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Researching the Question of the Polling Time of Sensors

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ABSTRACT: The issues of optimizing the time parameters of sensor survey signals in a microprocessor-based automatic control system are considered. An important task is to select the polling interval of the monitored sensors in order to detect deviations of the monitored parameters of railway automation and telemechanics devices in a timely manner. As a criterion for determining the survey interval, the nature of the change in the controlled process, the type of devices and their number, the process of functioning in real-time, and the minimum reaction time to changes in the parameters of the controlled objects are selected.Based on the results obtained, an algorithm is proposed, the optimal duration, start and duration of the survey, taking into account the importance and number of sensors.

1. INTRODUCTION

A feature of modern train traffic control systems at the present time is the need for operational control over the state of objects in real time. With regard to devices and systems of automation and telemechanics of railway transport, these objects include track circuits, switches and their position, traffic lights and two-position controls. Station control devices that monitor railway automation facilities require continuous polling of their status. With the subsequent display of information on the monitor of the station duty officer. As a basis, it is supposed to take control and monitoring means that are displayed in the form of an indication on the control panel and a board on duty at the station. From the standpoint of determining the importance of objects of control, the following can be cited. The most important sensors of vacancy or occupation of track sections at stations are track circuits. The second in terms of the importance of determining the state are switches and traffic lights, and the third, in terms of the importance of control, can be attributed to two-position controls and controls, information about which is displayed on the board. In the case of automation of the method of monitoring these objects, it is necessary to determine how much time is required for a complete interrogation of the sensors using the computer software.

II. MAIN PART

Let's start with the most important objects of track circuits, suppose that to interrogate the state of one track circuit, time $T_{1.р.ц.}$ is required, the time of polling by the software of one sensor is taken as t_T, therefore, to interrogate n-number of track circuits of the station, time equal

$$T_{о.р.ц.} = t_T \times \sum_{i=1}^{k} n_i,$$

where is k the number of track circuits of the station.

Similarly, the total survey time of the switches is determined

$$T_{о.стр.} = t_T \times \sum_{u=1}^{y} n_u,$$

where is y the number of station switches.

It will take time to poll the status of all station traffic lights

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$$T_{o.свт.} = t_T \times \sum_{r=1}^{j} n_r ,$$

where is j the number of train and shunting traffic lights of the station.

Determination of the polling time of two-position objects ($T_{o.дво.}$) assumes that a list of all toggle tumblers, switches and buttons, their number is easy to count having in front of you the station image on the control panel and an information board. The polling time is determined by the formula

$$T_{o.дво.} = t_T \times \sum_{q=1}^{f} n_q ,$$

where is f the number equal to the maximum number of two-position control objects on the control panel. The total time of polling of all objects at the station will be determined by the formula

$$T_{o.cm.} = t_T \times \sum_{i=1}^{k} n_i + \sum_{r=1}^{j} n_r + \sum_{u=1}^{y} n_u + \sum_{q=1}^{f} n_q$$

or

$$T_{o.cm.} = t_T \times \sum_{i=1}^{k} \sum_{r=1}^{j} \sum_{u=1}^{y} \sum_{q=1}^{f} n_i , n_r , n_u , n_q . \qquad (1)$$

As can be seen from formula (1), the duration of the polling time for all station objects is directly proportional to the number of objects, i.e. the larger the station, the longer it takes to poll its devices.

Let's determine the frequency or intensity of the poll during the day. It should be borne in mind that the active work of the stations has a different character, i.e., there are stations during the day that operate in an active mode, including shunting movements, and there are low-activity stations that actively operate during a short period of time per day. The unevenness of the workload of the stations should be reflected in the intensity of the sensor polling. Therefore, it can be assumed that, depending on the activity of the station, its intensity of interrogation during the day should be greater and vice versa. As for small and medium-sized stations, their activity depends on the batch method of passing trains through them, the rest of the day the stations do not work and changes in their facilities do not occur for a long time. It is necessary to solve the problem with what intensity it is required to poll the objects of stations with different activities, having the calculated value of the total polling time of the station objects, it can be assumed that the intensity will be determined by the formula

$$\lambda_{onpc.} = \frac{T_{o.cm.}}{T_{cym.}} , \qquad (2)$$

where is $T_{cym.}$ the time of day.

