

Development of an experimental setup enabling real-time phase determination and flexible coupling of mechanical oscillators in order to induce and analyze so called Chimera states

Advertising institute: ZEA-2 - Electronic Systems

Reference number: D146/2015, Electrical engineering, physics, mechatronics, mechanical engineering, or computer science

Background:

Chimera states in dynamical networks of coupled oscillators are defined by the coexistence of high synchronization regions and regions of irregular dynamics. Initially these states have been induced in simulations only, but in the last years there have been more and more observations of real world realizations. A rather common example are a large (≥ 20) locally and globally coupled mechanical pendula (metronomes), e.g. see <https://www.youtube.com/watch?v=XQYmWOM5AeQ>. The analysis of these experiments is up to now limited due to the insufficient quantitative recording of the single oscillator's phase dynamics.

Your task:

You will work on the development of a contactless method (including measurement technology and digital signal analysis) for the quantitative recording of the metronome's phase dynamics and the likewise contactless mutual phase dependent coupling of the metronomes. Depending on your experience for the computational real-time platform you may choose between a PC with Simulink Realtime and a microcontroller system (Raspberry Pi or the ZEA-2 in-house development iNODE ~ intelligent Network Operating DEvice).

Requirements:

You are expected to have knowledge in at least two of the following topics:

- electromagnetism, electromagnetic measurement technology
- digital signal processing
- Matlab/Simulink
- μ C programming
- dynamical system theory

We will be happy to assist you in training.

Forschungszentrum Jülich aims to employ more women in this area and therefore particularly welcomes applications from women. We also welcome applications from disabled persons.

Applications:

Have we aroused your curiosity and your interest?

For further information please contact:

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