МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ

НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ

«ПОЛТАВСЬКА ПОЛІТЕХНІКА ІМЕНІ ЮРІЯ КОНДРАТЮКА»

ЗБІРНИК НАУКОВИХ ПРАЦЬ

за матеріалами IX Всеукраїнської науково-практичної конференції

«ЕЛЕКТРОННІ ТА МЕХАТРОННІ СИСТЕМИ: ТЕОРІЯ, ІННОВАЦІЇ, ПРАКТИКА»

10 листопада 2023 року

Полтава 2023

UDC 621.34
O. Shefer, *Doctor of Science, Professor,*
***Ya. Mykhailenko**, postgraduate,*
***E. Sidan**, postgraduate*
National University «Yuri Kondratyuk Poltava Polytechnic»

METHOD FOR RADIO SIGNAL INTERFERENCE COMPENSATION BASED ON A RECURSIVE ALGORITHM WITH CORRELATION FEEDBACK

One of the representatives of recursive algorithms is an algorithm with correlation feedback, which uses the gradient method to solve the problem of adaptive adjustment of the weight coefficient vector [1, 2].

Let's consider the operation of a single-channel auto noise canceller with the formation of weighting coefficients using the gradient method for the case of exposure to stationary narrowband interference (Figure 1).

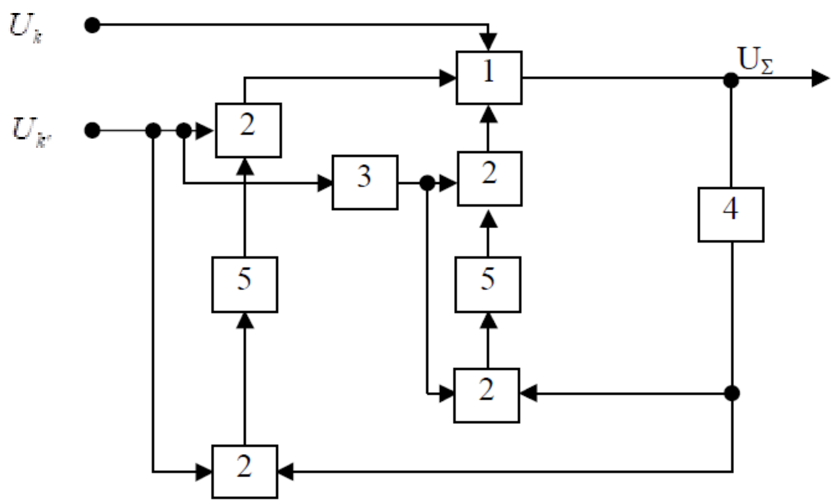

Fig. 1. One-channel interference compensation system

The system includes: 1 – adder; 2 – multipliers; 3 – phase shifter on π/2; 4 – feedback amplifiers with coefficients $\gamma_{c,s}$; 5 – low pass filters with time constants $T_{c,s}$.

The interference voltage at the output of the autocompensator is determined by the expression:

$$U_{\sum exit} = U_z - \left[w_c U_k + w_s U_{k'}\right], \tag{1}$$

where U_z - voltage of the main channel interference signal;

U_k and $U_{k'}$ voltage of the interference signal in the main and additional channels.

The transmission coefficients of controlled amplifiers (weighting coefficients) are proportional to the voltages generated at the outputs of the correlators

$$w_s = \gamma_s (U_{nk} \cdot U_\Sigma), \tag{2}$$

$$w_c = \gamma_c (U_{nk'} \cdot U_\Sigma), \tag{3}$$

where γ a value that influences the stability and performance of the autocompensator.

Substituted the value in (2). $U_{\sum exit}$ from (1), we get

$$w_s = \gamma_s (U_{nk} \cdot U_k) - \gamma_s w_c (U_{nk}^2) - \gamma_s w_s (U_{nk} \cdot U_{nk'}) \quad (4)$$

Because the $U_{nk'}$ and U_{nk} are uncorrelated at coinciding times, the last term on the right side of (4) is equal to zero. Then, given that $U_{nk} \cdot U_k = p_{n1}\sigma_0\sigma_k$, and also those that $\sigma^2{}_k = U_{nk}^2$, we will get

$$w_s = \gamma_s p_{n1}\sigma_0\sigma_k / 1 + \gamma_s \sigma_k^2 \quad (5)$$

At a high level of interference, the units in the denominator can be neglected, and expression (5) takes the form

$$w_s = p_{n1}(\sigma_0 / \sigma_k)\,. \quad (6)$$

Solving expression (1) for $U_{\sum exit}$ and conducting similar reasoning for the second subchannel, we get

$$w_c = p_{n'}(\sigma_0 / \sigma_k)\,, \quad (7)$$

where p_{n1} and $p_{n'}$ correlation coefficients of voltage interference values in the main channel and in additional (quadrature) subchannels.

The obtained values of the weight coefficients of the compensation subchannels (6) and (7) provide optimal compensation for each of the component noises.

LITERATURE:

1.Alamouti S M 1998 Space-time block coding: A simple transmitter diversity technique forwireless communications IEEE Journal on Selected Areas in Communications.

2. Samoylov A G, Samoylov S A, Samoylov V S and Galkin A P 2018 Adaptive encoding in remote digital telemetry and command systems IOP Conference Series: Materials Science and Engineering.

МЕТОД КОМПЕНСАЦІЇ ЗАВАД РАДІОСИГНАЛІВ НА ОСНОВІ РЕКУРСИВНОГО АЛГОРИТМУ З КОРЕЛЯЦІЙНИМ ЗВОРОТНИМ ЗВ'ЯЗКОМ

О.В. Шефер*, д.т.н., професор,*
Я.О. Михайленко*, аспірантка,*
Е.К. Сідан, *аспірантка*
Національний університет «Полтавська політехніка імені Юрія Кондратюка»