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Some Degenerated and Extended Wave Models of Elasto- and Hydrodynamics with Finite Velocity Disturbance Propagation

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A number of real models are presented when parabolic models singularly egenerate into hyperbolic ones and, controversly, when hyperbolic models can be obtained by the extention of parabolic operator up to hyperbolic ones. Degeneration of problems for wave guide type systems in transverse coordinate is considered in detail. Degeneration of the original IBV problem in R^n for the hyperbolic system of equations with respect to a transverse coordinate of a hyperlayer whose thickness is assumed to be much lesser than the others is investigated.Our aim is to derive hyperbolic approximations degenerated with respect to coordinate s,i.e. to construct a mapping $R^n \rightarrow R^{n-1}$ satisfying the condition of limiting correctness to be of hyperbolic type. Necessary and sufficient conditions are established to such a hyperbolic degeneration. This is proved for the case R^3 considering the elastodynamic problem for the layer. As a result, 3-D problem for the layer is reduced to the 6 extended order hyperbolic operator for bending waves in plate which includes as particular cases the known Timoshenko-Mindlin (4 order) and Kirchhoff models. The similar approach is used to construct extended degenerated close to hyperbolic model for nonlinear water wave propagation in the fluid of variable depth including known models for solitary wave propagation.

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