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Asymptotic stability of the equations system describing the manipulator hydralic system operation

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Abstract

© 2018, Institute of Advanced Scientific Research, Inc.. All rights reserved. The work determines the asymptotic stability area for the system of equations describing the mathematical model involving the system and the control object for the automated adjustment of the manipulator pump working volume. The pump displacement in the manipulator hydraulic system is variable. This is done to ensure the possibility of changing the power of the pump when the flow rate of the hydraulic motor changes, too. The considered manipulator will be used to feed the blanks in forging and hot stamping technological processes. All transporting degrees of motion of the manipulator are translational due to the peculiarities of technological processes in which it will be used. The equations describing the operation of the overflow valve and the electric motor are obtained. This equation is represented in relative variables. The equations describing the operation of the pump, pipeline, hydraulic motors and control systems derived earlier are also used. The coefficients for relative variables are determined after conversion of the considered system of equations. Using the Hurwitz method, the conditions for the asymptotic stability of this system of equations are derived. In these conditions, there are some parameters. Using the derived conditions and specifying one of the parameters, the stability regions are constructed.

Keywords

Area of stability, Asymptotic stability, Automated control system, Hydraulic engine, Pipeline, Pump

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