NUMERICAL SOLUTION OF THE 3D POISSON EQUATION USING FINITE ELEMENT METHOD IN FreeFEM++

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In this paper, we present the implementation of a Finite element method (FEM) by utilising the FreeFem++ software for a three dimensional Poisson equation with Dirichlet and Neumann boundary conditions. The finite element method (FEM) is squarely based on the idea of building a complicated object either with simple blocks or dividing into small and manageable pieces [1]. This is an efficient discretization technique in solving problems related to initial and/or boundary values in a precise manner by using a considerably small number of grid points.

Several approximate numerical analysis methods have evolved over the years, in which, a commonly used method is the finite difference. With finite difference techniques, we can solve some fairly difficult problems [2], however, when we stumble upon irregular geometries or an unusual specification of boundary conditions, we find that finite difference techniques become difficult to use. On the contrary, the finite difference method which visualises the solution region as an array of grid points, the finite element method visualises the solution region as built up of many small, interconnected sub-regions or elements. The developed numerical solution with the help of FreeFem++ gives results much closer to the exact solution when estimated at different nodes. The finite element method is a dynamic computational technique for approximate solutions when dealing with different aspects of real-world technological problems in medicine and engineering having complex domains subjected to general boundary conditions.

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REFERENCES

1. *Reddy J.N.* An introduction to the Finite element method. // 3rd Ed., McGraw Hill (2006).
2. *Avdiaj S. and Setina J.* Numerical solving of Poisson equation in 3D using Finite difference method // Journal of Engineering and Applied sciences, Vol. 5(1), 2010, P. 14-18.