# REVIEW ON THE ADOMAIN DECOMPOSITION METHOD AND COLLOCATION METHOD FOR SOLVING FRACTIONAL DIFFERENTIAL EQUATIONS

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Numerous real-life problems involving fractional calculus are widely used in different branches of mathematical physics, engineering science, etc. Solving Fractional Differential Equations (FDEs) is an active field of research. There are many ways to solve first order simple FDEs manually such as Laplace and Fourier etc. However, practically it is too difficult to solve a complex FDE to obtain an exact solution thus, numerical methods are suggested. There are several numerical methods such as Backlund transformation, Darboux transformation, inverse scattering transformation, Hirota's bilinear method, Homotopy perturbation method, symmetry method, and iterative method etc. among which the Adomain Decomposition Method (ADM) and collocation method are the two most widely used methods. ADM is a powerful technique with an efficient algorithm for solving linear and nonlinear FDEs. On the other hand, collocation method utilizes the polynomial interpolation technique where the differential operator over a working domain is approximated using an interpolation polynomial. This study analyses the existing literature to review on the two numerical approximation methods: ADM and collocation method. Further, based on the analysis the proposed study also suggests the appropriate strategies to reduce the error when solving FDEs. Several existing studies that focus on ADM and collocation methods were surveyed and the produced results were compared based on the applied problems in order to select the most effective method with the least error value for solving FDEs. It is noteworthy that the test problems used in existing studies have been selected based on their simplicity in order to be verified with their exact solutions using manual methods. Further, the efficiency of the method will be reflected through the error: lower the error higher the efficiency. Accordingly, the reviewed results demonstrate that ADM is superior to solve FDEs compared to the collocation method. The proposed research would contribute to the researchers who work on numerical field through providing useful insights and as well as assists the engineers in terms of solving FDEs based applications.

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