

A NOVEL APPROACH FOR SOLVING GEAR TRAIN OPTIMIZATION PROBLEM

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ABSTRACT: Gear train optimization is a constant subject of research with the goals of its adequate and justified use. One of the more important segments of optimization is the criteria of gear train volume. This paper is oriented on the analysis of the problem of decreasing gear train volume from a gear shaft axis position aspect. A heuristic approach has been developed for positioning shaft axes along a golden spiral contour, and the methodology for this alternative solution of optimization problems was defined. This approach represents an imitation of natural occurrences and development processes in nature. Nature itself achieves optimal processes, therefore this research started under the assumption of convergence towards optima. The process is verified on examples as functional, and results were compared to optimal solutions from literature. Achieved results of volume decrease are directly linked to savings, not only on space, but on housing material for the gear train, costs, speed of forming construction documentation, etc.

KEY WORDS: gear train, optimization, golden spiral, heuristic, novel method

NOVI PRISTUP REŠAVANJU OPTIMIZACIJE ZUPČASTIH PRENOSNIKA

REZIME: Optimizacija reduktora predstavlja stalnu temu istraživanja u cilju njegove adekvatne i opravdane primene. Jedan od značajnijih segmenata optimizacije jeste kriterijum zapremine reduktora. Ovo istraživanje orijentisano je na analizu problema smanjenja zapremine reduktora sa aspekta pozicije osa vratila zupčanika reduktora. Razvijen je heuristički pristup pozicioniranja osa vratila po konturi zlatne spirale i definisana je metodologija ovakvog alternativnog rešenja optimizacionog problema. Ovakav pristup predstavlja oponašanje prirodnih pojava i procesa razvoja u prirodi. Priroda sama po sebi postiže optimalne procese, tako da je ovo istraživanje započeto pod pretpostavkom konvergencije ka optimumu. Postupak je verifikovan na primerima, kao funkcionalan i rezultati su upoređeni sa optimalnim rešenjima iz literature. Dobijeni rezultati smanjenja zapremine direktno su povezani sa uštedama, ne samo u prostoru, već i u materijalu kućišta reduktora, troškovima, brzini formiranja konstrukcione dokumentacije i sl.

KLJUČNE REČI: zupčasti prenosnici, optimizacija, zlatna spirala, heuristika, nova metoda

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