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Develops an Alarm System in the Alarm Bath and an Adaptive Power Adjustment System

Sanjar Ruzimatov, Dadaxon Fayzullayev
Assistant, Namangan Institute of Engineering and Technology

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Annotation: Mathematical models of the weighting process are obtained in the form of material balance equations. These mathematical models allow the identification of key factors influencing the process. A systematic algorithm for the synthesis of adaptive observers and a structure for the adaptive control system have been developed for the slowing process. The proposed algorithm allows to identify the parameters of control objects and improve the performance of adaptive monitoring devices.

Keywords: Ohorla, algorithm, adaptive, automatic, model, discrete, stabilization, adaptation, textile, fabric, yarn.

The efficiency of spinning and dyeing processes in the textile industry is determined by the automatic maintenance of a reasonable balance between the average efficiency of the technological complex or device and the supply of regulated energy resources and raw materials, and ensuring the required quality of the finished product. shows.

In this regard, improving the safe operation and technical and economic performance of weighing devices due to the perspective principles of building adaptive process control systems, taking into account the difficulty of improving the methods and algorithms of loading and painting processes and the difficulty of expressing riots, incompleteness and uncertainty of primary information about is one of the most pressing and important issues of today.

With a system of linear differential equations with a delay of the process of straining the fabric and yarn

$$x_{k+1} = Ax_k + Dx_{k-\tau} + Bu_k + w_k \quad (1)$$

$$y_k = Lx_k + v_k \quad (2)$$

can be expressed in the form. We give the structure of the regulator ourselves, assuming that some vector affects the system [36]:

$$\dot{u} = C_1^T r + C_2^T x + C_3^T x(t-\tau), \quad (3)$$

This C_1, C_2, C_3 - matrices for adjustable parameters of the regulator, the dimensions are appropriate $(g \times w)$, $(n \times w)$, $(n \times w)$.

C_1, C_2, C_3 it is necessary to synthesize discrete algorithms that adjust the matrices so that the processes in systems (1) and (2) are close to the processes in the reference model at the end of the setup

$$\dot{x}_M = A_M x_M + D_M x_M(t-\tau) + B_M r,$$

This $x_M \in R^n; r \in R^g$. A, D, B the matrices can be expressed as follows

$$A = A_M - Bv_{20}^T, \quad D = D_M - Bv_{30}^T, \quad B_M = Bv_{10}^T,$$

This v_{10}, v_{20}, v_{30} – some unknown matrices.

The initial system In (1) and (3) $w_k \equiv 0$ In this case, we solve the problem using the method of continuous models as a continuous model.

Depending on the performance of the system, the following values of the reference model parameters are given after the adaptation process is complete

$$A_M = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix}, \quad D_M = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ -0.5 & -0.5 & -0.5 \end{bmatrix},$$
$$B_M = \begin{bmatrix} 0.55 & 0 & 0 & 0 \\ 0 & 2 & 0 & 1.3 \\ 0 & 0 & 2 & 0 \end{bmatrix}.$$

(4)

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In solving the stabilization problem, the adjustment coefficients of the discrete-continuous adaptive automatic control system were adjusted according to the discrete algorithms of adaptation:

$$C_{1i}(t_{k+1}) = C_{1i}(t_k) - \Delta t_{k+1}\left[\tilde{g}_i^T(x(t_k) - x_M(t_k))P_1 r + \alpha_1 C_{1i}(t_k)\right],$$

$$C_{2i}(t_{k+1}) = C_{2i}(t_k) - \Delta t_{k+1}\left[\tilde{g}_i^T(x(t_k) - x_M(t_k))P_2 x(t_k) + \alpha_2 C_{2i}(t_k)\right],$$

$$C_{3i}(t_{k+1}) = C_{3i}(t_k) - \Delta t_{k+1}\left[\tilde{g}_i^T(x(t_k) - x_M(t_k))P_3 x(t_k - \tau_k) + \alpha C_{3i}(t_k)\right],$$

this is the value of their parameters

$$G = P_1 = P_2 = P_3 = \begin{bmatrix} 1 & 0.5 & 0.5 \\ 0.5 & 1 & 0.5 \\ 0.5 & 0.5 & 1 \end{bmatrix};$$
$$\alpha_1 = \alpha_2 = \alpha_3 = 0.1; \quad \Delta t_{k+1} \equiv \Delta t = 1c;$$
$$C_1(0) = C_2(0) = C_3(0) = 0. \qquad (5)$$

Based on the given algorithm, the following block diagram of a discrete-continuous adaptive control system can be constructed, which also takes into account the delays in ammonia reduction processes (Figure 1).

