generated either analytically or numerically, while retaining the velocity components in a triply-orthogonal curvilinear coordinate system. The convective transport equations for mean velocities and turbulence parameters $(k, \varepsilon)$ are solved by the finite-analytic method in the transformed domain. The pressure field is updated using a modified version of the SIMPLER algorithm to satisfy the equation of continuity. The capability of the method and its overall performance are demonstrated by calculations of the flow over a typical ship hull.

A MIXED FINITE ELEMENT FORMULATION FOR MAXWELL'S EQUATIONS IN THE TIME DOMAIN. Robert L. Lee and Niel K. Madsen, *Lawrence Livermore National Laboratory, Livermore, California, USA.*

A Galerkin finite element solution technique for the Maxwell's equations is discussed. This new formulation can be viewed as a generalization of certain staggered-grid finite difference schemes to arbitrary meshes. It is shown that this technique is simple to implement and is more accurate as well as more cost effective than the standard equal-order finite element approach. Numerical examples are presented to evaluate the performance of this new element relative to the standard element.

AN ANALYSIS AND OPTIMIZATION OF THE PSEUDO-CURRENT METHOD. Dale E. Nielsen, Jr., *Lawrence Livermore Laboratory, Livermore, California, USA*; Adam T. Drobot, *Science Applications International Corporation, McLean, Virginia, USA.*

The pseudo-current method proposed by B. Marder for eliminating charge conservation errors in electromagnetic particle-in-cell codes has been analyzed and extended. The new method has been shown to be effective and efficient in removing high frequency, short wavelength errors caused by the choice of charge deposition algorithms. To maintain the physical properties of the electromagnetic field the choice of the free parameter in the originally proposed method has been restricted. It is found that the parameter should be homogeneous spatially and that an error minimization technique can be used to determine its value. A comparison is made between this adaptive pseudo-current method and the effects of spatial smoothing on the transverse and longitudinal components of the electromagnetic field.

SYSTEMATIC METHODS FOR CALCULATION OF THE DIELECTRIC PROPERTIES OF ARBITRARY PLASMAS. P. A. Robinson, *University of Colorado, Boulder, Colorado, USA.*

A new approach to the calculation of the dispersion integrals involved in determining the dielectric properties of arbitrary plasmas is developed. Rather than relying on ad hoc approximation methods, the dispersion integrals for an arbitrary distribution function with continuous derivative are systematically expanded in terms of a set of orthogonal functions for which the corresponding dispersion functions are known. Realizations of this general approach are discussed for unmagnetized plasmas and generalizations to treat relativistic and magnetized plasmas are also outlined. The method developed here enables the dispersion integrals for an arbitrary distribution to be calculated both systematically and efficiently for the first time for either real or complex arguments.

ON APPLICATIONS OF A COMPLEX VARIABLE METHOD IN COMPRESSIBLE FLOWS. Prabir Daripa, *Texas A&M University, College Station, Texas, USA.*

In this paper, we develop a complex variable formulation for the potential equations of compressible fluid flow and discuss the possibility of its application to the solution of compressible fluid flow problems. A numerical method to solve inverse problems using this formulation is discussed.