Metastable group synchronization dynamics in a competing Kuramoto model

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Here we consider a mixture of positive and negative coupling Kuramoto oscillators. Each oscillator with negative (positive) coupling attracts (repulses) every other oscillator. The synchronized phase of the mixed coupling system is characterized by two groups of oscillators roughly separated by an angle π in the phase space. They can either be static or traveling. When the natural frequency distribution of the oscillators is given uniform, the synchronization phase transition is hybrid. Near the hybrid critical point, we find two-step jump transition dynamics from incoherent to π to traveling wave state and a metastable π period [†].

† Jinha Park and B. Kahng, Phys. Rev. E. **97**, 020203 (2018).