

Symbolic Computation Study of a Generalized Variable-Coefficient Two-Dimensional Korteweg-de Vries Model with Various External-Force Terms from Shallow Water Waves, Plasma Physics, and Fluid Dynamics

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The variable-coefficient two-dimensional Korteweg-de Vries (KdV) model is of considerable significance in describing many physical situations such as in canonical and cylindrical cases, and in the propagation of surface waves in large channels of varying width and depth with nonvanishing vorticity. Under investigation hereby is a generalized variable-coefficient two-dimensional KdV model with various external-force terms. With the extended bilinear method, this model is transformed into a variable-coefficient bilinear form, and then a Bäcklund transformation is constructed in bilinear form. Via symbolic computation, the associated inverse scattering scheme is simultaneously derived on the basis of the aforementioned bilinear Bäcklund transformation. Certain constraints on coefficient functions are also analyzed and finally some possible cases of the external-force terms are discussed.

Key words: Generalized Variable-Coefficient Two-Dimensional Korteweg-de Vries Model;
Symbolic Computation; Bäcklund Transformation; Variable-Coefficient Bilinear Form;
Inverse Scattering Scheme.