Технические науки / 12. Автоматизированные системы управления на производстве

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Construction of systems of transfer of the information with use of the device of wavelet-functions

In modern telecommunication systems and the computer networks constructed with use of technology Radio-Ethernet principles of broadband modulation are widely used [1 – 3]. The principle of their work will consist in division of a radio signal in wide a strip of frequencies due to use of special algorithms. Two of them are standardized: a method of direct sequence (DSSS) in which basis replacement of each transmitted unit with a code combination and a method of frequency jumps (FHSS) is put. At the first method as a code combination use Walsh functions. As these functions are orthonormaling

$$\frac{1}{T}\int_T \left| w_k(t)\right|^2 dt = 1 \tag{1}$$

$$\int_T w_k(t)\,w_q(t)\,dt = 0, l \neq k \tag{2}$$

that the information does not mix up, and everyone reception point reacts to the code combination allocated only to it. At the other method the receiver and the transmitter synchronously through everyone some milliseconds are recustomized on different bearing frequencies within the limits of 79 channels of a range of transfer according to the algorithm determined by pseudo-casual sequence. Respect the protection of the information both algorithms are reliable enough, as only the receiver which uses harder the sequence can react to a signal of the transmitter. Thus opportunities of disputed situations that raise reliability of transfer are stipulated.

One more method of construction of broadband means of transfer of the information is entering redundancy by simultaneous parallel transfer of the information several (about 10) frequency channels (DHSS) [3].

Respect the parameters, use of a method of direct sequence (DSSS) is perspective. It is connected both to higher speed of transfer, and with the raised noise immunity though this method and differs the certain complexity of construction of the equipment. It is connected by that each code combination being Walsh function, actually is the sequent which methods of allocation though are known [4], but demand essential hardware expenses. It is connected by that everyone code at the same time, perspective of a method is outlined that the big attention is now paid to replacement of coding Walsh functions with others. The certain operating time is in use quazichaotic

signals [5, 6]. But the generated sequences are unipolar, that contradicts main principles of transfer of the information as they contain an essential constant component and demand artificial bipolarization. Proceeding from this, more perspective is use Wavelet functions, free from the specified lacks [7]. One of kinds of Wavelets are Haar functions for which formation the formula is used

$$H_l^n(\theta) = \begin{cases} 2^{l/2}, & \dfrac{n-1}{2^l} \le \theta < \dfrac{n-\frac{1}{2}}{2^l} \\[2ex] -2^{l/2}, & \dfrac{n-\frac{1}{2}}{2^l} \le \theta < \dfrac{n}{2^l} \\[2ex] 0, other & \theta \end{cases} \tag{3}$$

where $0 \le l < \log_2 N$;

N − quantity of formed functions;

$1 \le n \le 2^l$,

of the channel. Graphically these functions look like, submitted in fig. 1. Noticeably, that in comparison with Walsh functions, Haar functions are uniform, that simplifies designing filters, and bipolar as it is demanded with principles of construction of means of transfer of the information. At the same time, each their Haar functions represents one frequency, but within the limits of function its components are shifted on an hour axis. That is at use of Haar functions for groups of reception devices it is possible to use identical filters whereas at use of Walsh functions under each of them it is necessary to project the separate filter. Due to it is possible to reduce essentially hardware expenses without loss of advantages of a method of broadband modulation as Haar functions too orthonorming and the principle of division of signals is kept completely.

In this case the problem of identification of signals is subdivided into identification of frequency of the accepted signal and his phase concerning base value of a time interval. As for an asynchronous mode of transfer each report of information begins with a starting pulse the reference mark means algorithm of transfer as it is shown in fig. 2.

At a synchronous mode of transfer each report of information begins with transfer syncrosymbol which also can act as a reference mark of a phase of a signal.

The generalized block diagram for realization of the described method of transfer of the information is resulted in fig. 3. For realization the classical microprocessor structure with use of a mode of interruptions though it is possible to use and a mode of
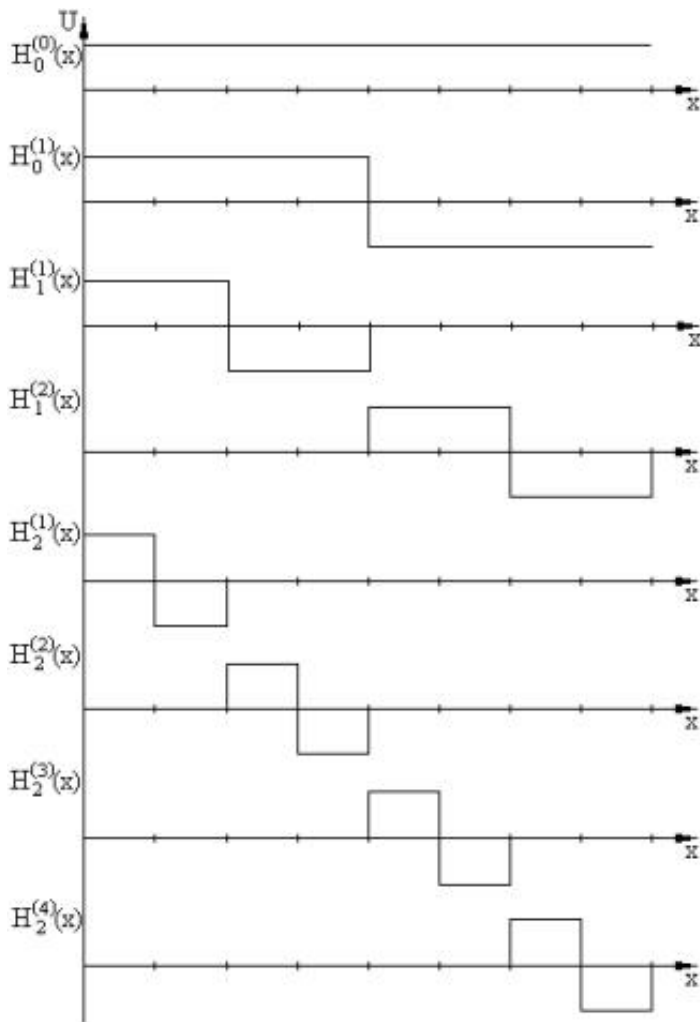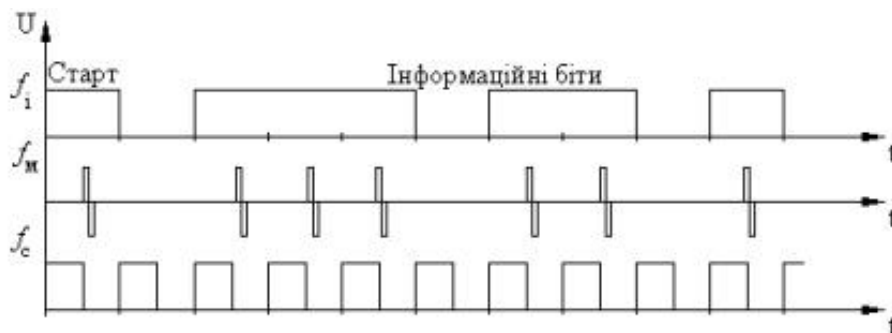
program interrogation is chosen.

