A MODEL OF PLANETARY GEAR TRANSMISSION

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ABSTRACT: In this paper dynamic behaviour of planetary gears with four degrees is analysed by a theoretical approach. Applying the basic principles of analytical mechanics and taking the initial and boundary conditions into consideration, it is possible to obtain the system of equations representing physical meshing process between the two or more gears. The non-linear properties of dynamics which are source of vibrations and noise in the gear transmission may be the caused by small debalances in design realizations of this gears. Using Lagrange's equation, the nonlinear equations of motion are derived. A discrete dynamic model for a planetary gear system is established and the dynamic behaviours of the planetary gear system are investigated. For one planetary gear, eigen fractional modes are obtained and visualization is presented. By using MathCAD the solution is obtained with the time responses computed from the equations of motion.

KEY WORDS: planetary gears, vibrations, fractional order derivative, fractional order eigen mode

MODEL PLANETARNOG PRENOSNIKA

REZIME: U ovom radu se primenom teorijskog pristupa analizira dinamičko ponašanje planetarnog zupčanika sa četiri stepena slobode. Primenom osnovnih principa analitičke mehanike i uzimanjem u obzir početnih i graničnih uslova, moguće je dobiti sistem jednačina koje predstavljaju fizički proces umrežavanja između dva ili više zupčanika. Nelinearna karakteristike dinamike koje su izvor vibracija i buke u zupčastim menjačima mogu biti izazvani malim neuravnoteženostima u procesu izrade i projektovanja ovih zupčanika. Izvedene su nelinearne jednačine kretanja primenom Lagranžeovih jednačina. Diskretni dinamički model planetarni prenosnika je formiran na osnovu ispitivanja dinamičkog ponašanja planetarnog seta zupčanika. Za jedan planetarni prenosnik, sopstveni frakcioni modovi su dobijeni i vizuelno predstavljeni. Rešenja jednačina kretanja u vremenskom domenu dobijena su korišćenjem MathCAD programskog paketa.

KLJUČNE REČI: planetarni zupčanici, vibracije, frakcioni red izvoda i frakcioni red sopstvenog moda.

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