

Media Technology

Prof. Dr.-Ing. Andreas Schrader
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Assignment 1

Please process the following tasks. Each course participant should provide an own solution. The results have to be delivered in written form either to my inbox in the secretary office or sent as an attachment via Email to schrader@isnm.de.

Deadline: Monday, November 24th, 2003.

Task 1.1 (Audio Sampling)

A friend of you in New York produced a digital stereo audio file which was sampled using 16 bit per sample and a sampling rate of 44100 Hz. You want to download this music, but you are in Tokyo and the only connection you can use is an analog modem in your hotel room, which provides 7KByte/s transmission speed. Unfortunately, the hotel charges you 100 Yen per minute. Your friend told you, that the music is 3 minutes 20 seconds long. How much do you have to pay for the complete download? Explain your answer! (Please assume an ideal situation with no signaling overhead or waiting time before the download starts etc. Just consider that you can take 100% usage of the transmission channel). Also remember that 1KByte = 1024 Bytes.

Task 1.2 (Binary System)

You were sent to a mission to mars and are the first to meet an alien from that planet. The marsians are not as friendly as expected and promise to kill you, unless you can solve the following puzzle. They are also experiencing a somehow different culture and use the binary system for calculations.

I have 11_2 fathers. My youngest father is 11_2 times older than my only brother. My oldest father is 100_2 times older than me. My brother and me together are 1111000_2 years old. My fathers are together 1010100111_2 years old. My third father is 10_2 as old as my brother and me together. How old are these persons?

Do you survive? How? (Please show, how you converted the binary numbers!)

Task 1.3 (Error Measures)

Let's assume we want to capture the first $N=10$ pixels of a video signal from a camera to judge the signal quality of two different quantizers $\hat{s}_1(u)$ and $\hat{s}_2(u)$. The captured original values of the greyscale video signal are given by the following set:

$$s(u) = \{6, 11, 14, 21, 24, 31, 36, 29, 25, 23\}$$

The results of the quantizers are as follows:

$$\hat{s}_1(u) = \{0, 10, 10, 20, 20, 30, 30, 20, 20, 20\}$$

$$\hat{s}_2(u) = \{5, 10, 10, 20, 20, 30, 35, 25, 25, 20\}$$

Calculate the MSE and SNR values for both quantizers for the given signal set. Which of the quantizers is more accurate? Explain your answers with the calculated values!