIBITMAP * image);

- image24 = FreeImage_ConvertTo24Bits(
  FreeImage_AllocateT(FIT_BITMAP, width, height));

Writing to EXR

- Weights for each image

$$\frac{1}{N}\sum_{i=0}^{N-1} w_i A_i 2^{H-L}$$

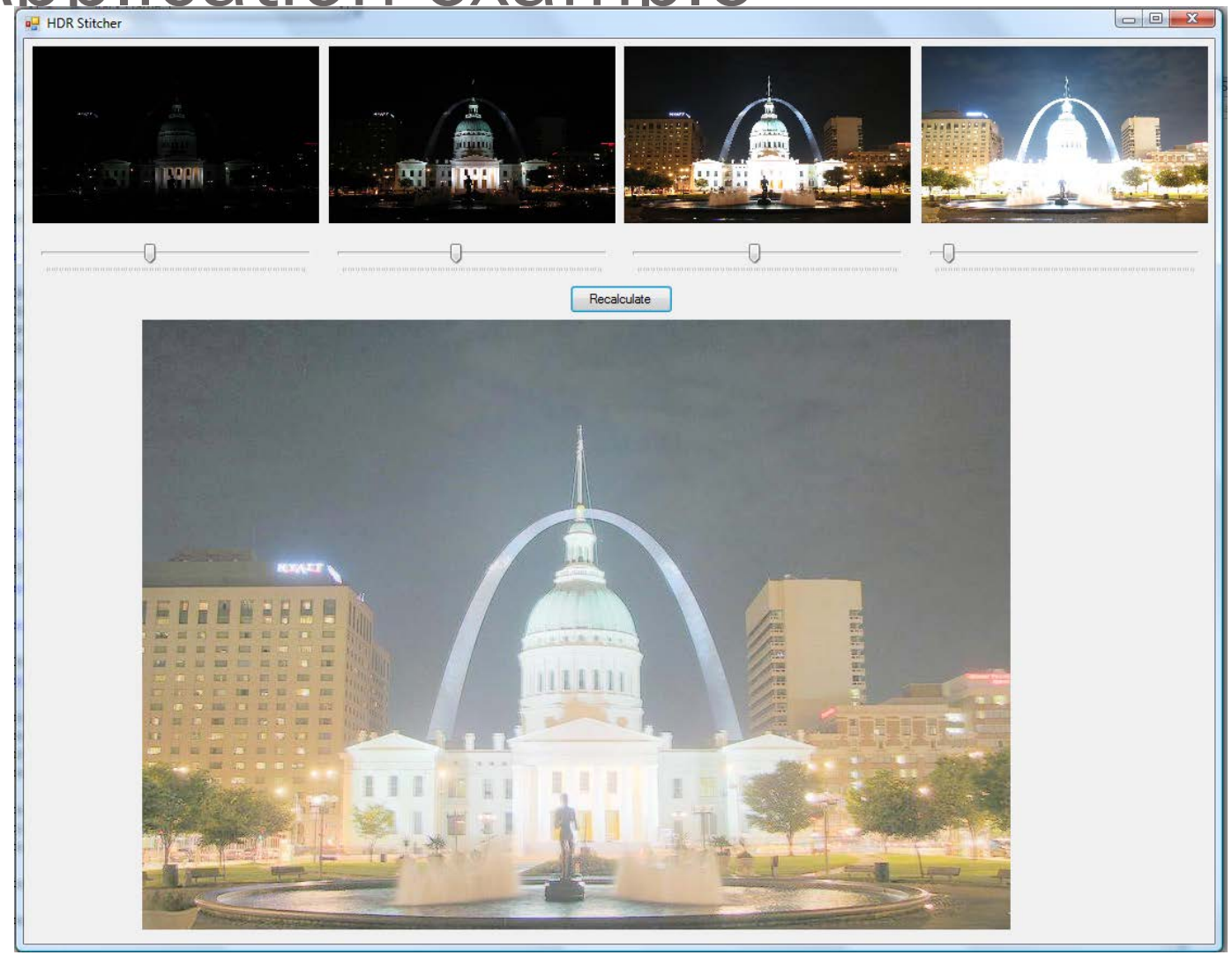
- Strech interval after sum → 5.7f/255 instead of 2^{H-L}
- Show the final image
  - Possible to use tonemapping from FreeImage

Tone mapping

- FreeImage_ToneMapping(HDRbitmap, algorithm, 0, 0);

- Algorithm
  - FITMO_DRAGO03
  - FITMO_REINHARD05
  - FITMO_FATTAL02

Application example



Useful links

- openEXR example files
  - http://savannah.nongnu.org/download/openexr/OpenEXR-images-1.1.1.tar.gz

- LDR images
  - http://en.wikipedia.org/wiki/High_dynamic_range_imaging
  - or take your own pictures ☺
    - Tripod is necessary

Send by email

- Deadline
  - 27.10.2015, 23:59
- Executable version + source code
- Sample application, LDR Images, compiled library VS2010