

Nonlinear study of a Pneumatic Artificial Muscle (PAM) under superharmonic resonance condition using method of multiple scales

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Abstract: In this work, the nonlinear behaviour exhibit in the Pneumatic artificial muscle (PAM) has been studied. For the analysis, a single degree of freedom system is considered where the nonlinear Pneumatic Artificial Muscle (PAM) is attached with an external spring to provide additional support the system. The nonlinear equation of motion is solved with the help of the method of multiple scales to find out the reduced equations for superharmonic resonance condition. The dynamic stability and bifurcation of the system have been studied from the reduced equations. The frequency responses have been plotted to understand the effect of the different parameters on the system amplitude. Basin of attraction also have been plotted to verify the frequency plots. Finally, with the help of this work, the designers and researchers working in this field will get an idea to know about the safe range of various system parameters to operate for different applications of PAMs.

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