UNIVERSITI TEKNOLOGI MARA

INTERVALWISE BLOCK PARTITIONING USING THREE POINTS FOR SOLVING STIFF SYSTEMS ORDINARY DIFFERENTIAL EQUATIONS

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institutions nor non-academic institutions for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

Partitioning is a strategy for solving stiff systems of ordinary differential equations (ODEs) problems. There are two types of partitioning; intervalwise and componentwise partitioning. This thesis is focused only on intervalwise block partitioning (IBP) which the system of equations will initially be treated as non-stiff subsystem and will be solved using Adams block method. Once an equation is identified as stiff, the whole system will be treated as stiff and will be solved using block Backward Differentiation Formulae (BBDF). This process will continue until the integration interval is completed. In addition, variable step size BBDF (VSBBDF) method using three points is derived in order to solve first order stiff ODEs. The partitioning strategy involved is based on Adams method formulae and VSBBDF formulae. A single code is developed based on variable step size IBP. The code is implemented using Microsoft Visual C++ 6.0 XP Version and compared with ode15s and ode23s which are run in MATLAB 7.8. The numerical results have shown that the partitioning strategy has performed well in term of computational time compared to VSBBDF and MATLAB ode solvers, ode15s and ode23s. It shows that the partitioning strategy can be an alternative method to solve first order stiff ODEs.

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