

## Exercise 1: Typical Compression Factors for Media Files

Determine typical compression factors for media files you use every day. Choose one or more examples for the following categories:

- **Images:** Pictures (JPEG) taken with your smartphone
- **Audio:** Songs (MP3 or AAC) you listen
- **Video:** Videos (AVC or ...) you captured or downloaded

Determine the compression factors by

- Measuring the file size
- Calculating the raw data rate, based on
  - for images: image size, color format, and bits per sample
  - for audio: duration, sampling rate, and bit depth
  - for video: duration, frame rate, picture size, color format, bits per sample

## Exercise 2: Compare Lossy and Lossless Image Compression

- 1 Choose one or more of the raw image files (PPM format) provided at the course web site: <http://iphome.hhi.de/schwarz/IVC1.htm>
- 2 Try to compress the file(s) with a general lossless compression tool (such as zip, rar, ...) and measure the compression factor
- 3 Convert the file(s) into the PNG format (lossless image compression format) and measure the compression factor
- 4 Convert the file(s) into the JPEG format (lossy image compression format) and measure the compression factor
- 5 Can you see a difference between lossy and lossless compression?

The conversion into PNG and JPEG can be done with any suitable software. One example is ImageMagick (available for Window, Linux, MacOS):

- Available at <https://www.imagemagick.org>
- Conversion from PPM to PNG: `convert test.ppm test.png`
- Conversion from PPM to JPEG: `convert test.ppm test.jpg`

## Exercise 3: Analysis of JPEG Compression

- Choose one or more of the raw image files (PPM format) provided at the course web site: <http://iphome.hhi.de/schwarz/IVC1.htm>
- Compress the image using JPEG with varying quality parameter ( $Q = 1..100$ )  
# with image magick, you can use the following command line  
convert -quality (Q) test.ppm test.jpg
- What effect has the quality parameter on
  - compression factor / file size
  - reconstruction quality
- Up to which compression factor
  - you cannot distinguish the compressed and the original image
  - does the compressed image looks acceptable
- What kind of compression artefacts do you observe in highly compressed JPEG images?

## Exercise 4: Lossless Compression of Media Files

Choose one or more files for the following categories:

- Compressed picture (JPEG)
- Compressed audio file (MP3 or AAC)
- Compressed video file (AVC or ...)

Try to further compress the media files using universal lossless compression tools, such as zip, rar, etc.

- Which additional compression factors can you achieve?
- What can you conclude?