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Generation of regular and chaotic pulses via an electrical oscillator forced by an external periodic signal

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The dynamics of the newly chaotic pulse oscillator, driven by an external periodic signal voltage is strongly investigated. This particular forced oscillator has broad range applications in electronic and telecommunication, such as the generation of trains of regular and chaotic pulses. Although regular pulses are useful for the modulation of signals, the chaotic one can be used for the signal masking and modulations. Based on the appropriate selection of the state variables, a mathematical model is derived for the analytical description of the system's dynamics. This mathematical model is used to seek the equilibrium points and study their stabilities. Applying next, the two parameters perturbation methods, the periodic solution is found and proved to be sensitive to nonlinearity parameter and the external signal voltage's amplitude. Through numerical investigations, the route to chaos by the periodic doubling is observed, as well as other complex behaviors such as the generation of pulse like signals. In order to verify theoretical and numerical studies, PSpice simulations and real experiments are performed and compared, showing a very good agreement between theory and experiments.

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