Choque-Rivero, A. E.; **Gonzalez, Graciela A.**; **Cruz Mullisaca, E.**

Korobov's controllability function method applied to finite-time stabilization of the Rössler system via bounded controls. (English) Zbl 1474.93013

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Summary: Rössler system has become one of the reference chaotic systems. Its novelty when introduced, being that exhibits a chaotic attractor generated by a simpler set of nonlinear differential equations than Lorenz system. It develops chaotic behaviour for certain values of its parameter triplet. The issue of controlling Rössler system by stabilizing one of its unstable equilibrium points has been previously dealt with in the literature. In this work, control of the Rössler system is stated by considering the synthesis problem. Given a system and one of its equilibrium points, the synthesis problem consists in constructing a bounded positional control such that for any x^0 belonging to a certain neighborhood of the equilibrium point, the trajectory $x(t)$ initiated in x^0 arrives at this equilibrium point in finite time. Namely, by using V. I. Korobov method, also called the controllability function method, a family of bounded positional controls that solve the synthesis problem for the Rössler system is proposed. We mainly use two ingredients. The first one concerns the general theory of the controllability function The second ingredient is a family of bounded positional controls that was obtained in. Different from previous works on finite-time stabilization we propose an explicit family of bounded controls constructed by taking into account the only nonlinearity of the Rössler system, which is a quadratic function. By using the controllability function method, which is a Lyapunov-type function, the finite time to reach the desired equilibrium point is estimated. This is obtained for an arbitrary given control bound and an adequate set of initial conditions to achieve the control objective is computed. This proposal may also be developed for any controlled system for which its linear part is completely controllable and its corresponding nonlinear part is a Lipschitzian function in a neighborhood of the equilibrium point. In turn, this technique may be implemented as a tool for control chaos.

MSC:

93B05 Controllability
93D40 Finite-time stability
93C15 Control/observation systems governed by ordinary differential equations
34D20 Stability of solutions to ordinary differential equations

Keywords:

Rössler system; Korobov's controllability function; bounded control; finite time stabilization

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