PV227 GPU Rendering

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DevIL

- library for working with images,
- simplifies loading textures to OpenGL,
- download built SDK at
  `http://openil.sourceforge.net/`
  (`http://downloads.sourceforge.net/openil/`
  `DevIL-SDK-x86-1.7.8.zip`).

DevIL (cont.)

- update VC++ Directories (taken care of ;-)),
- pass data from DevIL to OpenGL.

Image Processing

- image effects applied to a texture,
- may be used as post-process on the framebuffer,
- gray scale,
- negative,
- thresholding,
- blurring,
- general convolution.

Texture Setup

- same way as in fixed OpenGL,
- texture unit ID passed to the sampler in the shader,
- rendered using two triangles (quad),
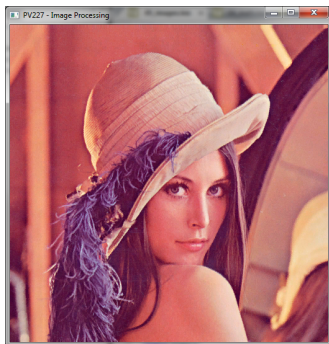- camera setup so that only the quad is seen.
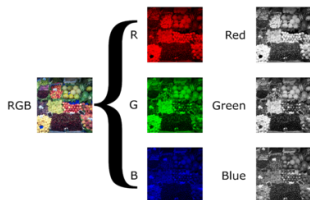

Figure: Rendered texture

Gray Scale

Figure: Taken from wikimedia.org

- linear combination of the RGB channels into luma (intensity),
- texel is multiplied component-wise (dot product) with the weights.

Gray scale (cont.)

- several options for choosing the weights,
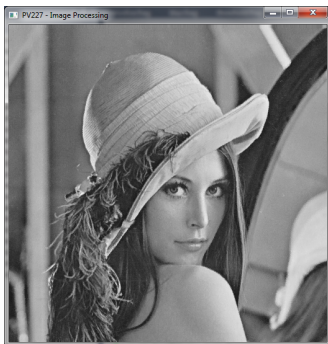- NTSC weights: 0.299, 0.587, 0.114.

Figure: Grayscale

Negative

- inversion of each color channel,
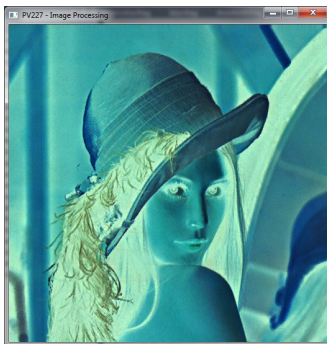- alpha channel should not be inverted.

Figure: Negative

Thresholding

- usually applied to gray scale images,
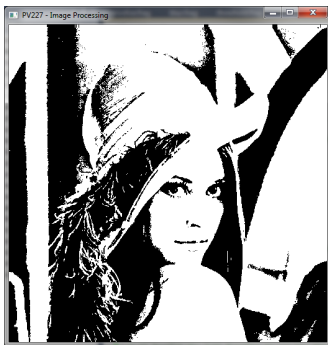- assigns white to pixels above threshold, black otherwise.

Figure: Thresholding

Blurring

- averaging of the image,
- the amount of blur depends on the kernel size,
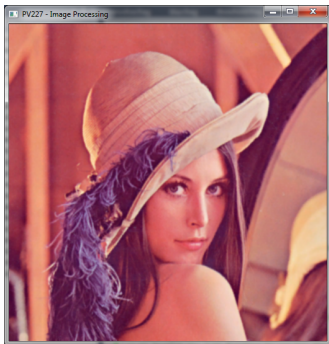- blur type is controlled by the blurring weights,
- the weights must sum to 1.
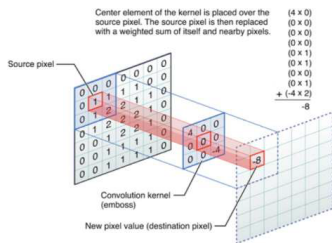

Figure: Gaussian 5x5 blur

Convolution

Figure: Taken from illinois.edu

- used to compute any linear filter,
- $(f * g)(t) \equiv \int_{-\infty}^{\infty} f(\tau)g(t - \tau)d\tau$,
- $(f * g)(t) \equiv \sum_{-\infty}^{\infty} f(\tau)g(t - \tau)$.

Sharpening

- inverse of blurring (subtraction of neighbourhood),
- the amount of sharpening depends on the kernel size,
- sharpen type is controlled by the convolution weights,
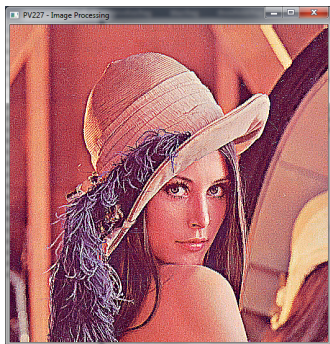- the weights must sum to 1.

Figure: Sharpening 3x3

Edge Detection

- detects changes in intensity,
- preferably blur the image before edge detection,
- detection type is controlled by the convolution kernel,
- the weights must sum to 0.

Figure: Laplacian edge detection

More

- PV131: Digital Image Processing,
- PA166: Advanced Methods of Digital Image Processing,
- PA170: Digital Geometry,

- PA171: Digital filtering,
- PA172: Image Acquisition Principles,
- PA173: Mathematical Morphology,
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