Algorithm for calculating the nonlinear control systems of the projection-matrix method

© Oukar Min, D.V. Melnikov

Kaluga Branch of Bauman Moscow State Technical University, Kaluga, 248000, Russia

In this paper we propose an algorithm for the calculation of nonlinear control systems. The algorithm is based on the representation of processes in the form of an expansion in the base system theme functions, and uses the machine structural reforms, as well as mathematical programming methods. Algorithm method involves replacing each link management system matrix opera. General feature of the algorithm is the calculation procedure of equivalent matrix operators' nonlinear elements using iterative schemes. Equivalence criterion is the equality of output signals of the nonlinear element and its equivalent linear element defined matrix operator, when developing a specific input. Such an approach makes it possible to transfer the synthesis problem is a class of linear systems. By the example of electronic automatic control system we considered in detail calculation algorithm. Obtained results show limiting accuracy of the solution.

Keywords: *algorithm, spectral response, the matrix operator, orthonormal basis, the control system, a linear object*.

REFERENCES

[1] Kaganov V.I. *Radioelectronnye sistemy avtomaticheskogo upravleniya. Kompyuternyi kurs* [Electronic systems of automatic control. Computer course]. Moscow, Hotline – Telecom, 2009, 432 p.

[2] Pupkova K.A., Yegupova N.D., eds. *Matrichnye metody rascheta i proektirovaniya slozhnykh sistem avtomaticheskogo upravleniya dlya inzhenerov* [Matrix methods of calculation and design of complex automatic control systems for engineers]. Moscow, Bauman MSTU Publ., 2007, 664 p.

[3] Jie Shen Tao Tang. Spectral and High-Order Methods with Applications. *Science Press*, 2007, 326 p.

[4] Melnikov D.V. *Vestnik MGTU im. N.E. Baumana. Seriya Mashinostroenie — Bulletin of Moscow State Technical University n.a. N.E. Bauman. Mechanical Engineering Series*, 2013, no. 4 (93), pp. 43–53.

[5] Kornyushin Yu.P., Melnikov D.V., Egupov N.D., Kornyushin P.Yu. *Vestnik MGTU im. N.E. Baumana. Seriya Estestvennye nauki — Bulletin of Moscow State Technical University n.a. N.E. Bauman. Natural Sciences Series*, 2014, no. 1, (52), pp. 78–93.

[6] Egupov N.D., Kornyushin Yu.P., Akimenko D.A., Kornyushin P.Yu. *Izvestiya Tulskogo Gosudarstvennogo Universiteta. Tekhnicheskie nauki — News of Tula State University. Engineering*, 2011, iss. 5-1, pp. 99–108.

Oukar Min is a post-graduate of the Automatic Control Systems Department at Kaluga branch of Bauman Moscow State Technical University. Author of 7 scientific works in the field of energy, electrical engineering, modeling and control of engineering systems; research interests: energy management system. e-mail: okkamin49@gmail.com

Melnikov D.V. (b. 1975) graduated from Kaluga branch of Bauman Moscow State Technical University in 1998. Ph.D., Assoc. Professor, he is the Head of the Electrical Department at. Author of over 125 scientific papers in the field of energy, electrical engineering, modeling and control of engineering systems. His research interests include energy management system. e-mail: melnikov-dv@yandex.ru