CLAIMS

What is claimed is:

5   1.   A method for use by an echo canceller to detect an echo path change and adjust to

said echo path change, said method comprising:

determining a first bulk delay of an echo signal using a foreground adaptive filter, said

foreground adaptive filter being a SPARSE filter;

configuring said foreground adaptive filter to an open-loop mode;

10   canceling said echo signal based on said first bulk delay using said foreground adaptive

filter;

determining a second bulk delay of said echo signal using a background adaptive filter,

said background adaptive filter being a SPARSE filter;

configuring said foreground adaptive filter to a closed-loop mode and continuing to

15   cancel said echo signal based on said first bulk delay;

configuring said background adaptive filter to said open-loop mode;

measuring an echo cancellation performance of said foreground adaptive filter and an

echo cancellation performance of said background adaptive filter; and

changing parameters of said foreground adaptive filter if said measuring determines that

20   said echo cancellation performance of said background adaptive filter is better than said echo

cancellation performance of said foreground adaptive filter.

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2.   The method of claim 1, wherein said changing said parameters includes copying one or more parameters of said background adaptive filter into respective one or more parameters of said foreground adaptive filter.

5   3.   The method of claim 1, wherein said changing said parameters includes:

determining a third bulk delay of the echo signal using said foreground adaptive filter;

configuring said foreground adaptive filter to said open-loop mode to determine new parameters for said foreground adaptive filter; and

configuring said foreground adaptive filter to said closed-loop mode to update said new

10   parameters.

4.   The method of claim 1, wherein said background adaptive filter is updated more aggressively in presence of a double talk detection than said foreground adaptive filter.

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5.   The method of claim 1 further comprising:

moving said foreground adaptive filter to a downsample domain prior to said determining said first bulk delay; and

moving said foreground adaptive filter to a regular domain for canceling said echo signal

20   based on said first bulk delay.

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6.   The method of claim 1 further comprising:

moving said background adaptive filter to a downsample domain prior to said

determining said second bulk delay.

5   7.   The method of claim 1, wherein said background adaptive filter operates in said

open-loop mode only.

8.   The method of claim 1, wherein said measuring measures an echo return loss

enhancement (ERLE) of said foreground adaptive filter and an ERLE of said background

10   adaptive filter.

9.   The method of claim 1 further comprising:

determining a third bulk delay of said echo signal using said background adaptive filter if

said measuring determines that said echo cancellation performance of said foreground adaptive

15   filter is better than said echo cancellation performance of said background adaptive filter.

10.   The method of claim 1 further comprising:

determining a third bulk delay of said echo signal using said background adaptive filter if

said measuring determines that said foreground adaptive filter and/or said background adaptive

20   filter are performing badly.

11.   The method of claim 10, wherein said third bulk delay is indicative of said echo

path change.

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12.   The method of claim 1, wherein said determining said second bulk delay occurs prior to configuring said foreground adaptive filter to said closed-loop mode.

5   13.   An echo canceller capable of detecting an echo path change and adjusting to said echo path change, said echo canceller comprising:

a foreground adaptive filter configured to determine a first bulk delay of an echo signal, wherein said foreground adaptive filter is a SPARSE filter, and wherein said foreground adaptive filter is further configured to an open-loop mode and cancels said echo signal based on said first

10   bulk delay, and wherein said foreground adaptive filter is configured to a closed-loop mode after being configured to said open-loop mode, and wherein said foreground adaptive filter continues to cancel said echo signal based on said first bulk delay in said closed-loop mode; and

a background adaptive filter configured to determine a second bulk delay of said echo signal, wherein said background adaptive filter is a SPARSE filter, and wherein said background

15   adaptive filter is further configured to said open-loop mode after determining said second bulk delay;

wherein said echo canceller measures an echo cancellation performance of said foreground adaptive filter and an echo cancellation performance of said background adaptive filter, and changes parameters of said foreground adaptive filter if said echo canceller determines

20   that said echo cancellation performance of said background adaptive filter is better than said echo cancellation performance of said foreground adaptive filter.

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14.   The echo canceller of claim 13, wherein said echo canceller changes said

parameters by copying one or more parameters of said background adaptive filter into respective

one or more parameters of said foreground adaptive filter.

5   15.   The echo canceller of claim 13, wherein said echo canceller changes said

parameters by:

        determining a third bulk delay of the echo signal using said foreground adaptive filter;

        configuring said foreground adaptive filter to said open-loop mode to determine new

parameters for said foreground adaptive filter; and

10   configuring said foreground adaptive filter to said closed-loop mode to update said new

parameters.

16.   The echo canceller of claim 13, wherein said background adaptive filter is

updated more aggressively in presence of a double talk detection than said foreground adaptive

15   filter.

17.   The echo canceller of claim 13, wherein said foreground adaptive filter

determines said first bulk delay in a downsample domain, and wherein said foreground adaptive

filter moves to a regular domain for canceling said echo signal based on said first bulk delay.

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18.   The echo canceller of claim 13, wherein said background adaptive filter

determines said second bulk delay in a downsample domain.

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19   The echo canceller of claim 13, wherein said background adaptive filter operates in said open-loop mode only.

20.   The echo canceller of claim 13, wherein said echo canceller measures an echo return loss enhancement (ERLE) of said foreground adaptive filter and an ERLE of said background adaptive filter.

21.   The echo canceller of claim 13, wherein said background adaptive filter determines a third bulk delay of said echo signal if said echo canceller determines that said echo cancellation performance of said foreground adaptive filter is better than said echo cancellation performance of said background adaptive filter.

22.   The echo canceller of claim 13, wherein said background adaptive filter determines a third bulk delay of said echo signal if said echo canceller determines that said foreground adaptive filter and/or said background adaptive filter are performing badly.

23.   The echo canceller of claim 22, wherein said third bulk delay is indicative of said echo path change.

24.   The echo canceller of claim 13, wherein said echo background adaptive filter determines said second bulk delay prior to said foreground adaptive filter is configured to said closed-loop mode.

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