# Image Data Compression

## FAQ on oral examinations

# General examination procedure

**Arranging an exam**

- First, you need to contact Frau Gross at IES Lehrstuhl: gaby.gross@kit.edu.
- Please write her an email, stating the subject of the exam (Image Data Compression / Bilddatenkompression), your name, your matriculation number, study program, and a desired range of dates to schedule an examination.
- She then suggests a time slot that has to be confirmed by all parties.

**Arriving to an exam**

- The exams are held at Fraunhofer IOSB (Fraunhoferstrasse 1) at Prof. Beyerer's office.
- Please try to arrive at the IOSB at least 10-15 minutes in advance.
- Upon arrival, please report at the gates, obtain an ID, and then wait at the lobby for someone to meet you and escort to the Prof. Beyerer's office.
- Please make sure that you bring your student ID and a printed registration slip!

**Oral examination procedure**

- The exam takes about 20-25 minutes, an official protocol is written along.
- Some questions/problems may require small calculations/drawings on paper (provided).
- The results are discussed and communicated to the you immediately after the exam.
- The grades are between **5.0** (fail) and **1.0** (excellent).

# Sample examination questions

**General questions**

- Describe the difference between lossy and lossless image compression.
- How can one evaluate the loss of quality due to lossy compression?
- Can we hope to find “the best ever” image compression algorithm?

**Coding and pre-coding**

- Estimate the information content of a printed page of text.
- A source emits random iid symbols, all symbols have the same occurrence probability. The alphabet size is 16. Find $H_{src}$.
- Describe run-length coding, its basic idea, and practical applications where it may help.

**Image compression**

- Sketch the main blocks of a typical image compression toolchain. Describe the purpose of each block and name some suitable algorithms.

**Watermarking and steganography**

- Define watermarking of digital images and name a few applications.
- Describe the least-significant-bit scheme: basic idea, practical advantages and drawbacks.

# Books to read

- K. Saywood, **Introduction to Data Compression**, Morgan Kaufmann, 2017.

(A comprehensive book on all data compression-related topics)

- V. Bhaskaran, K. Konstantinides, **Image and Video Compression Standards**, Kluwer, 1997.

(A slightly outdated but in-depth description of practical image and video codecs)

- T. Strutz, **Bilddatenkompression**, Vieweg+Teubner, 2005 (in German).

(A nice theoretical and technical introduction to many formats, such as JPEG, MPEG, H.264)

- J. Beyerer, F. Puente León, C. Frese, **Automatische Sichtprüfung**, Springer 2012 (in German).

(Foundations of optics, image acquisition and exploitation)

- I. Cox, M. Miller, J. Bloom, J. Fridrich, T. Kalker, **Digital Watermarking and Steganography**, Morgan Kaufmann, 2008.

(Detailed overview of WM'ing and relevant theoretical foundations)

- T. Cover, J. Thomas, **Elements of Information Theory**, Wiley-Interscience, 2006.

(General foundations of information and communication theories)

- R. Gonzalez, R. Woods, **Digital Image Processing**, Prentice Hall, New Jersey, 2008.

(Digital image processing, including basics of compression, enhancement, restoration etc.)

If you don't find an answer in the books, contact me at alexey.pak@iosb.fraunhofer.de