From formula (2) we can conclude that the longer the polling time of objects, i.e. the larger the station, the more intensity it is necessary to poll the sensors and vice versa. With the technical implementation of such an intensity, the polling time will be evenly distributed throughout the day. However, the activity of the stations throughout the day is not uniform; the station operates in a ragged mode fig. 1. The figure shows that in the time zones e, r, c, d, f and g, there is an unproductive use of the computational process, since the objects of control at this time do not change their state. Consequently, in order to optimize the operation of computing systems, it is necessary to take into account this feature, namely, in the software, variables should be laid down that respond to any change in the state of any control objects. Suppose that this variable (m), which at the beginning of the system is set to zero, when the state of an object changes, this variable is set to "1", which allows the system to start polling the controlled devices. After each completion of a full polling cycle, this variable takes on the value "0", until the next change in the state of objects, then the time diagram of the distribution of the station's work and the polling procedure will look like Fig.2. Let's consider

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the operation of the control system synchronously with testing. The newly introduced variables should be discussed beforehand. The start of the test cycle is determined by the value of the time $T_з$of the variable "s", which is equal to "1" if it is necessary to start testing and equal to "0" when the test start is canceled. Any change in the variable "m" leads to the setting of the variable "s" to one, the end of the test cycle sets "s" to zero. In fig. 3 shows the situation of the simultaneous start of active operation of the station and the start of the test cycle. At the point "a", the variable "m" changes its state and therefore the testing cycle starts. Fig. 4 shows the situation when the testing cycle ends before the changes in the controlled objects are completed, therefore, at the point "d" the variable "m" is not equal to zero and the next start of the cycle for checking objects will occur. Figure 5 shows the case when before the station shutdown the object scan cycle is completed, the time to start the next cycle has not come, point "d". In this case, there is a situation when the changed position of the objects will not be reflected on the monitor of the operating personnel, which is unacceptable, ie, at point "d" the variable "m" is zeroed and there is no way to carry out the next cycle of verification. In order to solve this problem, let us assume that the variable "m" must be in a single state for some time, even if there are no changes in the objects. It is easy to assume that the deceleration time for changes in the value of the variable "m" from "1 to 0" should be determined by the formula

$$T_m = T_з + T_i$$

where is$T_m$the time of change of the variable "m", at the moment of transition from "1" to "0",

$T_з$ - time to start the test cycle;

T_i- time correction factor, determined by the developers, taking into account the activity of the station and its configuration. (recommended value 0.5 $T_з$but no more than $T_з$) These considerations are valid for the case of Fig. 6.

Taking into account the above, we can conclude that in order to optimize the work of a computer system for automatic control over the state of objects, the polling time and the polling period should be determined by the developer at the software development stage.

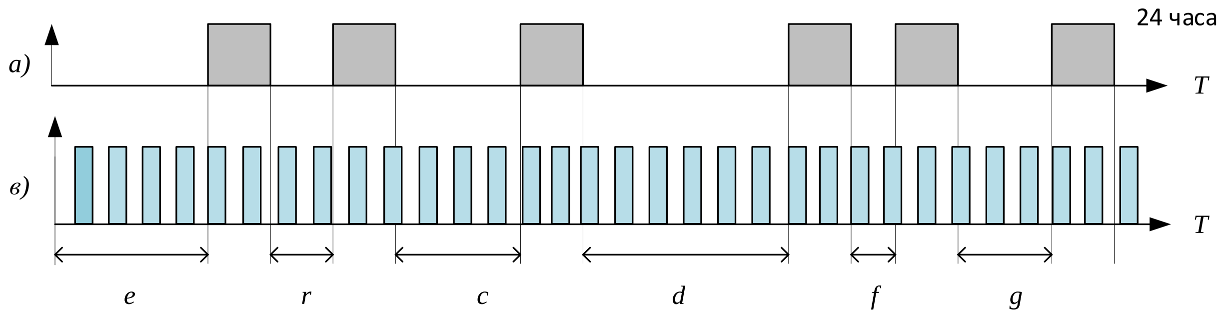

Figure: 1. Time distribution diagram. a) Station operating times. c) Time of polling of objects of control of the station

