THE ACTIVE MAGNETIC BEARING CONTROL WITH AUTOMATIC PARALLEL COMPENSATION

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The active magnetic bearing control through analytically designed linear PD regulator, with parallel nonlinear compensation represented by automatic approximator is described in this contribution. Coefficient (parameter) values come from actions of Continuous Action Reinforcement Learning Automata (CARLAs). Modified algorithm for automata implementation is used which continuously updates learning parameters according to former learning process. The goal of this on-line training is formulated as achievement of minimum mean square of control error. Described concept of control is proved by simulation study. It is shown that the significant improvement of whole system behavior can be achieved.

Key words: *continuous action reinforcement learning automata, active magnetic bearing*

1. Introduction

Active magnetic bearing (AMB) inhibits contact between rotor and stator and so it eliminates limitations of classic bearing. Therefore it is possible to use AMB in specific and extreme circumstances where classic bearing is inapplicable. Electromagnets located in stator of the bearing create magnetic field. The force caused by magnetic field keeps rotor levitating in desired position in the middle of air clearance. So the control of magnetic field is necessary.

Nonlinearity of controlled system causes problems when linear regulators are used for control. It is possible to control AMB by linear PD regulator only when small load disturbances and high accuracy of sensors are presented. It is possible to use compensating element parallelly connected to the regulator to improve the quality of control. This compensating element can be represented through nonlinearity with parameters automatically set up by CARLA method.

CARLA method belongs to the group of learning automats. It is capable to learn value of parameter without knowledge of mathematic model of controlled system. And this property is used to find unknown parameter values of nonlinear compensation.

2. AMB model

Simplified model of AMB with one DOF (see fig. 1) is used for simulation studies of one axis behavior. Rotor is replaced by mass point, gravitation is neglected (assumed as

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