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Controlling Chaos with Analysis of Fractional Chaotic System Predicting Respiratory Diseases

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Abstract

Considering the increasing virus spread in the society, it is important to understand the connection between respiratory illnesses, the prevalence of respiratory viruses, and meteorological conditions in various nations in order to effectively prepare hospital services for admissions. The paper addresses the fractional four dimensional chaotic system predicting respiratory diseases. The system is thoroughly analyzed by using dynamical tools of phase portraits, bifurcation diagrams, Lyapunov diagrams etc. Adaptive SMC method is applied for controlling chaos in presence of uncertainties and disturbances. Theoretical studies is verified numerically using MATLAB.

1 Introduction

It is thought that seasonal weather patterns and respiratory illnesses like influenza are connected. In reality contrary connections between some climatic variables viz. temperature and relative humidity, and prevalence of various respiratory viruses have been proposed. It's possible that this is the case since the majority of viral transmission occurs inside, in air-conditioned rooms, which are cooler and less humid settings that are more suited for the survival and spread of airborne viruses. It is still important to understand the connection between respiratory illnesses, the prevalence of respiratory viruses, and meteorological conditions in various nations in order to effectively prepare hospital services for admissions. This is particularly crucial right now because viruses are just now starting to arise.

Lorenz (1963) discovered a phenomenon that would later be known as the "Butterfly Effect" while looking into a meteorological issue [1]. Lorenz, a mathematician and meteorologist, used a skewed model of atmospheric convection to investigate the behavior of weather systems. As he changed the

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