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The solution structure of the Düffing oscillator's transient response and general solution.

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Summary: A modification of homotopy analysis method (HAM) is developed in this paper. The solution structure of the Düffing oscillator's free vibration at different damping levels is put forward based on this new modified HAM. Explicit expressions for the fundamental decaying rate and the fundamental frequency are derived. Numerical examples with different initial conditions are calculated to verify the proposed solution structures. The number of terms required to be considered in the modified HAM for yielding satisfactorily accurate solutions is analyzed. The structure of forced and damped Düffing oscillator's general solution is also put forward and verified.

MSC:

34C15 Nonlinear oscillations and coupled oscillators for ordinary differential equations

34D05 Asymptotic properties of solutions to ordinary differential equations

Keywords:

Düffing oscillator; transient response; analytical approximation

Software:

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