

Streszczenie w j. angielskim rozprawy doktorskiej
*"Revealing different kinds of
chimera states in the systems of coupled pendula"*
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Using mathematics one may describe many phenomena in different fields of science, for example in physics. Employing differential or difference equations model of the system may be created and in-deeply analysed. Such analysis may reveal, for example, synchronized or chaotic motion, which have been already studied for years.

The behaviour, where both: coherence and incoherence co-exist, is known as the chimera state and has been observed in both theoretical and experimental studies. Recently, the new chimera-like states have been discovered: weak chimera states and solitary states. Both of them are characterized by weaker assumptions than usual, originally defined chimera states.

The Doctoral Thesis is based on the series of articles about different kinds of chimera states in the systems of coupled pendula, which are: the paradigmatic model called Kuramoto model with inertia and real-life system of pendula coupled through the springs. By analysing elementary and complex properties of those models we are able to describe the nature of coupled inertia oscillators.

The parameter regions of occurrence of different chimera behaviours for systems of few coupled oscillators and networks is outlined. The usual chimera state is not the only chimeric pattern in the system. Solitary states, multi-headed and imperfect chimera states are present there as well and occur for wide range of parameters.

Number of solitary states varies in a wide range starting from only one isolated unit and increases exponentially with change of control parameter. Solitary states are present for local, non-local and global coupling, in the thermodynamic and Hamiltonian limit, what implies that they are a very common behaviour in such a systems.

The smallest possible chimera state, for only three coupled elements, is detected and it's kinds are thoroughly described. Thanks to analysis on manifold, we show that creation of chimera states happens as a result of homoclinic bifurcation.

Part of the theoretical results are confirmed experimentally for twenty coupled metronomes, what proves that chimera patterns are present in the real-life systems.

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