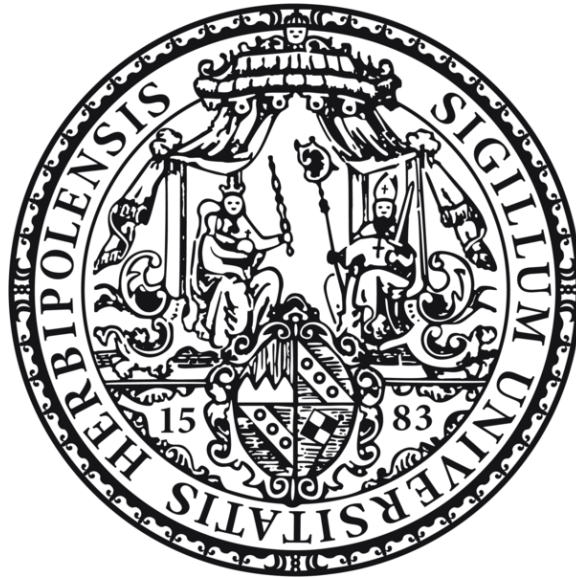


Hardwarepraktikum Internet-Technologien

Comprehension Questions of Task 6: Simple digital signal processing



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Chair of Computer Science III

A project report submitted by **group 11**

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6.5. Comprehension questions

1. What effects can oversampling ($f_s > 2f_g$) or undersampling ($f_s < 2f_g$) of the analog signal produce?

If oversampling occurs, we could overload the buffer, if undersampling occurs, we lose audio quality and information.

2. Why not always use a very high sampling rate, regardless of the signal, to avoid undersampling?

If T is small \Rightarrow it will take a lot of samples, no information is lost, but if it is very small the sampling devices will be very expensive.

If a band-limited signal $f(t)$ at B Hz is sampled at a sampling rate $f_s \geq 2B$ then no information is lost in the sampling process and, therefore, it is possible to reconstruct at the receiver the original signal $f(t)$ from the sampled one. The sampled signal will contain all the information of the original signal.

3. How much smaller are the rounding errors (see signal to quantization noise ratio, SNQR) when quantizing if double the resolution (e.g. 16 bits instead of 8 bits) is used? How much does the audio file size increase (without further compression)?

The rounding errors will be smaller, because having more bits, the resulting quantized signal will lose less information, so the reconstructed signal will be more similar to the original, the more bits for quantization, the more information we have and the more the reconstructed signal will be similar to the original.

It increases in relation to the number of bits used, a file quantized in 16 bits has twice as much information as a file quantized in 8 bits. It also depends on the sample rate and whether the recording is in mono or stereo.

1 sec x 44100 (frequency) x 2 stereo x 16 bits for example.

4. Can you make the signals as strong as you want by digital processing without affecting the quality? Why?

No, because if you increase it too much, when normalizing the signal you would lose values, so when reconstructing the signal you would hear it modified by this loss of values. Distortion is produced.