Speech Signal Processing (SSV)

Examiners	Prof. Dr. Timo Gerkmann
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Department	Informatik
Labels	mündlich

The examination was approx. 30 minutes long. To start off, he first gave a short introduction into the topic of speech processing, especially how some understanding of the signal characteristics is required to develop efficient methods for speech signal processing.

- Sketch and explain the source filter model
- What does voiced/unvoiced mean? Give examples for each
- What are the parameters of the source filter model?
- Sketch the spectrum of a voiced speech segment. Explain: Harmonics, fundamental frequency, formants
- Length of the vocal tract filter impulse response?
- Which kind of model do we use for the vocal tract filter? *AR*
- Write down the differential equation for the AR model
- What does LPC stand for? Where does the term come from? Write down prediction equation
- How is the LPC derived? *MMSE*
- How are the optimal coefficients computed? $a_{opt} = -R^{-1} \varphi_{SS}$
- How do we compute the autocorrelation values? How is the autocorrelation defined?
- Which steps are required to digitize a signal? Which are lossy? *Sampling, quantization*
- How should the sampling rate be chosen? *Sampling theorem*
- He gives me the plot for "SNR for Uniform Quantization" (see slide 206). Explain. What does the form factor do? What does "overload" mean? What happens if we apply a gain to the signal?
- What is speech enhancement used for? How is it even possible to find out which part of the signal corresponds to speech? *A high level explanation of the assumptions was required here*
- Write down the equation for the Wiener Filter. Explain. What is the value range? Which methods do you know to estimate the variables?