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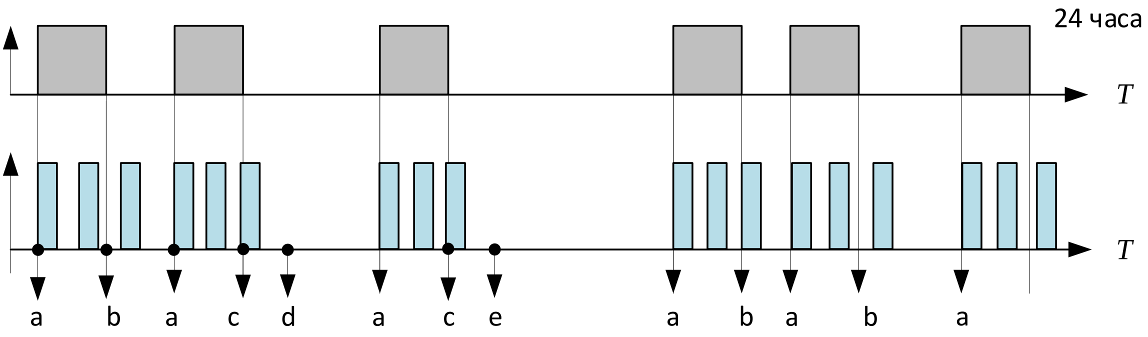

