**A Laplace transforms method for the time dependent problems**

N. Kokulan, C.H. Lai

Department of Mathematical Sciences

University of Greenwich

London, UK

E-mail: {N.Kokulan, C.H.Lai}@gre.ac.uk

Abstract: Many of the real-world physical processes are modeled using time dependent differential equations with nonlinear features. It is imperative that rapid and efficient means of solving these equations be developed. Standard solution methods for numerically solving time-dependent problems is the time marching scheme which is typically begin by discretizing the problem on uniform time grid and then sequentially solving for successive time points. The dependence of the solution in the previous time step makes the problem difficult to solve in parallel environment, in their original time dependent form. To avoid this problem the time domain decompositions methods (time-parallelism) seem to offer some breakthrough in the concept of parallelisation of the temporal domain. Use of the Laplace transforms permits solution to the time dependent problems in a parallel environment. The solution procedure requires numerical computation of the inverse Laplace transform and two methods (Stehfest, BKL) have been analyzed. We investigate performance and efficiency for two problems related to 1D linear and 2D non-linear diffusion equation and compared the results with temporal integration. Comparisons between two inverse Laplace transforms are given.