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CHARACTERISTIC PROBLEMS FOR THE FIRST ORDER SYMMETRIC HYPERBOLIC SYSTEMS IN THE CONIC DOMAINS

It is known that Goursat problem, i.e., the characteristic problem for the second order hyperbolic equation admits different formulations by passing from the two-dimensional case to multi-dimensional. For example, the characteristic problem for the multi-dimensional wave equation can be set as in a conic domain whose boundary is the characteristic conoid as well in a dihedral angle when both sides are characteristic planes. These problems are well-posed if we consider the Dirichlet boundary conditions. In the sense of the correct formulation the situation becomes essentially complicated when in the multidimensional case we are passing from a single equation to hyperbolic systems. For example, though for a second order hyperbolic system with a split main part the Goursat problem with Dirichlet data on the characteristic conoid is well-posed, A. V. Bitzadze constructed an example of second order hyperbolic system with a non-split main part for which the corresponding homogeneous characteristic problem has an infinite number of linearly independent solutions. The difficulties arise even for a strictly hyperbolic system with a non-split main part whose cone of normals consists of infinitely smooth cavities. In this case the corresponding cones of cavities of rays may have strong singularities. Therefore the difficulties arise already in the formulation of a characteristic problem in wich the support of the boundary data should be pointed out.

We propose an approach permiting to formulate the correct characteristic problems for a class of the first order symmetric hyperbolic systems in conic domains. For example, the well-known Maxwell, Dirac and crystal-optics systems of differential equations of mathematical physics belong to that class.