

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 17

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte TERRY LYNN COLE

Appeal No. 2000-1887
Application No. 08/853,075

ON BRIEF

Before JERRY SMITH, DIXON and SAADAT, Administrative Patent Judges.
SAADAT, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal from the Examiner's final rejection of claims 1-29, which are all of the claims pending in this application.

We reverse.

BACKGROUND

Appellant's invention is directed to a signal processing arrangement using an adaptive filter. In conventional filters, the number of taps or length of the finite impulse response (FIR) filter is typically fixed and only the tap coefficients of the filter may be adjusted (specification, page 2). According to

Appellant's invention, a data processor selectively modifies the weighting coefficients in response to an error signal and selectively increases or decreases the number of weighting coefficients in response to a characteristic of the weighting coefficients (specification page 4). As depicted in figures 1 and 3, adaptive filter 102 generates output signal 108 through a FIR filter using coefficients $a_0, a_1, a_2, \dots, a_N$ which are stored at locations 110 of memory 106 (specification, page 9). To improve the efficiency of the adaptive filter, data processor 118 adjusts the number as well as the values of the coefficients and stores the new coefficient values in memory 106 (specification, pages 12 & 13). Thus, dedicating system resources to taps that contribute little to the output signal can be avoided and the amount of system resources involved in storing and processing the history of signals may be reduced (specification, page 11).

Representative independent claim 1 is reproduced below:

1. A signal processing arrangement, comprising:

an adaptive filter, coupled to receive an input signal and configured and arranged to generate an output signal as a function of the input signal and a number of weighting coefficients;

a memory, configured and arranged to store the weighting coefficients;

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an error detector, responsive to the output signal and configured and arranged to generate an error signal at least in part as a function of the output signal and to provide the error signal to the adaptive filter; and

a data processor, operatively coupled to the adaptive filter and configured and arranged to

selectively modify the weighting coefficients in response to the error signal,

selectively increase or decrease the number of weighting coefficients used by the adaptive filter in response to a characteristic of the weighting coefficients used by the adaptive filter and no other weighting coefficients, and

selectively allocate system resources for storing the weighting coefficients.

The Examiner relies on the following references in rejecting the claims:

Horna	4,377,793	Mar. 22, 1983
Sugiyama	5,517,435	May 14, 1996

Claims 1-29 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Horna in view of Sugiyama.

Rather than reiterate the viewpoints of the Examiner and Appellant regarding the above-noted rejection, we make reference to the answer (Paper No. 14, mailed December 28, 1999) for the Examiner's reasoning, and to the appeal brief (Paper No. 12, filed October 18, 1999) and the reply brief (Paper No. 15, filed February 1, 2000) for Appellant's arguments thereagainst.

OPINION

In rejecting claim 1, the Examiner relies on Horna for disclosing an adaptive filter for generating an output signal as a function of the input signal as well as a number of weighting coefficients and an error detector for generating an error signal as a function of the output signal (answer, pages 2 & 3). The Examiner specifically points to figure 1 and column 1 lines 33-35 and 62-68 for teaching a processor that selectively modifies the weighting coefficients in response to the error signal and selectively allocates system resources for storing the weighting coefficients (answer, page 3). However, the Examiner points out the deficiencies of Horna and further relies on Sugiyama (col. 4, lines 37-43) for showing that a processor increases or decreases the number of the weighting coefficients in response to a characteristic of the weighting coefficient used by the filter (id.).

Appellant argues that Sugiyama merely redistributes taps between sub-filters 60_i of adaptive filter 60 based on tap coefficients of each sub-filter instead of the claimed increasing or decreasing the number of taps used by filter 60 based on "a characteristic of the weighting coefficient used by adaptive filter only and no other weighting coefficients" (brief, pages 5-

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7). Appellant points out that although Sugiyama increases or decreases the number of taps of an individual sub-filter, there are no details provided as to how such change in their numbers is performed (brief, page 7). Finally, Appellant argues that neither reference teaches or suggests that system resources are selectively allocated for storing the weighting coefficients (brief, page 8). Appellant adds that the X-register 60 of Horna, as relied on by the Examiner, is a shift register for storing input samples involving no selectivity even in storing the samples and differs from the claimed selective allocation of system resources (id.). Furthermore, Appellant argues that even if the Examiner meant to refer to H-register 65a of Horna or substitute the registers with random access memory, there still would have been no teaching related to dynamically varying the size of the storage element (reply brief, page 2).

In response to Appellant's arguments, the Examiner points to column 4, lines 37-43 of Sugiyama for teaching a step of selectively increasing or decreasing the number of taps used by the adaptive filter (answer, pages 10 & 11). Additionally, the Examiner repeats the discussion of Horna related to register 60 in figure 4 and concludes that the references "disclosed the

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coefficient samples are being selective for allocating and storing into element 60" (answer, page 11).

