# Barycentric - Maclaurin Interpolation Method for Solving Volterra Integral Equations of the Second Kind

*Basma Magdy Ahmed Mohamed ,Emil Shoukralla*

**Abstract**

In this paper, the Lagrange functions of Lagrange interpolation are expanded into Maclaurin polynomials to improve the performance of an improved formula of the Barycentric Lagrange interpolation with uniformly spaced nodes and was used for solving Volterra integral equations of the second kind. For the implementation of this technique, the given data function, the kernel and the unknown function are approximated by the given improved formula to get interpolated polynomials of the same degree. Furthermore, the interpolated unknown function is represented by four matrices and is substituted twice into both sides of the considered integral equation, while the kernel is represented by five matrices. This enforcement provided the possibility to reduce the solution of the Volterra equation into an equivalent algebraic linear system in a matrix form. To show the efýciency of this method, four examples are solved. It turns out, that the obtained approximate solutions were equal to the exact ones. Moreover, it is noticed that a smaller number of nodes are applied if the given function and the kernel were algebraic functions and the upper bound of the integration domain variable was canceled. For a nonïalgebraic given function and kernel, the exact solutions were obtained by increasing the number of nodes and taking the upper bound of the integration domain to be equal to one, which ensures the accuracy and authenticity of the presented method.

*Menoufia Journal of Electronic Engineering Research  2020, January*