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Investigation of synchronization in two nonlinear electrical LC-circuit with linear mutual inductance and external field using chaos theory

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Abstract

We consider two nonlinear electrical circuits consisting of two nonlinear capacitors that are coupled to each other through linear inductors (mutual induction) under the influence of time-dependent external fields. By excitation of two non-linear chaos electrical circuits (chaos oscillators) by each other, the Lyapunov indexes were extracted numerically and the synchronization of two electrical circuits without chaos connection was observed. The dependence of the Lyapunov exponent on the numerical value of the coupling coefficient (mutual induction m) has been studied and the critical value of this coefficient has been determined. Also, the effect of this coupling coefficient of two nonlinear electrical circuits (two Duffing oscillators) coupled without connection has been investigated in order to observe different dynamic states. Diagrams of charge and current changes in terms of time for the numerical value of critical mutual induction have been studied and the synchronization of the two circuits is shown.

Keywords: synchronization, chaos , nonlinear capacitor, mutual induction, Lyapunov exponent

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