On the Fractional Order Differential Equations for Real life Models

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Fractional order derivative in mathematics is a natural extension of integer order derivatives. In order to deal with fractional order derivatives, many definitions are introduced, such as Riemann-Liouville, Grünwald-Letnikov, and Caputo, definitions. On the other hand, there are many applications of the fractional derivatives in different fields, including biology, chemistry, physics, geology, mechanical engineering, electrical engineering, control theory, astrophysics and social sciences.

In this work, an overview will be given to some types of fractional Order differential equations for real life models such as the fractional cable equation and the fractional SIRC model and influenza A. Consequently, considerable attention has been given to the efficient numerical solutions of such models, because it is difficult to find the exact solutions for it. Special attentions is given to use the parallel weighted average finite difference method on a distributed system using message passing interface (MPI). The resultant large system of equations is studied using precondition conjugate gradient (PCG), with the implementation of cluster computing on it. The proposed approach fulfills the suitability for the implementation on Linux PC cluster through the minimization of inter-process communication.