

Method of Trajectories for Approximation of First Derivatives in Partial Derivative Equations

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First we shall demonstrate the method of trajectories for the partial derivative equation of first order (mass transfer along trajectories). We set out simple modification of method and its correction by high-order differences for increase of accuracy. Then we apply this approach to time-dependent convection-diffusion equation for approximation of convective part. Due to such an approximation we get self-adjoint elliptic problems at each time level, which are more convenient to finite element method rather than not self-adjoint elliptic problems with convective terms under traditional approximation of time derivative. Sometimes this approach is named as the modified characteristics method, but it is not related to characteristics of parabolic and other equations solved. We briefly discuss as well the application of this method for Navier-Stokes equations for viscous gas.