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Bifurcation and Chaos in Coupled Periodically Driven Non-identical Duffing Oscillators

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We study the bifurcation and chaotic behaviour of a system consisting of a periodically forced double-well Duffing oscillator coupled to a single-well Duffing oscillator. Using the amplitude and frequency of the driving force as the bifurcation parameters, we show that our model exhibits richer complex dynamics which is strongly dependent on the coupling strength than exhibited by coupled periodically forced Duffing oscillators with identical potentials [1, 2]. In relatively low coupling regime, our model exhibits symmetry-breaking (sb), chain of symmetry-breaking (-(sb-sb)-) and sudden chaos; in addition to the familiar forward and reverse period-doublings. For higher couplings, 'higher order' Hopf bifurcations of various types (including supercritical and subcritical Neimark bifurcations) are observe. We also observe the existence of local-global bifurcation of intermittent catastrophe type during the transition from quasiperiodicity to periodicity; and *attractor-merging crisis* as a precursor to stable chaotic motion. Frequency locking and stable *steady-state* solutions consisting of co-existing *strange non-chaotic attractors* arising from tori breakdown were also found as a signature of high-dimensional dynamics.

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[2] A. Kenfack, Chaos, Soliton & Fractals **15** 205 (2003).