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PROPORTIONAL AND DIFFERENTIAL CONTROL OF A PIECEWISE-LINEAR CAPACITOR CHAOS CIRCUIT

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Abstract.A piecewise-linear capacitor chaos circuit which is a compact three dimensions autonomous circuit is introduced. The proportional and proportional-differential feedback control methods are proposed for this circuit. Two linear feedback control methods both can lead chaos to the unstable equilibrium points and various period orbits. The proposed strategies have the advantages of being simple, efficient and easy to implement. Furthermore, the controller does not require any information about unstable periodic orbits of the system. Theoretical predictions are verified with numerical simulations and experimental measurements.

Keywords. Chua's circuit, Piecewise-linear capacitor, Hopf bifurcation, Routh-Hurwitz criterion.

AMS (MOS) subject classification: 34C28, 34H05, 94C15, 94B90.

1 Introduction

It has potential advantages that utilizing the nonlinear circuit to simulate the practical physics systems along with an in-depth study of nonlinear theorems. Chua's circuit is one of the most famous chaos circuits which has a piecewise linear negative resistor and exhibits a wide variety of nonlinear dynamics phenomena such as bifurcation and chaos. This paper introduces a new chaos circuit [1] whose core component is a piecewise-linear capacitor. The new chaos circuit is a compact three dimensions autonomous circuit, whose components quantity is same with Chua's chaos circuit. It has some advantages of being simple and easy to realize in practical projects.

Chaos control is a new research area in nonlinear systems. There are two basic purposes of chaos control, one is to restrain and eliminate chaos appropriately, another is transform the chaotic motion into the periodic motion, equilibrium points with best performance [2,3]. Many experimental systems have been studied with the aim of establishing control over chaos.Controlling chaos to the equilibrium points have been successfully done in deal with the