Solitary states

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Two mechanisms of the coherence-incoherence transition in networks of coupled oscillators are discussed. One is the recently discovered and intensively studied chimera state. It is characterized by spontaneous splitting the oscillators into two groups, synchronized/coherent and desynchronized/incoherent. The second scenario is via so-called {\it solitary states}, when the incoherent behavior in a network starts with the splitting off a single or a few oscillators whiles theothers remain synchronized. At further variation of the control parameter, more and more oscillators leave the synchronized cluster in visually random way (determined by the initial conditions) manifesting eventually the phenomenon of {\it spatial chaos}.

In the talk, the solitary state appearance is reported for globally coupled Kuramoto model with attractive and repulsive interactions [1], for non-locally coupled Kuramoto model with inertia [2-3], as well as in a nonlinear delayed-feedback system ([4]).

[1] Yu.~Maistrenko, B.~Penkovsky, and M.~Rosenblum. Solitary state at the edge of synchrony in ensembles with attractive and repulsive interactions. {\it Phys.Rev. E} 89, 060901(R) (2014).

[2] T.~Kapitaniak, P.~Kuzma, J.~Wojewoda, K.~Czolczynski, and Yu.~Maistrenko. Imperfect chimera states for coupled pendula. {\it Scientific Reports} 4, 6379 (2014).

[3] P.~Jaros, Yu.~Maistrenko, and T.~Kapitaniak. Chimera states on the route from coherence to rotating waves. {\it Phys. Rev. E} 91, 022907 (2015)

[4] V.~Semenov, A.~Zakharova, Yu.~Maistrenko, and E.~Sch{\"o}ll. Delayed-feedback chimera states: Forced multiclusters and stochastic resonance. arxiv.org/pdf/1511.03634.pdf (2015)