USING ARTIFICIAL NEURAL NETWORK FOR COMPENSATION OF THERMISTOR CONVERSION FUNCTION NONLINEARITY

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The primary transducers such as semiconductor thermistors are often used in the practice of temperature measurements. The advantages of these sensors include a large range of temperature measurement, vibration strength, compactness, low inertia and high sensitivity. In a wide temperature range, the dependence of semiconductor resistance on temperature is complex and nonlinear. A universal method to reduce the influence of the nonlinearity of the conversion function on the error of the measurement result is an algorithmic correction of the conversion function with the help of an additional compensator device that implements the dependence opposite to the conversion function. An additional condition is the invariance of such a converter to the form of nonlinear dependence, which it needs to correct, that is, the possibility of adaptation to an arbitrary type of conversion function.

As a device-compensator, it is most expedient to use an artificial neural network [1, 2]. The rationale for this choice is that artificial neural networks are nonlinear in nature, have good approximating properties and do not require specially developed design methods, they can be synthesized through training [3].

The purpose of the report is the research of the properties and characteristics of the proposed system for the correction of the conversion function of a semiconductor thermistor. In general, the results of simulation modelling fully confirm the efficiency of the considered system of automatic correction of the conversion function of a semiconductor thermistor and are consistent with the theoretical treatment. A comparative analysis showed that the standard error of the correction of the transformation function by the neural network device is less than the error of correction by the polynomial approximator.

The advantage of the proposed approach is the invariance of the neural network compensator to the type of nonlinear characteristics of a semiconductor thermistor and the ability to synthesize such a system through training, without involving complex design methods. The use of the proposed adaptive corrector will significantly reduce the systematic measurement error caused by the mismatch between the nominal and real conversion functions of the measuring device.

References

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