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Optimal control in minimum time of the operating unbalanced rigid rotors. (English)

Zbl 0900.70325

Rev. Roum. Sci. Tech., Sér. Méc. Appl. 39, No. 6, 667-691 (1994).

Summary: The paper presents mechanical and mathematical models of balancing machines with plane oscillations about a fixed center. In order to improve the operating process of rigid rotors balance we propose to determine the minimum time necessary for the braking regime, and greater consumption working time in the rotors balancing. Considering two friction regimes for the uncontrolled strength moment, dry and viscous, we use the maximum Pontryagin's principle for this optimal control problem of the classic "bang-bang" type. For each case we obtain the switching curves given by their parametric or analytical equations. Illustrative numerical and experimental examples include also all technical phases to obtain the minimum braking time during the rotors balancing.

MSC:

70K40 Forced motions for nonlinear problems in mechanics

49J15 Existence theories for optimal control problems involving ordinary differential equations

Keywords:

braking regime; two friction regimes; maximum Pontryagin's principle; switching curves