International Conference and Advanced Workshop on Modelling and Simulation of Complex Systems

Monday, 27 May 2024 - Friday, 31 May 2024

OAU Campus, Ile-Ife, Nigeria

Book of Abstracts

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Arrival/ Registration/ Familiarization

CEREMONY DECORUM
As a courtesy to the speakers and other guests, we ask that you remain in your seats throughout the entire lecture except break /lunch
CELL PHONES AND PAGERS
Please turn off all cell phones and pagers before entering the hall
PHOTOGRAPHS
For your convenience, we have made arrangements with professional photographers to take a picture of each participant/ group. This will enable us to have photographs of this special event

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Plenary Talk 1 / **27**

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Plenary Talk 1 / **28**

Opening remarks - ARCSSTE-E

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Plenary Talk 1 / **29**

Opening remarks - AFRIGIST

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Plenary Talk 1 / **30**

Opening remarks - NMC

National Mathematical Centre

Technical session 1 / **31**

EXISTENCE OF SOLUTION OF IMPULSIVE QUANTUM STOCHASTIC DIFFERENTIAL INCLUSIONS USING NON FIXED POINT APPROACH

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We observed that Impulsive Quantum Stochastic Differential Inclusion (IQSDI) may not have solution even if it is Lipschitz continuous because of the limiting condition imposed on the impulsive term t_k. We impose an extra regularity condition on t_k and establish solution using minimal selection theorem. QSDI in this work is in the framework of Hudson and Parthasarathy developed quantum stochastic calculus on Boson Fock space

Technical session 2 / **33**

A SYSTEMATIC LITERATURE REVIEW OF MACHINE LEARNING FOR MALWARE: METHODS, ALGORITHMS, PERFORMANCE, LIMITATIONS AND FUTURE RESEARCH DIRECTION

UAV, and Wireless Sensor Networks.
Key words:
ML Machine Learning, DL Deep Learning, AI Artificial intelligence, RL Reinforcement Learning, ITSs Intelligent Transportation Systems, VANET vehicular ad-hoc network, UAV unmanned aerial vehicle, DNNs Deep Neural Networks, IOV Internet of Vehicles, NN Neural Networks, CNNs Conventional Neural Networks, RNNs Recurrent Neural Networks, DDPG Deep Deterministic Policy Gradient, IDS Intrusion Detection System, IPS Intrusion Prevention System.

Technical session 1 / 63

Numerical Integration of Nonlinear FitzHugh-Nagumo Partial Differential Equations Using Second Derivative Two-step Hybrid Block Method Coupled with the Compact Difference Schemes

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In this paper, the derivation of a second derivative two-step hybrid block Method is carried out via Collocation techniques and the scheme is coupled with sixth-order compact difference schemes for the numerical solution of the nonlinear FitzHugh-Nagumo Partial Differential Equations (PDE) which is of physical relevance. The sixth-order standard compact difference schemes are used to semi-discretize the nonlinear FitzHugh PDE to a system of first-order ordinary differential equations (ODEs). Then the derived two-step hybrid block scheme proposes an approximate solution to the resulting system of ODEs. The proposed block scheme has been proven to be zero-stable, consistent, and convergent while maintaining good accuracy. The numerical results reveal that the derived block scheme is computationally efficient, when compared to the exact solution and some existing schemes solutions derived from solving FitzHugh-Nagumo PDE.

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Mathematical Modeling of Chemotherapy Effects on Brain Tumour Growth

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Brain tumor is an abnormal growth or mass of cells in or around the brain. It is also called a central nervous system tumor. Brain tumors can be malignant (cancerous) or benign (not cancerous). In this work we proposed a system of nonlinear differential equations that model brain tumor under treatment by chemotherapy, which considers interactions among the glial cells X(t), the cancer cells Y(t), the neurons Z(t), and the chemotherapeutic agent C(t). The chemotherapeutic agent serves as a predator acting on all the cells. We studied the stability analysis of the steady states for both cases of no treatment and continuous treatment using the Jacobian Matrix. We concluded the study with numerical simulation of the model and discussed the result obtained.

Technical session 2 / **65**

RECYCLING OF MUNICIPAL SOLID WASTE: A DETERMINISTIC APPROACH.

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Effective waste management aims at minimizing garbage's detrimental effects on the environment, public health, and aesthetics, which also attempts to recover valuable resources and support sustainable development.
The Next Generation matrix was employed to calculate the reproduction number, the model equations were solved using the Differential Transformation Method (D.T.M.) and the obtained result was simulated using the Maple software. The result shows that waste management will be effective if recycling of waste is given the proper attention that it deserves. It also indicates that waste for disposal will be limited and managing waste will become easier.

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OPTIMAL ANALYSIS OF THE EFFECT OF D1 AND D2 VACCINES ON MEASLES VIRUS

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Abstract
Measles, an acute viral infectious disease caused by the measles morbillivirus, belongs to the paramyxovirus family. It spreads through direct contact and airborne transmission, primarily infecting the respiratory tract through coughs, sneezes, and nasal secretions. The prevalence of measles is a concern in African and developing countries where overpopulation and limited birth control measures exist. Outbreaks in such regions pose significant risks. In this study, a mathematical model was developed to analyze measles transmission, considering various immunization strategies, and the effectiveness of the Two-Dose vaccination D1(t) and D2(t). A control model was formulated, and the Disease-Free Equilibrium (DFE) state was determined. The basic reproduction number, denoted as R_0, was computed to assess the potential spread of the virus. Local stability analysis of the DFE was conducted using Jacobian Matrix Techniques, revealing that the DFE is locally asymptotically stable when R_0 is less than 1. The findings suggest that global eradication of measles is feasible if R_0 remains below one.

Key words: Basic Reproduction Number R_0, D1 and D2 Vaccination, Jacobian Matrix, Measles, Optimal Control, Stability

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