UNIVERSITI TEKNOLOGI MARA

NUMERICAL STUDY OF LORENZ'S EQUATION BY THE BANACH CONTRACTION METHOD, P03S23

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Report submitted in partial fullfillment
of the requirements for the degree of
Bachelor of Science (Hons.)
(Mathematics)

College of Computing, Informatics & Mathematics

January 2024

ABSTRACT

This studied explores the application of the Banach Contraction Method (BCM) and its modification, the Multistage Banach Contraction Method (MBCM). The two methods are applied to solve the Lorenz's equation, a nonlinear system with chaotic behavior. The goal is to assess their accuracy and efficiency through comparison with the widely-used RK4 method. MBCM has been applied to approximate the numerical solution of the Lorenz's equations. In contrast to the standard BCM, which faces difficulties as the solution point deviates from the initial position, the multistage approach is employed to achieve more accurate solutions over wider intervals. The convergence of MBCM and RK4 solutions is discussed, emphasizing the reliability of MBCM within specified time domains. Maximum global errors for each variable further validate the superiority of MBCM over BCM. The findings recommend using MBCM with a small step size for accurate solutions to the Lorenz equations, achieving a balance between computational efficiency and precision. Moreover, employing this method yields favorable outcomes in solving nonlinear differential equations.

ACKNOWLEDGEMENT

We would like to express our sincere gratitude to my lecturer, Mr. Mohd Azdi Maasar, for his invaluable guidance and unwavering support throughout the course of MSP660. His expertise and encouragement have been instrumental in shaping the direction of this project.

We are deeply thankful to our supervisor, Dr. Mat Salim Selamat, for his insightful feedback, constructive criticism, and continuous encouragement. His mentorship has been crucial in refining the methodology and ensuring the quality of this research.

We would also like to express our appreciation to UiTM Seremban 3 for providing the necessary resources and a conducive environment for the successful completion of this project.

Lastly, we would like to express our gratitude to all those who have directly or indirectly contributed to the completion of this final year project (FYP). Their support has been invaluable, and we are truly grateful for the opportunity to undertake this research.

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