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DETERMINATION OF WAYS TO IMPROVE THE DESIGN EFFICIENCY OF AUTOMATED CONTROL SYSTEMS BASED ON A SPECIALIZED DIGITAL DEVICENET NETWORK

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Abstract. *The specialized digital network DeviceNet is an inexpensive, simple and effective solution for combining various industrial automation devices from independent manufacturers into a single system. In a DeviceNet dedicated digital network, the data transfer rate depends on the length of the network segment and the type of cable used to run the network. The manufacturer of the DeviceNet specialized digital network sets data transfer rates for only certain lengths of network segments for different types of cables. It has been established that increasing the efficiency of the design of automated control systems based on the DeviceNet specialized digital network will be facilitated by mathematical models of the dependence of the data transfer rate on the length of the DeviceNet specialized digital network segment for various types of cables, which are planned to be developed during further research.*

Key words: *DeviceNet, fieldbus, specialized digital network, automated control system, data transfer rate, mathematical model*

Introduction.

The DeviceNet specialized digital network was developed in 1994 by the Allen-Bradley company and later transferred to the management of the ODVA (Open DeviceNet Vendor Association Inc.) association specially organized for its support [1].

Dedicated digital network DeviceNet is a low-level network that provides communication between simple industrial devices (such as sensors and actuators) and higher-level devices (such as controllers and computers) [2-6].

Main text

As a result of the search for information about the DeviceNet network and its analysis, the main characteristics of the DeviceNet network were determined and then they are displayed in Table 1 [7, 8].

The specialized digital network DeviceNet is an inexpensive, simple and effective solution for combining various industrial automation devices of independent manufacturers into a single system (photo-thermal sensors, starters, barcode readers, human-machine interface elements: keyboards, display panels, along with controllers PLC devices).

In a DeviceNet dedicated digital network, the data transfer rate depends on the length of the network segment and the type of cable used to run the network.

The manufacturer of the DeviceNet specialized digital network sets data transfer rates for only certain lengths of network segments for different types of cables.

For a thick round cable, the manufacturer of a specialized DeviceNet digital network has set transmission speeds depending on the length of the DeviceNet network segment [7, 8]:

- 500 kbit/s at a distance of 100 m;
- 250 kbit/s at a distance of 250 m;
- 125 kbit/s at a distance of 500 m.

Table 1 - Basic characteristics of the DeviceNet network

The name of the characteristic	The value of the characteristic
Data exchange mode	master-slaves, device-device, many masters - many slaves (multimaster), Producer/Consumer
The maximum length of the segment, m	500
The maximum data transfer rate at the maximum segment length, kbit/s	125
The number of nodes in one segment	64
The maximum number of active nodes (leaders)	64
The type of data transmission medium	cable with metal wires
Network topology	bus
Standards by which it is approved	European (European Union) EN 50325
The main scope of application	industry
The layers of the ISO/OSI model are implemented in the network	1, 2, 3, 4, 5, 6, 7

For a flat cable, the manufacturer of the specialized DeviceNet digital network has set transmission speeds depending on the length of the DeviceNet network segment [9]:

- 500 kbit/s at a distance of 75 m;
- 250 kbit/s at a distance of 200 m;
- 125 kbit/s at a distance of 420 m.

The above has a negative impact on the development of automated systems based on the specialized digital DeviceNet network.

Summary and conclusions.

It has been established that increasing the efficiency of the design of automated control systems based on the DeviceNet specialized digital network will be facilitated by mathematical models of the dependence of the data transfer rate on the length of the DeviceNet specialized digital network segment for various types of cables, which are planned to be developed during further research.

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