## Abstract

In this thesis we present new multidimensional schemes within the frame work of finite volume evolution Galerkin(FVEG) methods for nonlinear hyperbolic systems of conservation laws. In these schemes we couple a finite volume formulation with the approximate evolution operators, where the approximate evolution operators are constructed using the bicharacteristics of the multidimensional hyperbolic system, in which all the infinitely many directions of wave propagations are considered.

We linearize the system of Euler equations at a constant state, then we derive the exact integral representations for the three dimensional Euler equations, at this point we mimic Kirchhoff's formula that represents the solution of the wave equation and neglect the part in the integral equations that contains the integral with respect to time to obtain an approximate evolution operator, we call it N1 approximate evoluton operator. We derive another approximate evolution operator by applying the midpoint rule to approximate the integral with respect to time, we call it EG3 approximate evolution operator.

The derived approximate evolution operators were used to determine the intermediate values of the Euler variables. These values determine the fluxes throughout the surfaces of each cell in the discretized domain.

Finally we used the finite volume approach to update the values of the Euler variables.

The derived FVEG schemes were applied to some numerical experiments to demonstrate the accuracy and the multidimensionality of the solution.