

## Accepted Manuscript

Title: Existence of Chaos, dynamical behaviour with fractional order derivatives and modified adaptive function projective synchronization with uncertain parameters of a chaotic system

Author: S.K. Agrawal K. Vishal

PII: S0030-4026(16)31396-1  
DOI: <http://dx.doi.org/doi:10.1016/j.ijleo.2016.11.070>  
Reference: IJLEO 58485

To appear in:

Received date: 19-9-2016  
Accepted date: 11-11-2016

Please cite this article as: S.K.Agrawal, K.Vishal, Existence of Chaos, dynamical behaviour with fractional order derivatives and modified adaptive function projective synchronization with uncertain parameters of a chaotic system, *Optik - International Journal for Light and Electron Optics* <http://dx.doi.org/10.1016/j.ijleo.2016.11.070>

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## Existence of Chaos, dynamical behaviour with fractional order derivatives and modified adaptive function projective synchronization with uncertain parameters of a chaotic system

S. K. Agrawal<sup>a\*1</sup>, K. Vishal<sup>b</sup>

<sup>a\*</sup> Department of Applied Sciences, Bharati Vidyapeeth's College of Engineering, New Delhi-110063, India

<sup>b</sup> Department of Mathematics and Basic Science, NIIT University, Neemrana, Rajasthan-301705, India

### Abstract

In this article, the authors have studied dynamics of Duffing - Van der Pol system with fractional order derivative and found the existence of chaos. The main contribution of this effort is implementation of the Largest Lyapunov Exponent (LLE) criteria based on Wolf's algorithm. The conditions for chaos control based on fractional Routh-Hurwitz stability conditions and feedback control are obtained. Also synchronization between fractional order chaotic system and controlled fractional order Duffing - Van der Pol system using modified adaptive function projective synchronization method for different scaling matrix has been obtained. Numerical simulation results which are carried out using Adams–Bashforth–Moulton method show that the method is easy to implement and reliable for synchronizing the two nonlinear fractional order systems.

**Keywords:** Chaos; Largest Lyapunov Exponent (LLE); Fractional derivative; Duffing -Van der Pol system; Chaos control; Feedback control; Modified Adaptive function Projective Synchronization.

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\* Corresponding author: *S. K. Agrawal* ;  
E-mail address: saurabh.goel9944@gmail.com;

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