

【CLAIMS】

【Claim 1】

A symbol timing offset synchronizer for simplifying a direct form filter structure into an eight tap transposed direct form structure and converting eight filter coefficients into a canonic signed digit (CSD) form, wherein

a filter coefficient of the transposed direct form filter structure is converted into coefficients of the CSD form after the direct form filter structure is converted into the transposed direct form filter structure, and the filter structure is re-designed based on the CSD form coefficient, wherein

a packet constructed at a transmitting end of a WLAN (IEEE 802.11a) OFDM wireless communication scheme includes a preamble, a header and a payload which is a data actually desired to transmit, and a structure of the preamble used in the IEEE 802.11a has 160 short training symbol samples and 160 long training symbol samples;

the short training symbol is used for signal detection, AGC, diversity selection, timing synchronization and coarse frequency offset estimation, and the long training symbol is used for channel estimation and fine frequency offset estimation; and

short training sequences are configured of ten identical symbols from s_1 to s_{10} , in which each symbol has 16 real number parts and 16 imaginary number parts, and long training sequences are configured of two identical symbols of l_1 and l_2 , in which each symbol has 64 real number parts and 64 imaginary number parts.

【Claim 2】

A method of designing a symbol timing offset synchronizer which simplifies a direct form filter structure into an eight tap transposed direct form structure and converts eight filter coefficients into a canonic signed digit (CSD) form, the method comprising the steps of:

converting the direct form filter structure into the transposed direct form filter structure;

converting a filter coefficient of the transposed direct form filter structure into coefficients of the CSD form; and

re-designing the filter structure based on the CSD form coefficient, wherein

a packet constructed at a transmitting end of a WLAN (IEEE 802.11a) OFDM

wireless communication scheme includes a preamble, a header and a payload which is a data actually desired to transmit, and a structure of the preamble used in the IEEE 802.11a has 160 short training symbol samples and 160 long training symbol samples;

the short training symbol is used for signal detection, AGC, diversity selection, timing synchronization and coarse frequency offset estimation, and the long training symbol is used for channel estimation and fine frequency offset estimation; and

short training sequences are configured of ten identical symbols from s_1 to s_{10} , in which each symbol has 16 real number parts and 16 imaginary number parts, and long training sequences are configured of two identical symbols of l_1 and l_2 , in which each symbol has 64 real number parts and 64 imaginary number parts.

【CLAIMS】**【Claim 1】**

A symbol timing offset synchronizer for
converting a direct form filter structure into a
5 transposed direct form filter structure, and converting a
filter coefficients of the transposed direct form filter
structure into coefficients of a canonic signed digit (CSD)
form, wherein the filter structure is re-designed based on
the CSD form coefficient.

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【Claim 2】

The synchronizer according to claim 1, wherein training
symbols of the transposed direct form filter structure are
expressed in a 2's complement form, and then the 2's
15 complement form is converted into the CSD form.

【Claim 3】

The synchronizer according to claim 1, wherein the
transposed direct form filter structure comprises four
20 filters of $r_1(n)$, $r_2(n)$, $i_1(n)$, and $i_2(n)$ (here, r denotes a
real number (real), and i denotes an imaginary number
(image)).

【Claim 4】

25 The synchronizer according to claim 3, wherein $r_1(n)$ and
 $i_1(n)$ are the same filter, and $r_2(n)$ and $i_2(n)$ are the same
filter.

【Claim 5】

30 A method of designing a symbol timing offset
synchronizer, the method comprising the steps of:

converting a direct form filter structure into a transposed direct form filter structure;

converting a filter coefficient of the transposed direct form filter structure into coefficients of a CSD form; and

5 re-designing the filter structure based on the CSD form coefficient.

【Claim 6】

10 The method according to claim 5, further comprising the step of expressing training symbols of the transposed direct form filter structure in a 2's complement form, wherein symbols expressed in the 2's complement form are converted into the CSD form.

15 **【Claim 7】**

The method according to claim 5, wherein the transposed direct form filter structure comprises four filters of $r_1(n)$, $r_2(n)$, $i_1(n)$, and $i_2(n)$ (here, r denotes a real number (real), and i denotes an imaginary number (image)).

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【Claim 8】

The method according to claim 7, wherein $r_1(n)$ and $i_1(n)$ are the same filter, and $r_2(n)$ and $i_2(n)$ are the same filter.

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