



## MSc Thesis Task Description

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# Performance evaluation and simulation of the physical layer of an embedded communications system in MATLAB

Wireless communication systems are essentials for our everyday life. In most cases these systems are embedded into our devices to send or receive various type of data. One way of wireless data transmission is mapping the data into the properties of radio frequency waveforms used as carriers. This process is called modulation among which one of the most popular is the binary phase shift keying (BPSK).

The modulated RF signal can be radiated by the transmitter via an antenna to carry the information for the receiver side. Unfortunately the information suffers distortion in the propagation channel which is widely modelled as an additive white Gaussian noise (AWGN) source. As a first approach this model can be always used however more sophisticated models also exist that are specific for the propagation environment.

The distorted information is received by the receiver side whose duty is to recover the information sent by the transmitter and to provide the best estimate of the data. The recovery algorithm is an important part of the detection.

The thesis topic focuses on the theory and simulation of wireless digital communications applied in embedded systems. BPSK modulation scheme is applied in terms of simulation and performance evaluation of the whole wireless link, i.e., the transmitter, the channel and the receiver. The building blocks of the simulator have to be the student's own design, the application of a communication toolkit is prohibited.

Tasks to be performed by the student will include:

- Elaboration of a BPSK system simulator in Matlab (transmitter, channel and receiver)
- Analysis of the application of different transmit filters on the spectral properties of the transmitted signals
- Performance evaluation of BPSK in an AWGN channel
- Effect of nonlinear phenomena in the system on the spectral properties
- Time- and frequency domain evaluation of the signals of interest

**Supervisor at the department:** Tamás Krébesz, Assistant Lecturer

**External supervisor:** -

Budapest, 3/7/2019

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