

Kuramoto Oscillators under local unidirectional coupling: the phenomenon of bunching and anti-bunching

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Abstract: Inspired by our recent work that relates bus bunching as a phenomenon of synchronisation of phase oscillators [Scientific Reports 9, 6887 (2019)], we construct a model of Kuramoto oscillators that follows an analogous interaction mechanism of local unidirectional coupling. We uncovered the critical transitions of the Kuramoto oscillators to the state of complete phase-locking (bunched state) or partial phase-locking (partially bunched states) from the state where the oscillators are completely unbunched. By adding various configurations of kicking force to the system as a form of control, we investigate the transformation of the stable bunched state of the Kuramoto oscillators to a state where the oscillators remain staggered (anti-bunched) with respect to each other.

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