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Newton Polynomial Numerical Solutions for the Fractional Order Rabies Mathematical Model

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Introduction

In the realm of mathematical modelling, particularly in epidemiology, the fractional order rabies mathematical model presents a unique set of challenges due to its nonlinear and non-integer order differential equations. To address these challenges, numerical methods such as Newton polynomial interpolation offer a powerful tool for approximating solutions, Newton polynomial interpolation involves constructing a polynomial function that passes through a set of given data points. In the context of the fractional order rabies model, this method can be applied to approximate the solutions of the differential equations governing the dynamics of rabies transmission within a population, By discretizing the fractional derivatives using appropriate numerical schemes, such as the Grunwald-Letnikov or Caputo derivatives, the fractional order differential equations are transformed into a system of algebraic equations. These equations can then be solved using Newton polynomial interpolation to obtain an approximation of the solution over a specified time interval.

Description

One of the key advantages of using Newton polynomial interpolation is its flexibility in handling irregularly spaced data points and its ability to provide high-order accuracy. This is particularly beneficial in the context of epidemiological models, where the availability of data may be sparse or unevenly distributed. Furthermore, Newton polynomial interpolation allows for the incorporation of additional constraints or boundary conditions, enabling researchers to tailor the numerical solutions to specific epidemiological scenarios or real-world data, Overall, Newton polynomial interpolation serves as a valuable numerical tool for approximating solutions to the fractional order rabies mathematical model, providing insights into the dynamics of rabies transmission and informing public health interventions aimed at controlling the spread of this deadly disease [1,2].

Through the application of Newton polynomial interpolation to the fractional order rabies mathematical model, researchers gain the ability to perform detailed simulations and sensitivity analyses. These analyses can reveal critical insights into the effectiveness of various intervention strategies, such as vaccination campaigns, culling of infected animals, or implementation of public awareness programs, Additionally, the numerical solutions obtained through Newton polynomial interpolation allow for the investigation of the impact of model parameters on the spread and persistence of rabies within a population. Sensitivity analysis techniques can identify which parameters have the greatest influence on model outcomes, guiding researchers in prioritizing control measures and allocating resources effectively, Moreover, the flexibility of Newton polynomial interpolation facilitates the exploration of complex dynamics, including the emergence of spatial heterogeneity, seasonal variations, and the interplay between different host species. By incorporating spatial and temporal variations into the model, researchers can better understand the factors driving the spread of rabies and design targeted interventions tailored to specific regions or time periods [3-5].

Conclusion

The use of Newton polynomial interpolation enables researchers to validate the fractional order rabies model against empirical data, thereby enhancing confidence in the model's predictive capabilities. By comparing model predictions with observed epidemiological trends, researchers can assess the model's accuracy and identify areas for improvement, ultimately refining our understanding of rabies transmission dynamics, Newton polynomial interpolation offers a robust and versatile numerical approach for solving the fractional order rabies mathematical model. By leveraging this method, researchers can gain valuable insights into the dynamics of rabies transmission, inform evidence-based decision-making in public health policy, and contribute to the global efforts aimed at controlling and ultimately eliminating rabies as a public health threat.

Acknowledgement

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Conflict of Interest

None.

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