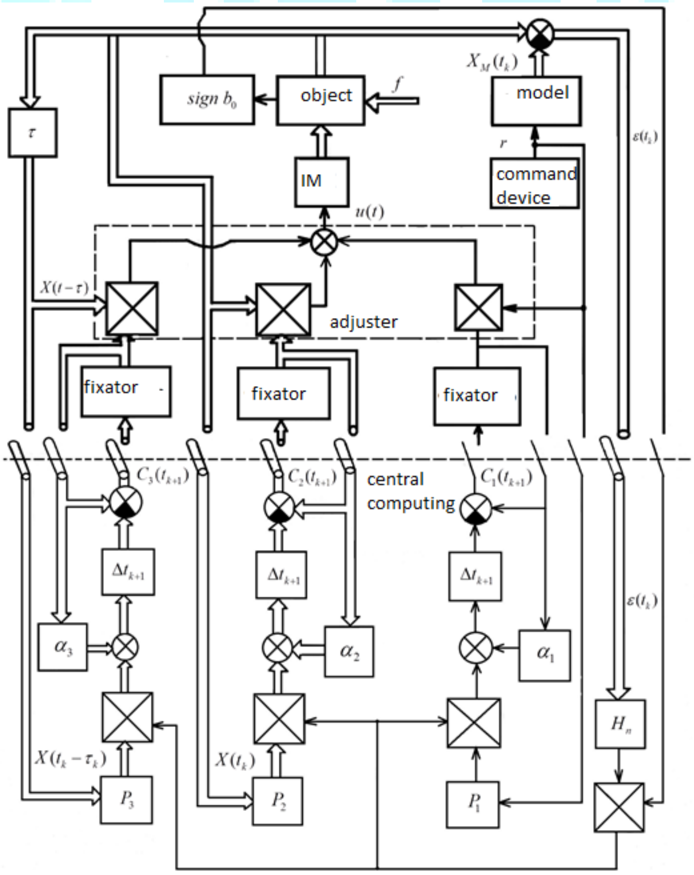

Figure 1. Block diagram of the discrete-continuous adaptive control system of the reference model, taking into account the delays of slowing processes

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According to the block diagram, the task of calculating the algorithm of adaptation to the electronic computing complex is assigned, that is, it makes adjustments to the parameters of the controller at discrete time moments. When the calculations are complete, the new values of the adjuster parameters are remembered in the clamps until the next time moment. In the future, new measured values will be introduced into the central computing complex and new adjustments will be made to the adjustment coefficients. The signals at the output of the clamps (values of the adjustable parameters of the regulator) are continuous-piece functions of time and have the appearance of continuous steps

Figure 2 shows graphs of synthesized discrete-continuous, discrete adaptive control systems and their transition processes in the reference model. They are valid for the following cases, where the parameters of the object have values (3.49) and (4), while the conditions

$$\tau_1 = 15c; \quad \varphi(s) = 0; \quad s \in [-\tau, 0];$$
$$r^T = (1;0;0). \qquad (6)$$

To the object П ($f_0^T = (0.1; -0.1; 0.1)$)affected by the type of disturbance. As can be seen from the graphs (Fig. 2a, b, c), the synthesized discrete-continuous, discrete adaptive control system is D adaptive in a given class of adaptation. The transition processes in the system are oscillation, and the tuning times $t_{рег.1} = 15{,}2 мин$, $t_{рег.2} = 42c$, $t_{рег.3} = 60c$.

2. Figures a, b, c also show a graph of the transition processes in the discrete adaptive control system being modeled. The values of the parameters of the control object

$$B = \begin{bmatrix} 1.3 & 0 & 0 & 0 \\ 0 & 1.9 & 0 & 1.2 \\ 0 & 0 & 2.7 & 0 \end{bmatrix}, \quad L = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1.3 \\ 1.5 & 2 & 1.2 & 0 \end{bmatrix}. \qquad (7)$$

(4) and (6), and the object $I(\tilde{f}) = 0.1$ type of interference. The parameters of the discrete algorithms of adaptation have the values in (5), where the sampling step $\Delta t = 0{,}5c$ It can be seen from the graphs of the transition processes that the synthesized discrete adaptive control system is D adaptive in a given class of adaptation. Transition processes in the system are vibration, adjustment time

$t_{рег.1} = 13{,}2 мин$, $t_{рег.2} = 35c$, $t_{рег.3} = 52{,}8c$.

