ISSN(O): 3108-1916

Jana Nexus: Journal of Computer Science

Publisher's Name: Jana Publication and Research LLP

https://www.jananexuscs.com

REVIEWER'S REPORT

Manuscript No.: JNCS-025

Title: A Second Derivative Hybrid Block Method with Variational Stability Parameters for the Direct Solution of Second-Order Initial Value Problems in Ordinary Differential Equations

Recommendation:

Accept as it is .....

Accept after minor revision……yes……

Accept after major revision .....

Do not accept (*Reasons below*) .....

Rating	Excel.	Good	Fair	Poor
Originality			Y	
Techn. Quality			Y	
Clarity			Y	
Significance			Y	

Reviewer's ID: JPR-Dr.Shaweta sachdeva

Detailed Reviewer's Report

1. The manuscript addresses an important problem in numerical analysis by proposing a high-order block method for solving ordinary differential equations and contributes to the development of efficient computational techniques.
2. The abstract should clearly state the novelty of the proposed method, its order of accuracy, and the key numerical advantages over existing approaches.
3. The introduction would benefit from a more comprehensive review of recent literature on block methods, hybrid methods, and collocation-based numerical schemes published within the last five years.
4. The research gap should be explicitly identified to help readers understand the motivation for developing the proposed scheme.
5. The derivation of the method is mathematically detailed; however, additional explanatory remarks between equations would improve readability for a broader audience.
6. Several long mathematical expressions should be reformatted for better presentation and easier verification of the derivation process.
7. The notation used throughout the manuscript should be summarized in a dedicated nomenclature table to enhance clarity and consistency.
8. The authors should provide a clearer justification for the selection of interpolation and collocation points used in constructing the block method.
9. A flowchart or algorithmic pseudocode describing the implementation procedure would make the proposed technique more accessible to practitioners.
10. The consistency, zero-stability, convergence, and region of absolute stability analyses should be discussed in greater detail, emphasizing their practical implications.
11. The stability plots are useful, but additional interpretation of the stability characteristics would strengthen the discussion.

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12. The numerical examples should include more challenging benchmark problems, including stiff and highly nonlinear differential equations, to demonstrate the robustness of the method.
13. A direct comparison with recently published high-order block methods and established numerical solvers would provide stronger evidence of the method's effectiveness.
14. Computational efficiency metrics such as execution time, convergence rate, or computational cost should be included where possible.
15. The error analysis section would benefit from graphical representations showing error behavior across different step sizes.
16. The manuscript should discuss potential limitations of the proposed method, particularly regarding its applicability to large-scale or stiff systems.
17. Some derivations appear highly condensed; including supplementary mathematical details or appendices would improve reproducibility.
18. The discussion section should more explicitly connect the theoretical properties of the method with the observed numerical performance.
19. The conclusions effectively summarize the results, but they could further highlight the practical significance and potential applications of the proposed scheme.
20. The manuscript is technically sound and mathematically rigorous; however, improvements in presentation, comparative evaluation, and discussion of numerical performance would significantly enhance its overall impact and readability.