

X The thesis develops numerical methods based on finite difference techniques for the solution of some time-dependent partial differential equations.

The method of lines (MOL) approach is used, to transform the partial differential equation into a time-continuous system of ordinary differential equations (O.D.E.).

Two numerical methods based on spatial discretization - O.D.E. in time and time discretization - integration in the spatial variable are used for solving the linear cubic and quintic dispersive equations. Global extrapolation in time only, and in time and space are used to increase the order of accuracy.

A first-order nonlinear hyperbolic equation and Burgers' equation are solved using a family of numerical methods arising from finite difference, upwind replacements of the convection terms. The methods are analyzed with respect to stability criteria. A global extrapolation procedure is also considered.

Finally, applications to equations exhibiting soliton-type solutions, namely the Korteweg-de-Vries (KdV) equation and a generalized KdV equation are considered. Effectivity and accuracy of the different approaches are demonstrated in computer plots using the graphical system GINOSURF. X