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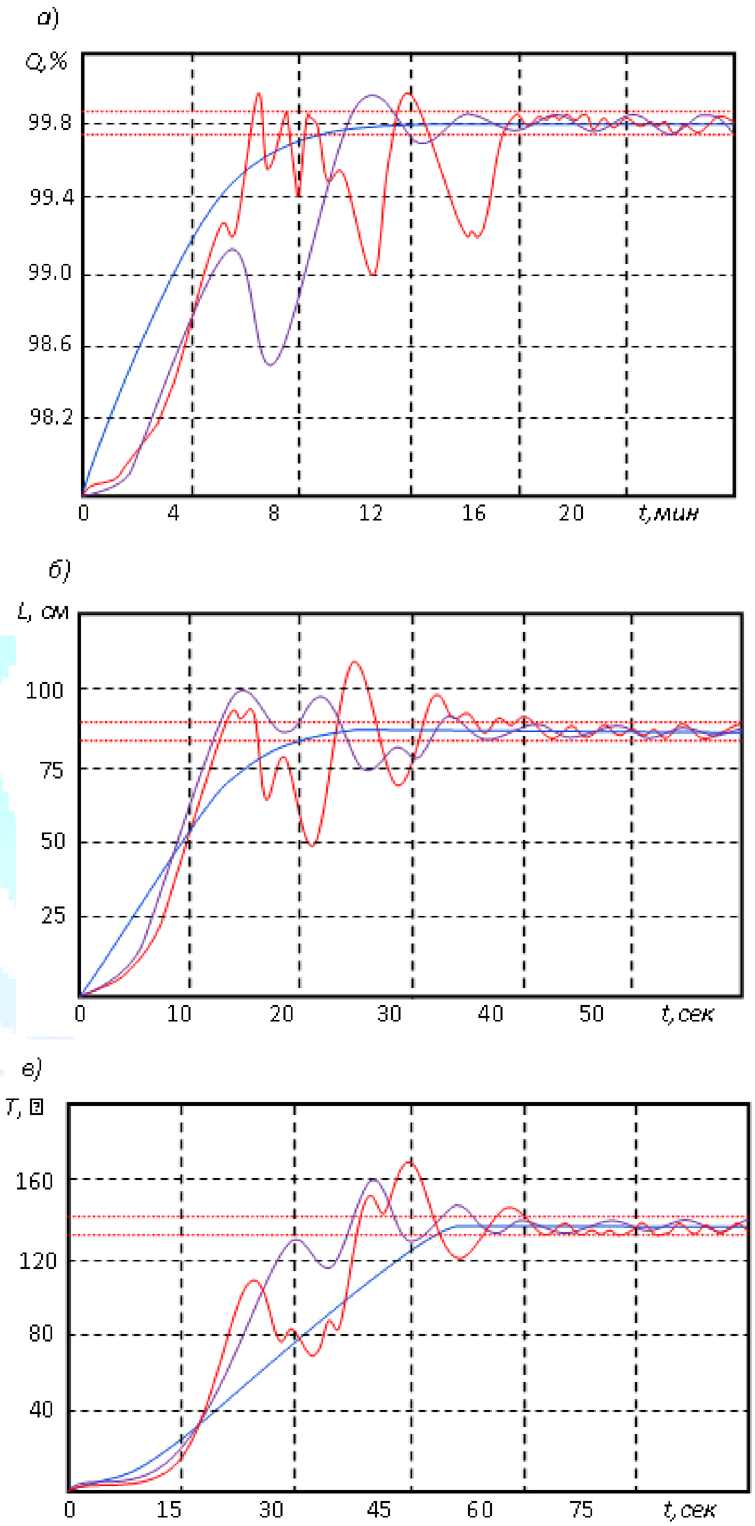

Figure 2. Graphs of discrete-continuous, discrete adaptive control systems and their transition models in the reference model: (a) sediment concentration, level (b) and temperature in the sedimentation bath (v).

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Thus, an adaptive system designed to control the weighting process ensures high adjustment quality and has sufficient accuracy for the process under consideration.

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