The synchronization of the angular velocities of identical rigid bodies

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We consider a mechanical system consisting of two rigid bodies, one of which is the master, and the other is the slave. It is assumed that the slave body has control, depending on its own state and the state of the leading body. We propose control law, that solves the problem of the bodies angular velocities synchronization in the form of feedback on the states of these systems. Our main goal to construct a control obtained from such feedback by substitution instead of the state of the master system their estimates obtained as a result observation problem solution. The question of whether such "approximate" control solve the initial problem are considered in stabilization theory, see for example, [1], where the corresponding separation principle was formulated. A non-linear observer is constructed using the method of invariant relations, the synthesis scheme of auxiliary invariant relations for which was described in [2]. Using the second Lyapunov method, it is shown that the output control thus obtained solves original synchronization problem.

[1] Freeman R. Global internal stabilizability does not imply global external stabilizability for small sensor disturbances / R.Freeman // IEEE Transactions on Automatic. Control. 1995, V.40, 12, P. 2119-2122.

[2] Zhogoleva N.V., Scherbak V.F. Synthesis of additional relations in inverse control problems (in Russian) / Nina Zhogoleva, Vladimir Shcherbak // Proceedings of IAMM NAS of Ukraine. - 2015. - Vol.29 - P. 69-76