Fig. 1 – First three Haar functions

Fig. 2 – Principle of coding by Haar functions
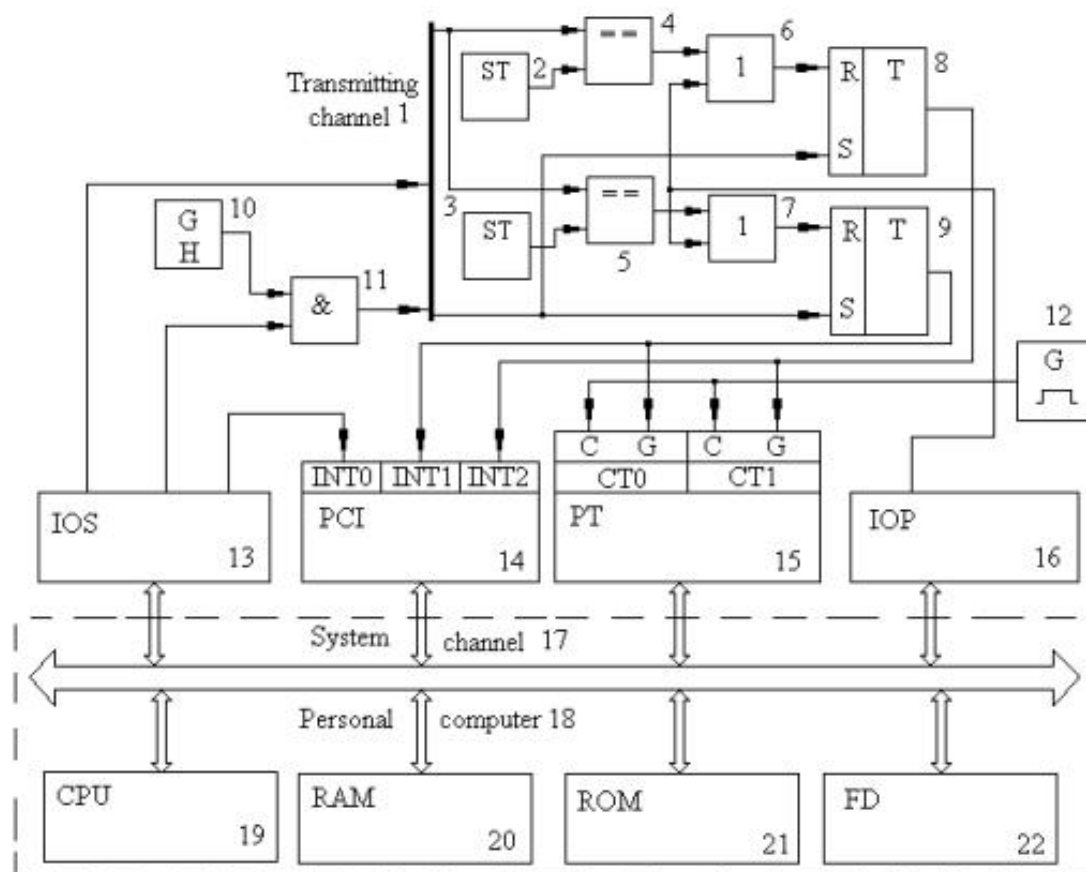in conditions of broadband modulation

Fig. 3 – The generalized structure of the device reception-transfer
of the information.

Transfer of the information is carried out with the help of the consecutive interface to which signal the certain component of Haar function is mixed.

On the reception party the scheme of measurement of time intervals with use programming the timer is constructed, and the parallel interface is intended for formation of signals of management.

At receipt of an informative signal on the reception device on a starting pulse measurement of a time interval which is defined by a phase of a signal, and also lengths of positive and negative pulses begins. Only in case of full concurrence of the received set of pulses with control on all parameters, the data will be decoded and will be transformed to a report of information.

The control of length and structure of a signal allows to allocate completely handicaps and to neutralize them, Except for it is possible to identify the messages intended for the concrete receiver and to ignore all others.

The developed structure does not interfere with use, if necessary, algorithms handicapprotection coding, cryptographic closing of the information and others.

In view of orthogonality of functions the offered algorithm can be used not only for radio channels, but also at use of wire and fibre-optical communication lines.

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