Circuit Implementation of the Jerk Chaotic System in Integer and Fractional Order Domains

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Abstract

This paper investigate a 3D chaotic oscillator with entire and fractional derivatives. We design an electrical circuit which modelling an autonomous oscillator, able to implement one of the classical Jerk equations. We analyze the dynamics of nonlinear system analytically and numerically. The results show that the fractional model can exhibit chaotic dynamics where it should be impossible if one would consider the classical model. This work also explore the synchronization of initial conditions of two identical Jerk systems through the active control method.

Full Text

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Please see the Manuscript PDF file for the complete figure caption.

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Classical synchronization result: u_1, u_2 and u_3 are synchronization function. e_1, e_2 and e_3 are synchronization error, x_m is synchronized with x_s , y_m is synchronized with y_s and z_m is synchronized with z_s .

Figure 17

Fractionnal synchronization result: u_1, u_2 and u_3 are synchronisation function. e_1, e_2 and e_3 are synchronisation error, x_m is synchronized with x_s , y_m is synchronized with y_s and z_m is synchronized with z_s .