fractal and fractional

Editorial

New Challenges Arising in Engineering Problems with Fractional and Integer Order-II

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Modern science is one of the most-used commodities globally, and it is especially important in determining the sources of various threats faced by the world. These problems are studied using scientific tools and norms, and the development of science and technology has attracted the attention of experts from different disciplines. This has led to increasing scientific investigation of real-world problems. With the help of computer programs, experts can determine the roots of such problems using graphics and simulations.

A total of 45 papers were submitted to this Special Issue, all of which were reviewed by several scientists who are experts in their fields. Following strict review, 16 manuscripts were accepted for publication in this Special Issue, meaning the acceptance rate was 35%.

The following is a brief summary of the accepted papers:

In the first paper [1], the authors studied a large spacecraft, considering its different properties such as solar cell plates and mechanical flexible arms. They observed the fractional-order PD attitude control method of the governing model.

In [2], the authors developed a fractional order-based frequency regulation for some systems. Their results confirmed that the stable operation and the frequency regulation performance of the new proposed controller were highly accurate.

In [3], the authors implemented two schemes, LFNHAM and LFNDM, to investigate the local fractional Lighthill–Whitham–Richards model, which arose in their fractal vehicular traffic platform.

The methods considered incorporated local fractional natural transform (LFNT), which produced many novel analytical solutions to the governing model.

In [4], the authors studied a mathematical model of the COVID-19 outbreak. In this model, six fractional differential equation parameters were used to explain its characteristic properties. COVID-19 has spread considerably over the last two years, and the generalized Runge–Kutta method of the fourth order (GRK4M) was used to observe its numerical wave distribution. The authors compared the results via FDM.

In [5], the authors considered the fractional Laplacian operator. They used a new numerical scheme, CRUS-WENO, in the frame of differential equations. The operator of order b ($0 < b < 1$) was split into its integral parts, and the Gauss–Jacobi quadrature method was used to solve the integral parts of operator. This newly presented CRUS-WENO scheme was found to possess some important advantages.

In [6], the authors investigated real-world tracking control problems using fractional calculus properties. Using the global sliding-mode control method (GSMCM), they improved the global robustness of the systems. The first form was based on a full-order GSMCM with a fractional operator, and the second was a novel time-varying control law which presented error signals.

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In [7], stochastic resonance was studied in terms of a time-delay fractional Langevin system. This system is used to symbolize nonlinear-form multiplicative colored noise and fractional Gaussian noise. Via trichotomous colored noise, the authors observed the excitation frequency and found that a multimodal pattern only occurred with a small noise-switching rate and memory-damping order.

In [8], the authors analyzed a nonlinear coronavirus (2019-nCoV) model using a fractional operator. This model is based on four parameters: susceptible, infected, reported and unreported. The results were obtained using a modified predictor–corrector method.

In [9], the authors focused on a Sobolev-type Hilfer fractional neutral delay Volterra–Fredholm integro-differential system. Via fractional calculus, they investigated the measure of noncompactness and the Mönch fixed-point technique and presented several simulations of their findings.

In [10], the authors primarily achieved approximate controllability. By using resolvent operators, fractional semilinear integro-differential equations were investigated. They introduced two alternative options and used the theories from the functional analysis. The primary property was proven in the second situation, after which the authors repeated the observations for the fractional Sobolev-type semilinear integro-differential system.

In [11], the authors introduced the second kind of nonlinear Lane–Emden prediction: the differential Singular model (NLE-PDSM). A powerful numerical scheme was used, namely, a neuro-evolution computing intelligent solver, through which the authors corroborated, validated, and confirmed the efficacy of the ANN-GAASM for three distinct problems.

In [12], the authors studied a COVID-19 infection model by considering the Caputo derivative. The aim of this model is to contain the spread of disease in communities. The authors conducted stability analysis of the model and also observed the R0 number. Using real parameters, they presented a numerical solution for the model.

In [13], the authors studied on the nonlinear Gardner and (3 + 1)-dimensional mKdV-ZK equations. A newly developed method, namely, the rational sine-Gordon expansion method (RSGEM), was used to study their analytical roots. The authors also provided a detailed reported of the strain conditions for valid solutions.

In [14], the authors proposed generalized weighted-type fractional integrals. Using these integrals, they observed some novel inequalities in certain Chebyshev's functions. Moreover, they observed their general wave behaviors using specific parameter values.

In [15], the authors considered the semi-analytical methods HFIT and ADM. They applied these methods to the time-fractional Swift–Hohenberg equation (SHe) and determined the fuzzy Caputo fractional derivative (CFD) via Elzaki transform.

In [16], the authors considered the time-fractional coupled Burgers equation using the Caputo fractional operator. A modified version of the He–Laplace method was considered and the authors obtained an approximate solution to the governing model.

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