Sensitivity Analysis and Solitary Wave Solutions to the (2+1)-Dimensional Boussinesq Equation in Dispersive Media

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Abstract : This paper explores the dynamical behavior of the (2+1)-dimensional Boussinesq equation, which is a nonlinear water wave equation and is used to model wave packets in dispersive media with weak nonlinearity. This equation depicts how long wave made in shallow water propagates due to the influence of gravity. The (2+1)- dimensional Boussinesq equation combines the two-way propagation of the classical Boussinesq equation with the dependence on a second spatial variable, as that occurs in the two-dimensional Kadomstev- Petviashvili equation. This equation provides a description of head- on collision of oblique waves and it possesses some interesting properties. The governing model is discussed by the assistance of Ricatti equation mapping method, a relatively integration tool. The solutions have been extracted in different forms the solitary wave solutions as well as hyperbolic and periodic solutions. Moreover, the sensitivity analysis is demonstrated for the designed dynamical structural system's wave profiles, where the soliton wave velocity and wave number parameters regulate the water wave singularity. In addition to being helpful for elucidating nonlinear partial differential equations, the method in use gives previously extracted solutions and extracts fresh exact solutions. Assuming the right values for the parameters, various graph in different shapes are sketched to provide information about the visual format of the earned results. This paper's findings support the efficacy of the approach taken in enhancing nonlinear dynamical behavior. We believe this research will be of interest to a wide variety of engineers that work with engineering models. Findings show the effectiveness simplicity, and generalizability of the chosen computational approach, even when applied to complicated systems in a variety of fields, especially in ocean engineering.

Keywords : (2+1)-dimensional Boussinesq equation, solitary wave solutions, Ricatti equation mapping approach, nonlinear phenomena

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