

Audio and Video Coding (2019/20)

Lab work Nº 1 - Due: 11 Oct. 2019

Part I - Audio and Image/Video manipulation

1. Implement a program to copy a wav file, sample by sample. Both filenames should be passed as command line arguments to the program.
2. Implement a program to copy an image, pixel by pixel. Both filenames should be passed as command line argument to the program.
3. Implement a program to display an image or a video on the screen.
4. Implement a program to calculate the histogram of an audio file. You should visualize the histogram of the left and right channels, as well as the histogram of the average of the channels (the mono version).
Note: For visualizing graphically the histograms, you can either save the histogram data as a text file and use an external application to visualize it or you can extend the functionality of the program in order to graphically display the histogram
5. Following the same suggestions of the previous exercise regarding the visualization, implement a program to calculate the histogram of an image file. Consider the histogram of each channel in color images, as well as the histogram of the grayscale version. Extend the program to work with video.
6. Implement a program to reduce the number of bits used to represent each audio sample (uniform scalar quantization).

7. Implement a program to reduce the number of bits used to represent each pixel on an image. In this case, you are free to explore several approaches to quantize the images. Extend the program to work with video.
8. Implement a program that prints the signal-to-noise ratio (SNR) of a certain audio file in relation to the original file, as well as the maximum per sample absolute error.
9. Implement a program that prints the signal-to-noise ratio (SNR) of a certain image file in relation to the original file, as well as the maximum per pixel absolute error. Extend the program to work with video.

Part II - Entropy

10. Implement a program to calculate the entropy of an audio file based on the use of a finite-context model. Parameters, such as the order of the context model, should also be provided to the program.
11. Based on the previous exercise, implement a program to calculate the entropy of an image/video file.
12. Elaborate a short report where you describe all the relevant steps and decisions taken in all the items of the work. Include also all the relevant measures that you obtained (examples: processing times, example of histograms with and without quantization, the error introduced by the quantization process and their relation to the chosen algorithm, the entropy according to the parameters of the models, etc.).