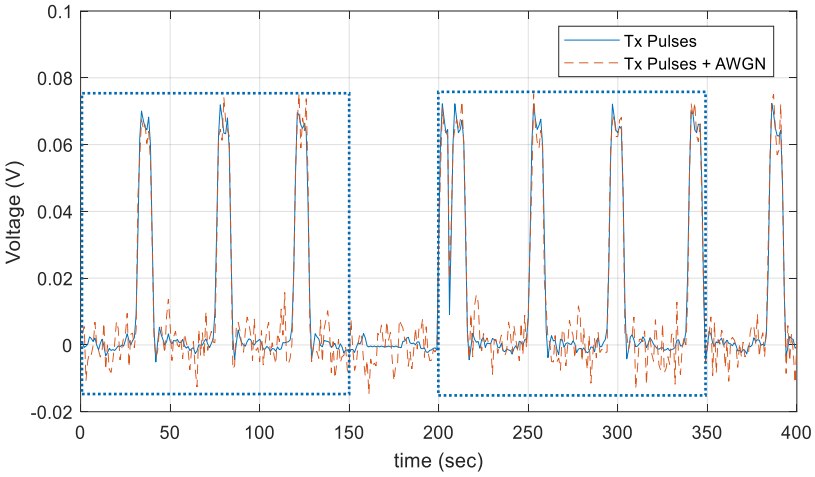
TECHNISCHE UNIVERSITÄT DRESDEN

Faculty of Electrical and Computer Engineering Vodafone Chair Mobile Communications Systems

Timing Jitter in Spike-Based Communications

Diploma Thesis

Problem Statement



We're studying spike-based signaling for very energy-efficient sensor node communication. In such spike-based communication, information is encoded in the inter-spike distance. However, the timing of these spikes is distorted due to the jitter caused by the analog circuitry in the spike generation as well as noise on the wireless channel. As shown in the figure, jitter can cause a temporal shift of pulses, erasure of pulses, or insertion of pulses. This noise and jitter can severely affect the communication performance. In this thesis, the aim is to study the impact of such noise effects on the achievable data rate of spike-based communications.

Tasks

- Timing synchronization at the receiver end with temporally correlated cycle-to-cycle jitter
- Analyze the impact of jitter on mutual information in spiking communication

Expected Skills

- Basic knowledge of information theory
- Experience with Python or MATLAB

Contact Person

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  Please include a recent transcript of your grades when getting in contact

Recommended References

- F. Roth et al., “Why to Use the Phase in Time-Encoding Modulation and Its Effect on the Spectral Efficiency,” in Proceedings of IEEE International Symposium On Personal, Indoor And Mobile Radio Communications (PIMRC 2024), Valencia, Spain, Sep 2024.
- F. Roth et al., “Spike-Based Sensing and Communication for Highly Energy-Efficient Sensor Edge Nodes,” in Proceedings of 2nd IEEE International Hybrid Symposium on Joint Communications & Sensing (JC&S 2022), Innsbruck, Austria, Mar 2022.