National Institute of Technology Rourkela

Departmental Seminar

Seminar Title	: TRAJECTORY POSITIONING OF AN ACTIVE MAGNETIC BEARING INTEGRATED COUPLED ROTOR SYSTEM USING PID AND SLIDING-MODE CONTROLLER
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Venue	: CAD LAB
Date and Time	: 02 Jan 2025 (09:00)
Abstract	: The real problem in the current study is regulating the position of high-speed rotating machines integrated with active magnetic bearings. The time tracking and corrective actions of the controller are the major challenges in stabilizing the AMB integrated rotor system position. This study presents a hybrid controller based on the Proportional integrator derivative (PID) with a sliding-mode controller (SMC) to achieve the time tracking, corrective actions and position trajectory of the AMB integrated rotor system. Here, the PID with SMC controller in AMB provides faster response, high convergence rate and precision control of the rotor position as well as the system is tuned for its stability and trajectory control. The rotor system is modelled using finite element method (FEM). Based on the system formulation, a SIMULINK model is developed to acquire the time response data. The control characteristics of the PID with SMC controller in the AMB is used to tune the system for the steady state response and trajectory position of the rotor. The dynamic characteristics of the systems are examined with PID and PID with SMC. According to the analysis, misalignment forces and moments are significant at the system's critical speeds when AMB is used with a PID controller and lower at higher critical speeds when AMB is used with a PID and SMC controller. Similarly, the PID+SMC controller stabilizes the system and reduces vibration amplitude at higher running speeds. Vibration amplitude in the system is significantly reduced at higher running speeds when using the PID+SMC controller, regardless of whether the controller gain parameters are set to minimum, maximum, or variable.