Chair of Automatic Control

FAU

Announcement for Master/Bachelor Thesis/Research project

Different topics in the field of control of microring resonator modulators

Motivation

Microring resonator modulators (MRM) are a crucial part of the optical interconnections used in the integrated photonic technologies to satisfy the ever-increasing demand for data traffic and bandwidth. But the thermal perturbations which leading to a drift in the detuning of the MRM results in the performance deterioration of the optical communication system as being not able to achieve the target bit-error-rate (BER). The operating point stabilization of MRM through suitable control techniques becomes relevant in this regard.

Task description

The possible tasks related to this topic which could be done as a student thesis or research project are:-

- Investigating the possibilities of faster state estimation techniques
- Simplifying the existing non-linear observer with an alternate implementation taking the computational effort into account
- Studying the effect of perturbations such as laser wavelength in the operation of MRM system and designing a suitable controller
- Adapting MPC for systems with faster dynamics like MRM

Requirements

Sound knowledge of Matlab and Simulink is required. Good understanding of control concepts from the lectures (e.g. Regelungstechnik A, B or Dynamical Systems, Numerical Optimization and MPC (for topics involving MPC). Note that the thesis can be written in English.

References

[1] Bogaerts, W., De Heyn, P., Van Vaerenbergh, T., De Vos, K., Kumar Selvaraja, S., Claes, T., Dumon, P., Bienstman, P., Van Thourhout, D., and Baets, R., “Silicon microring resonators,” Laser & Photonics Reviews 6(1), 47–73 (2012).

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