LOCALIZED ADJOINT METHOD: AN UPDATED REVIEW

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The Eulerian-Lagrangian Localized Adjoint Method (ELLAM) is a general characteristic-based numerical solution procedure that applies to a variety of transport equations. It is a member of the general family of numerical approximations referred to as Localized Adjoint Method (LAM). This latter method follows from the original work did by Herrera in the eighties. However, LAM has been generalized and improved very much in recent years, especially since it was interpreted as a domain decomposition method (DDM). This can be better understood when DDM are seen from a unified perspective. Then DDMs are classified into direct and indirect (or Trefftz-Herrera) methods. Given a partition of the region of definition of a boundary value problem, DDMs seek to define well posed problems in each one of the subdomains of the partition. This can be done mainly by direct methods, which are the standard approach to domain decomposition, or by indirect (or Trefftz-Herrera) procedures, which are based on Localized Adjoint Method. The essential feature of indirect procedures is the use of a special kind of test functions, which satisfy the adjoint differential equation locally, with the property of yielding information about the sought solution in the inter-element boundaries, exclusively. The advances in this theory is having important implications in parallel processing of continuous system models and in discretization procedures for PDEs. In this talk such advances are discussed as well as their implications in numerical methods for advection dominated transport.