Figure: 2.Distribution of time control over station objects

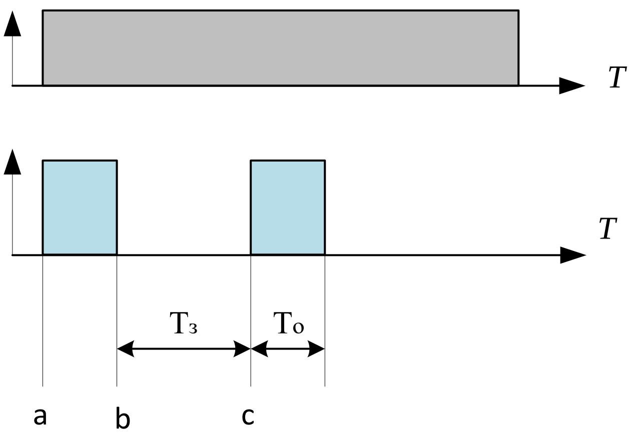

Figure: 3.Distribution of time control over station objects

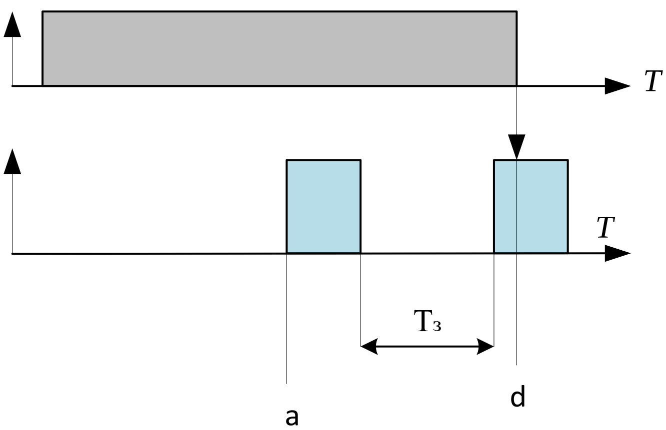

Figure: 4.Distribution of time control over station objects

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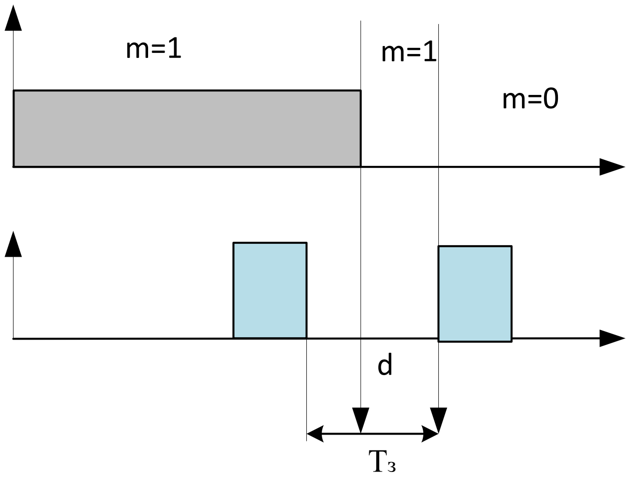

Figure: 5. Distribution of time control over station objects

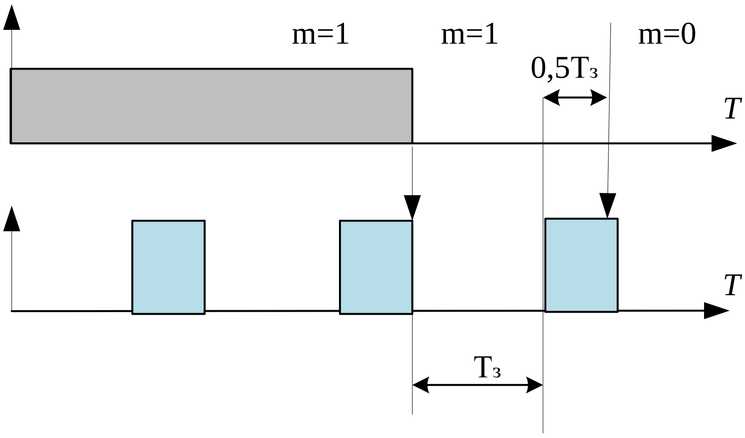

Figure: 6. Distribution of time control over station objects

REFERENCES

1. Azizov A.R., Ametova E.K. Developing of microelectronic block HCC. // International Journal of Advanced Research in Science, Engineering and Technology. Vol. 6, Issue 3, March 2019.
2. Soroko, V. I. Equipment of railway automation and telemechanics: Ref.: in 2 book., Book. 2. - 3rd ed. / IN AND. Soroko, E.N. Rosenberg M.: NPF Planeta, 2000 .-- 1008 p.
3. Reference. "ERI Reliability." - M.: MO RF, 2006.
4. GOST 27.301-95. Reliability in technology. Reliability calculation. The main provisions.
5.Bestemyanov P.F. Monitoring the correct functioning of microprocessor devices of the automatic control system of the metro train speed. // Interuniversity collection of scientific papers.-M.: MIIT, Issue 862.1992.
6. Bestemyanov P.F. Methods for improving the safety of microprocessor-based systems for interval regulation of train traffic. Doctoral dissertation, Moscow, 2001, 324c.
7. Bestemyanov P.F. Statistical processing of data on dangerous failures of signaling devices. // The second scientific-practical conference "Traffic safety". Conference proceedings. Book 2. M.: MIIT, 2000. C.IV-7 - IV-8.
8. Chaliagin D.V., Razinova I.I. Bestemyanov P.F. A device for interfacing a switching element with a microprocessor system. G06F 3/00, RU 2021629, Bull. No.19 of October 15, 1994
9. Security. Choice and general rules for standardizing safety indicators. OST 32.18 -92. S.-Pb.: PTU PS, 1992.17 p.
10. Safety of railway automation and telemechanics. Safety test methods. RD 32 TsSH 1115842.01-93 S.-Pb.: PTU PS, 1993.10 s.