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IDENTIFICATION OF UNKNOWN PARAMETERS OF A FULLY CONTROLLED NOISY GYROSCOPIC SYSTEM

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The work is devoted to the identification of unknown parameters of a fully controlled gyroscopic object with noise at the input and in the system. Such gyroscopic objects are described by the following system of equations
= $(A_0 + \varepsilon A_1)x + \varepsilon Bu + v$, (1)
$y = Cx + f$,

where $x \in \Re_{2n}$ — dimensional state vector, $A_0 = -A_0^T \in \Re_{2n\times 2n}$ — skew-symmetric non-degenerate matrix, $A_1 \in \Re_{2n\times 2n}$ — disturbance matrix, $u \in \Re_m$ — control vector, $B \in \Re_{2n\times m}$ — control matrix, $\varepsilon > 0$ — small parameter, $y \in \Re_l$ — observation vector, $C \in \Re_{l\times 2n}$, $v \in \Re_2 n$ - noise in the system, which is not measured, $f \in \Re_l$ —noise in observations. The elements of matrices A_0, A_1, B and C are all or partially unknown.

Gyroscopic objects have a special structure, this structure is defined by a matrix - which is a skew-symmetric non-degenerate matrix. Since the state vector has a size of 2n, the author used the invariant immersion method to restore A_0, A_1, B and C[1]. As it was mentioned, the appearance of the gyroscopic system (1) is determined by the matrix A_0, this made it possible to develop and significantly simplify the algorithm of the invariant immersion method in comparison with the general case.

These algorithms have been improved to restore unknown matrices of system (1). Algorithms are given in the work, which in an analytical form make it possible to obtain unknown parameters of the system (1). Solving such a problem makes it possible to apply previously developed analytical methods of optimal control and monitoring, in particular [2], [3] to system (1). This approach made it possible to manage and restore the state vector of system (1) when the matrices A_0, A_1, B and C are all or partially unknown.

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