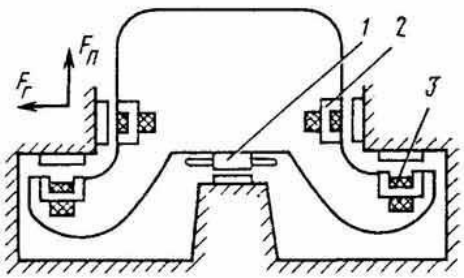
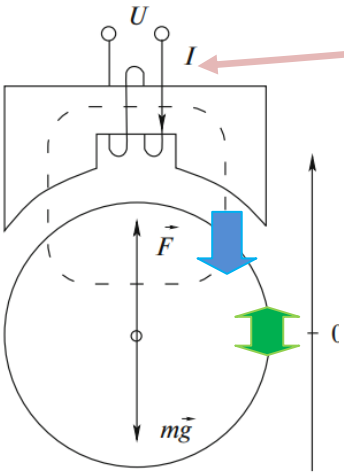
Research (What is it about?)	**Optimal levitation without any sensors of the body position**
UNN authors	*Balandin D., Biryukov R., Kogan M., Fedyukov A.*
We find (The result)	The algorithm of optimal stabilization of bodies in ***electromagnetic suspensions*** is proposed on the principle of weight tradeoff between various quality indices while only the measuring of the current intensity in the circuit of the electromagnet is used.
Abstract	The idea to use an alternating field for suspending (levitating) ferromagnetic bodies is applied in various technical areas including power engineering, transport, and instrumentation. At the moment, the theoretical aspects of the technology of electromagnetic suspensions (including mathematical models, controllability conditions, and control algorithms) are sufficiently developed to successfully implement such devices in practice. The classical scheme of an electromagnetic suspension means that the main element forming the feedback in the control contour is the location transmitter for the levitating body. We develop the ***sensorless*** (self-sensing) ***suspension***: no location and velocity of the body is measured, while ***only the measuring of the current intensity*** in the circuit of the electromagnet is used to implement the levitation. Synthesizing a control for a body in an electromagnetic suspension, one has to take into account various types of actions. Therefore, posing the optimal stabilization problem, we combine various quality indices on the principle of weight tradeoff. The method of linear matrix inequalities is used as the main method to synthesize the stabilizing controls. The mathematical simulation examples for the dynamics of a body in an electromagnetic suspension show certain advantages of that control compared with the classic controls on the basis of external action and body position.

Representative articles 2017-2018, quartiles	1. *Balandin D.V., Biryukov R.S., Kogan M. M., Fedyukov A.A.* Optimal stabilization of bodies in electromagnetic suspensions without measurements of their location. J. Comp. Syst. Sci. Intern. **56**(3). 351–363 (2017).	Q4
	Q-index (Qi) for the result	**1**
	high green	

In collaboration	–





$$m\ddot{s} = F - mg,$$
$$\dot{\Psi} + RI = U.$$

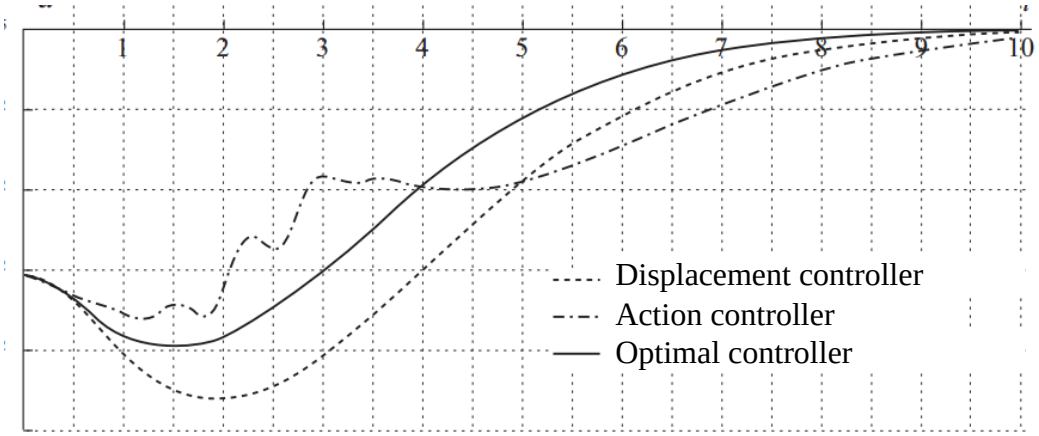
Feedback:

A) by external action control,

B) by initial conditions control.

Optimal control:

The tradeoff between **A** and **B** only by the measuring of the current intensity in the circuit of the electromagnet.



The displacement of the suspended body in time for the different criteria of control.