

## A Nonlinear Dynamical System with Application

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**Abstract :** In this paper, a nonlinear dynamical system is presented. This system is a bilinear class. The bilinear systems are very important kind of nonlinear systems because they have many applications in real life. They are used in biology, chemistry, manufacturing, engineering, and economics where linear models are ineffective or inadequate. They have also been recently used to analyze and forecast weather conditions. Bilinear systems have three advantages: First, they define many problems which have a great applied importance. Second, they give us approximations to nonlinear systems. Thirdly, they have a rich geometric and algebraic structures, which promises to be a fruitful field of research for scientists and applications. The type of nonlinearity that is treated and analyzed consists of bilinear interaction between the states vectors and the system input. By using some properties of the tensor product, these systems can be transformed to linear systems. But, here we discuss the nonlinearity when the state vector is multiplied by itself. So, this model will be able to handle evolutions according to the Lotka-Volterra models or the Lorenz weather models, thus enabling a wider and more flexible application of such models. Here we apply by using an estimator to estimate temperatures. The results prove the efficiency of the proposed system.

**Keywords :** Lorenz models, nonlinear systems, nonlinear estimator, state-space model

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