THE ALGORITM OF TUNING THE PID CONTROLLER TO THE UNSTABLE MODEL OF OBJECT WITH INERTIA SECOND ORDER

Bartolomeu IZVOREANU, Mihail POTLOG, Irina COJUHARI, Ion FIODOROV, Dumitru MORARU, Nadejda POPOVICI, Adrian SECRIERU

Tehnical University of Moldova, bd. Ștefan cel Mare, 168, Chișinău, R. of Moldova

Corresponding author: bartolomeu.izvoreanu@ati.utm.md

The unstable model of the control object with inertia second order with known parameters is given. In order to tune the PID algorithm to these types of control models, several methods can be used as the root-locus allocation method etc., which lead to difficult calculations. The classical method of tuning the PID controller by the maximum stability degree to unstable control models with second order inertia is not applicable. For tuning the PID algorithm to the unstable object model, the algorithm was developed based on the maximum stability degree method with iterations. The advantages of the method of maximum stability degree with iterations are highlighted by reduced calculations in minimum time, which lead to the simplification of the procedure of according the PID algorithm for these classes of unstable control models of objects. In order to verify the obtained results when PID algorithm is tuned to the unstable models of control objects, an example of an automatic system was studied and simulated in MATLAB.

Analyzing the obtained results when the PID algorithm was tuned to the model of object by the maximum stability degree method with iterations, it was observed that:

- With the increase the degree of stability J increases the values of the parameters of the PID controller and the performances of the system the rice time t_c and the settling time t_r are reduced, and the overshoot is kept at the level $\sigma = 20 - 22\ \%$.

- With the increase of T_1, T_2 it is reduced the performance and, conversely, the reduction of the T_1, T_2 rises performance.

- With the increase of k the performances also increase, and with the decrease of k the performances are reduced.

***Keywords*:** unstable control model of object with second order inertia, tuning of the PID algorithm, maximum stability degree method with iterations, system performance.

References

1. ДОРФ, Р. К., БИШОП, Р. Х. *Современные системы управления*. Москва: Лаборатория Базовых Знаний, 2004, 832 s.

2. ЛУКАС, В. А. *Теория автоматического управления*. Москва: Недра, 1990, 416 с.

3. ЗАГАРИЙ, G. І., ШУБЛАДЗЕ, А. М. *Синтез систем управления на основе критерия максимальной степени устойчивости*. Москва: Энергоатомиздат, 1988, 198 с.

4. IZVOREANU, B., IZVOREANU, F. FIODOROV, I. The synthesis of linear regulators for aperiodic objects with time delay according to the maximal stability degree method. *In: The Preprints the Fourth IFAC Conference on System Structure and Control*. Bucureşti: EdituraTehnică, 1997, pp. 449 - 454.

5. IZVOREANU, B., FIODOROV, I., PISARENCO, M. Comparative analysis of regulators tuning methods to models of objects with inertia. *In: Buletinul Institutului Politehnic din Iaşi, Tomul L(LIV)*, Fasc. 5A, Electrotehnică, Energetica, Electronica, 2004, pp. 63-68.