

Multimedia Datenformate

Projekttitel

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30. Juni 2017

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Intro

General incentive of this assignment:

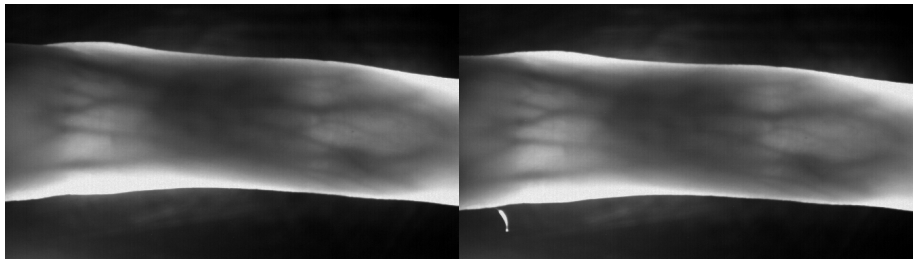
„Is it possible to effectively apply **video compression** for almost identical **pictures**?“

- can we achieve *better* results with video compression than with image compression?
- which codec is best suited for our purposes?
- how does the change of video codec parameters affect the results?
- how to determine the quality of the results?

Dataset

The database consists of finger vein images of different fingers of different persons

- 6 fingers per person, with 4 pictures per finger \rightarrow 24 pictures per person
- 60 persons at all
- we worked with a subset of those



JPEG2000

- used as a baseline for comparison
- standard encoding settings, except number of layers
- ImageMagick (7.0.5-10) with integrated OpenJPEG library
 - 1 encode pictures with jp2, with different compression rates
 - 2 determine quality of the pictures
 - 3 compare with pictures compressed with video codecs

Video Compression

Why video compression?

Video Compression

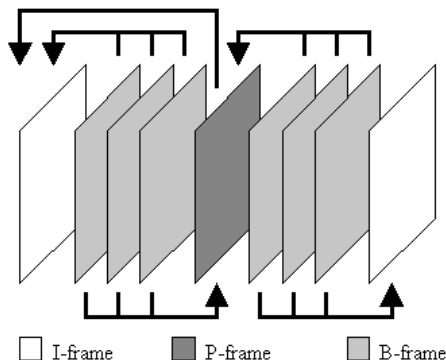
Why video compression?

- Very similar images
- Image compression only compresses individual images
- Video compression does 2 things:
 - 1 Compresses images
 - 2 Exploits similarities between images

I,P,B-Frames

3 different types of pictures

- I-Frame: Intra-coded picture
- P-Frame: Predictive-coded picture
- B-Frame: Bidirectional predictive-coded picture



Group Of Pictures

- usually defined with two numbers
 - ① defines distance of two I-Frames
 - ② defines distance of two anchor frames (I or P)
- we used GOP to adapt the encoding to the database
 - 24 pictures per person: use GOP 24 \rightarrow 1 I-Frame per person
 - 4 pictures per finger: use GOP 4 \rightarrow 1 I-Frame per finger
- P- and B-Frames allow higher compression \rightarrow GOP affects the compression rate

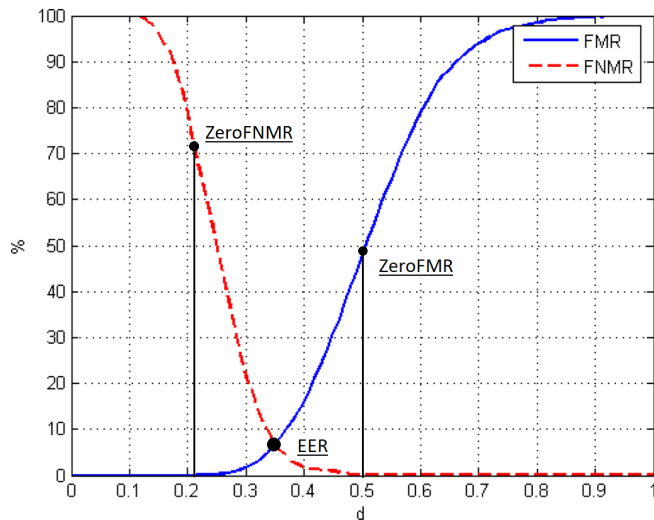
Matcher

- Used as a "black box"
- Compares original and compressed images
→ Checks if matches found
- calculates different error metrics
- Target:
Compare results of jpeg2000 and video compression

Error Metrics

- FMR: False Match Rate
- FNMR: False Non Match Rate
- EER: Equal Error Rate
- Lower values are always better

Error Metrics



http://www.mdpi.com/sensors/sensors-11-09499/article_deploy/html/images/sensors-11-09499f22-1024.png

CRF

- CRF value (Constant Rate Factor)
 - 1 The range of the quantizer scale is 0-51
 - 2 A lower value means better quality (0 for best quality, lossless)
 - 3 default value is 23
 - 4 A higher value means bad quality (51 for worst quality)

Presets

- presets (they provide a certain encoding speed)
 - 1 ultrafast , superfast , veryfast , faster , fast
 - 2 medium (default)
 - 3 slow, slower, veryslow, placebo
 - 4 we focused more to the slower presets (medium-veryslow)

Settings

- what are the settings behind them?

medium	veryslow
default	-b-adapt 2
default	-partitions all
default	-bframes 8
default	-ref 16

Settings

- quick explanation of the settings :
 - -b-adapt "Mod":
 - algorithm for the adaptive distribution of B-frames
 - values : 0,1,2
 - -bframes "Max":
 - Defines how many B-frames can be positioned directly behind each other
 - values are between 0 and 16 (3 is default)

Settings

- `-partitions "partitions"`:
 - partition size for macroblocks
- `-ref "frames"`:
 - amount of valid reference frames

Settings (qscale mpeg4)

- -qscale:v n
- configure and select a video quality level
- value for n : 1-31
- 1 is the highest quality for largest filesize
- 31 is the lowest quality for smallest filesize

Video Compression

Setup:

- Used ffmpeg v.3.3.2 (latest version)
- Compressed 240 images
- Different crf values (0-50)
- Different qscale values for mpeg4 part 2
- Varying group of pictures (1, 4, 24)
- two presets (medium, veryslow)

Video Compression

Repeat for each (crf, gop, preset) - combination

- 1 Compress images into single video
- 2 get videosize (for compression rate)
- 3 Decompress video → get images
- 4 Put into folder named with settings

Additional steps

- Collect image names → parameters for matcher
- rename decompressed videos

Matching

- Used matcher as "black box"
- Input:
 - ① original images
 - ② compression output folders (crf, gop, preset)
- Match each output folder
- Retrieve error metrics
- Evaluate Error rate dependent on compression rate