

## **Numerical Simulation for the Viscous Flow inside Complex Shapes Using Grid Generation**

**Saleh M. Al-Harbi**

*Department of Mathematics, Universal College in Makkah,  
Umm Al-Qura University, Makkah, Saudi Arabia*

*E-mail: salharbi434@yahoo.com*

### **ABSTRACT**

In this paper, we determined a numerical solution of the incompressible Navier-stokes equation in the vorticity-stream function formulation. The solution is based on a technique of elliptic grid generation in which we transform the physical domain into rectangular computational domain, which requires the use of a curvilinear coordinate system to transform the governing equations to be applied on the computational domain. The transformed equations are approximated using central differences and solved simultaneously by the Alternating Direction Implicit method and successive-over relaxation iteration method.

Keywords: Alternating direction implicit method, successive over relaxation iteration method, Navier-Stokes equation.