Use of Fractional-Quadratic Approximation Invariant of Nonlinear Characteristic of Magnetoelectric Sensor

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Abstract
An idea of a sensor of direct magnetic fields using the magnetoelectric effect in a planar ferromagnetic-piezoelectric composite structure is described. It is shown that introduction in the sensor circuit a negative feedback, which contains a current amplifier, a convenient approximation characteristic former, and a compensation coil, results in a widening of the sensor magnetic field region without of linearization of its characteristic. The approximation nonlinear characteristic is close in shape to the original sensor characteristic. Therefore, no deep negative feedback is required and thereby stability is ensured. As this convenient characteristic, a fractional-quadratic relationship is used, for which an invariant is performed between the output voltage value and the magnetic field strength. Such an invariant is a cross ratio (double proportion) for four values   or samples of these values. The cross ratio contains the differences of these values   and the ratios of these differences. Therefore, additive and multiplicative errors of the output voltage measurements due to the accuracy of the measuring instrument, the noise of the sensor itself and the electronic circuit are mutually reduced.

Citation: