Approximate Solutions of Perturbed Nonlinear Schrödinger Equations

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Abstract: By applying Lou's direct perturbation method to perturbed nonlinear Schrödinger equation and the critical nonlinear Schrödinger equation with a small dispersion, their approximate analytical solutions including the zero-order and the first-order solutions are obtained. Based on these approximate solutions, the analytical forms of parameters of solitons are expressed and the effects of perturbations on solitons are briefly analyzed at the same time. In addition, the perturbed nonlinear Schrödinger equations is directly simulated by split-step Fourier method to check the validity of the direct perturbation method. It turns out that the analytical results given by the direct perturbation method are well supported by numerical calculations.

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