

## Resonance study of spring pendulum based on MSM solutions with polynomial approximation

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*Abstract:* The nonlinearities of geometric nature that is characteristic for pendulum-type systems are expressed by the trigonometric functions. In order to apply the method of multiple scales (MSM) in time domain to solve problems concerning such systems, the trigonometric functions of the generalised coordinates are usually approximated by a few terms of their Taylor series. In the paper we apply the polynomial approximation with orthogonal and non-orthogonal bases. In contrast to the Taylor series, the proposed manner approximates the functions not around a given point but in the given interval. Quality and accuracy of the solutions obtained using the multiple scales method based on such approach have been tested. The steady state responses in the main resonance have been also examined and compared with their counterparts obtained using the MSM based on the Taylor series.

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