Zürcher Hochschule
für Angewandte Wissenschaften

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Digital Image Processing
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Exercise Sheet 1

1 Basics

1. What is the wavelength range of visible light?
2. At which wavelength are the three colors *red*, *green* and *blue* located?
3. Explain what *preprocessing* means in the context of digital image processing.

2 Memory Consumption

A camera stores a 2304×1728 RGB color image.

1. How many pixels does the image contain?
2. How much memory (in kByte) is required to store the image, assuming a depth of 8 bit per pixel and color channel?
3. How much memory is needed when we store an 8 bit grayscale image instead?
4. By which factor is the required memory reduced if we now convert the color image to a black and white image?

3 Row-Major-Format

Assume we are looking at a small 2×3 grayscale image

$$x = \begin{array}{|c|c|c|} \hline 40 & 80 & 120 \\ \hline 160 & 200 & 240 \\ \hline \end{array}$$

1. What does this image look like in memory when stored in *row-major-format*?
2. What does this image look like in memory when stored in *column-major-format*?

Solutions

Exercise 1

1. Roughly $\approx 400\,\text{nm} \ldots 700\,\text{nm}$
2. *red*: $\approx 650\,\text{nm}$, *green*: $\approx 550\,\text{nm}$, *blue*:$\approx 450\,\text{nm}$
3. *Preprocessing* means that an image is prepared in such way that subsequent operations yield better results. Typical examples are γ-correction, noise removal and geometric rectification.

Exercise 2

1. 3.98 mega pixels
2. 93312 kByte
3. 31104 kByte
4. 24

Exercise 3

1. *row-major-format*: 40, 80, 120, 160, 200, 240
2. *column-major-format*: 40, 160, 80, 200, 120, 240