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ACQUISITION OF A SPREADING SEQUENCE IN APERIODIC DSSS SYSTEMS

Main Technological Area ⟶ Telecommunications

Keywords⟶ DSSS | Direct Sequence Spread Spectrum | bandwidth | PN sequence | Chip Time | Aperiodic

In a spread spectrum communication system, a transmitter spreads an information signal over a wide bandwidth and a receiver, upon reception of the information signal, reconstruct this information signal into the original bandwidth.
In a system employing a DSSS technique, before transmission a narrow-band information signal is multiplied by a spreading code so as to spread its energy over a broader band. After reception, the broad-band information signal is multiplied again by the same spreading code used in transmission, thus recovering the original narrow-band information signal.
The patented invention relates to a Direct Sequence Spread Spectrum (DSSS) detector for detecting synchronization between aperiodic DSSS signal; it uses multiplexer, comparator and branch adder in receiving correlation values, and detecting if all correlation values are maximum. This way, it would be possible to acquire a pseudo-random noise (PN) sequence, used as spreading codes in telecommunication systems employing an aperiodic direct sequence spread spectrum (DSSS) modulation.

TECHNICAL SPECIFICATIONS

For a DSSS system to work effectively, the receiver must be able to perform a synchronized acquisition, i.e. it must be able to generate a local replica of the PN sequence used in transmission and then to synchronize the phase of the local replica with the phase of the PN sequence contained in the received signal. When considering the acquisition operation, *matched filter* technique allows to detect the phase of the PN sequence contained in the received information signal and then to align the local replica, in order to recover the original narrow-band information signal from the received information signal.
The *matched filter* technique offers the best performances in terms of acquisition speed under low signal-to-noise (SN) ratio conditions and is less affected by problems of missed and/or false acquisition. However, it has some limitations which the patented solution aims to resolve:

- the large amount of computational resources required for its implementation;
- it cannot be used in aperiodic DSSS systems.

According to Figure 1 below, a DSSS detector (19) has at least one branch (16) that is formed by correlators (1) that are cascade connected to each other, and separated from by branch delay block (20). The branch is used to receive the aperiodic DSSS signal (r(nTc)). Each correlator has multiplier for correlating chips of spreading sequence of aperiodic DSSS signal, and then each generates a correlation value. A multiplexer (22), comparator (23) and branch adder (27) are used in receiving the correlation values, and then in detecting if all correlation values are maximum.

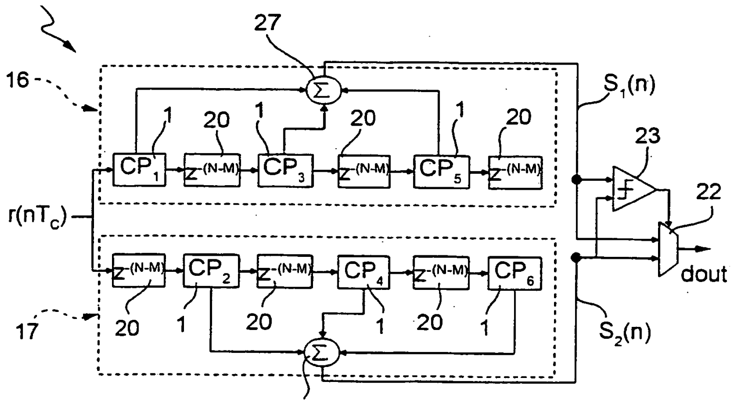

Figure 1 – DSSS Detector: system block diagram

INNOVATION/ADVANTAGES

The aim of the present invention is to overcome the limitations of usual matched filter techniques by proposing a system and a method that applies the matched filter technique to aperiodic DSSS systems.

Today the interest toward matched filter technique is considerably increasing, mostly because of advances in computational resources, as obtainable from programmable logic devices or field programmable gate arrays (FPGA), and cost reduction of the same.

FIELDS OF APPLICATION

Telecommunications	Signal processing, wireless sensors, RFID, underwater acoustic communication, RAKE receivers

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