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ON RIEMANN-EARNSHAW INVARIANTS AND CHARACTERISTIC DIRECTONS IN HYPERBOLIC VARIATIONAL MODELS

Abstract

The author has considered the problem on the decomposability of the two-forms coming into a system of equations which describe two-dimensional extremal manifolds and investigated the problem on the exactness of the one-forms which are multipliers of this expansion. The solution of the first problem leads to the classification of variational models (hyperbolic, elliptic, degenerated) and helps to find characteristic directions (characteristic velocities) in the configuration space for hyperbolic models. The solution of the second problem helps us to find for each characteristic direction a family of Riemann-Earnshaw invariants having a functional degree of freedom. By this way, in the applications, the author has received families of Riemann-Earnshaw invariants and characteristic velocities for models of dynamics of an elastic pivot and for gas-dynamic models describing isothermal flows of ideal gas and adiabatic flows of polytropic gas. The characteristic velocities and Riemann-Earnshaw invariants are received for equations both in Lagrange and Euler coordinates.