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THE IMPACT OF QUARTER-SWEEP COMPLEXITY REDUCTION APPROACH FOR SOLVING PARTIAL DIFFERENTIAL EQUATIONS

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Background. Dr. Jumat Sulaiman is a professor in Mathematics with Economics from Universiti Malaysia Sabah (UMS). He is the director of Preparatory Center for Science and Technology at UMS. He is a prominent researcher in his field and has published over 300 articles in numerous international journals. His research interests include numerical analysis using finite element and finite difference methods, scientific computing and numerical solutions on optimization problems.

Abstract. Partial differential equations (PDEs) are frequently employed as the foundation of many mathematical models in various physical and scientific phenomena. Then, even now, numerically solving PDEs remains a significant issue. As a result, much work has been focused on developing discretization schemes and iterative approaches for obtaining numerical solutions to any PDE. Various families of iterative approaches have also been proposed and explored, based on the findings of prior studies, primarily in solving any system of linear equations formed by discretizing differential equations in mathematical models. Following that, literature reviews on the concept of quarter-sweep iterative methods have revealed that these methods can accelerate their convergence rate in solving any system of linear equations in which the corresponding finite difference approximation equations generate linear systems. As a result, these iterative approaches might be classified as efficient iterative methods. The main advantage of quarter-sweep iterative approaches is that they lower the computing complexity of the created linear system. Because of the advantage of this characteristic through the combination of the concept of quarter-sweep iteration and several families of proposed standard iterative methods, the convergence rate of modification over the families of proposed iterative methods can be shown to be superior to the standard full-sweep iterative methods. To summarize, the quarter-sweep iterative approaches that have been presented are appropriate for solving linear partial differential equations of various dimensions.

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