

**FULL MULTIGRID METHOD WITH POLAR AND SPHERICAL POLAR TO CARTESIAN  
GRID TRANSFORM FOR SOLVING TWO AND THREE DIMENSIONAL ELLIPTIC  
PARTIAL DIFFERENTIAL EQUATION**

**OSAMA EL-GIAR**

Department of Basic Science, Modern Academy for Engineering and Technology in Maadi, Cairo, Egypt

**ABSTRACT**

In this paper we use grids defined in Cartesian coordinates in place of grids defined in polar and spherical polar coordinates to solve an elliptic partial differential equation in two and three space dimensions. This transforming of the grids makes using both the interpolation and restriction operators more simple and moreover they give convergence rate better than operators defined in polar and spherical polar coordinates. A full multigrid method with  $W(\gamma_1, \gamma_1)$  cycle with line relaxation and both restriction and interpolation operators defined in Cartesian form are used. Finally numerical examples have been given.

**KEYWORDS:** Multigrid Method, Numerical Analysis, Elliptic PDE, Cartesian, Polar and Spherical Polar Coordinate Systems