As a general proposition, in rejecting claims under 35 U.S.C. § 103, the examiner bears the initial burden of presenting a prima facie case of obviousness. See In re Rijckaert, 9 F.3d 1531, 1532, 28 USPQ2d 1955, 1956 (Fed. Cir. 1993) and In re Fine, 837 F.2d 1071, 1074, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). A prima facie case of obviousness is established when the teachings of the prior art itself would appear to have suggested the claimed subject matter to one of ordinary skill in the art. See In re Bell, 991 F.2d 781, 783, 26 USPQ2d 1529, 1531 (Fed. Cir. 1993); In re Fritch, 972 F.2d 1260, 1266 n.14, 23 USPQ2d 1780, 1783-84 n.14 (Fed. Cir. 1992); Uniroyal, Inc. v. Rudkin-Wiley Corp., 837 F.2d 1044, 1051, 5 USPQ2d 1434, 1438 (Fed. Cir. 1988); Ashland Oil, Inc. v. Delta Resins & Refractories, Inc., 776 F.2d 281, 293, 227 USPQ 657, 664 (Fed. Cir. 1985). In considering the question of the obviousness of the claimed invention in view of the prior art relied upon, the Examiner is expected to make the factual determination set forth in Graham v. John Deere Co., 383 U.S. 1, 17, 148 USPQ 459, 467 (1966), and to provide a reason why one having ordinary skill in the pertinent art would have been led to modify the prior art or to combine prior art references to

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arrive at the claimed invention. See also In re Rouffet, 149 F.3d 1350, 1355, 47 USPQ2d 1453, 1456 (Fed. Cir. 1998). Our reviewing court requires this evidence in order to establish a prima facie case. In re Piasecki, 745 F.2d 1468, 1471-72, 223 USPQ 785, 787-88 (Fed. Cir. 1984); In re Cofer, 354 F.2d 664, 668, 148 USPQ 268, 271-72 (CCPA 1966).

Additionally, the Federal Circuit further states that motivation, suggestion or teaching may come explicitly from statements in the prior art, the knowledge of one of ordinary skill in the art, or, in some cases the nature of the problem to be solved. See In re Dembiczak, 175 F.3d 994, 999, 50 USPQ2d 1614, 1617 (Fed. Cir. 1999). However, "the Board must not only assure that the requisite findings are made, based on evidence of record, but must also explain the reasoning by which the findings are deemed to support the agency's conclusion." In re Lee, 277 F.3d 1338, 1344, 61 USPQ2d 1430, 1434 (Fed. Cir. 2002).

After reviewing Horna, we find that the reference generally relates to an adaptive filter having a first shift register for storing new samples while the old samples are read into a second shift register for storing (col. 3, lines 46-55). The adaptive filter of Horna, as depicted in figure 4, includes first shift registers 60a and 65a in unit 100 for storing the first samples

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and coefficients (col. 4, lines 40-56) and second shift registers 60b and 65b in unit 200 for storing the old samples and coefficients after the new ones are read into the first register (col. 4, lines 56-59). We agree with Appellant that these two sets of registers are indeed shift registers with fixed sizes that are allocated for storing the signal samples and coefficients with no regard for their lengths. We again observe that the Examiner has incorrectly corresponded the fixed length shift registers of Horna for selectively changing the number of taps and allocating system resources for storing.

Sugiyama, on the other hand, relates to a system of subband adaptive filters in which the number of adaptive filter taps corresponding to each subband is controlled for reducing computation time (col. 3, lines 11-16). We find that the teachings relied on by the Examiner (col. 4, lines 37-43) refers to increasing or decreasing the number of taps of the adaptive filter based on maximum and minimum power of subband error signals and not based on a characteristic of the weighting coefficients used by the adaptive filter. Furthermore, the Examiner provides no specific correlation between the claimed features and Sugiyama's disclosure, nor can we find the necessary teachings related to selectively increasing or decreasing the

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number of weighting coefficients based on a characteristic of the weighting coefficients, as recited in claim 1. A review of the reference confirms Appellant's position that although Sugiyama controls the number of taps (coefficients) based on their values, the number of taps are actually re-distributed based on an analysis of the coefficients of last P taps (P is an integer) in each adaptive filter (col. 8, lines 28-31). Sugiyama, in column 8, lines 65-68, further teaches that:

Excess or shortage of number of taps is adjusted by the number of taps of the adaptive filter corresponding to i-th subband giving mathematical expression 7.

Therefore, the number of taps determined in each subband filter is a part of the overall tap numbers associated with filter 60_i .

In view of our analysis of Horna and Sugiyama, even assuming, arguendo, that it would have been obvious to combine the adaptive filter of Horna with the subband filter of Sugiyama, as held by the Examiner, we still find that the combination would have disclosed neither the selectively increasing/decreasing the number of weighting coefficients nor selectively allocating system resources for storing the weighting coefficients, as claimed by Appellant. The subject matter of claim 1 would not, therefore, have been prima facie obvious because the necessary teachings and suggestions to combine the adaptive filter of Horna

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with the subband adaptive filter arrangement of Sugiyama and form the claimed selectively increasing or decreasing the number of weighting coefficients and allocating system resources, are not shown.

We note that independent claims 13, 14 and 23, similar to claim 1, recite a signal processing arrangement and method that require selectively increasing or decreasing the number of weighting coefficients and allocating system resources. Furthermore, independent claims 24 and 25, similar to the arrangement of claim 1, require means for selectively increasing or decreasing the number of weighting coefficients and allocating system resources. Accordingly, we will not sustain the rejection of independent claims 1, 13, 14, 23, 24 and 25 as well as claims 2-12, 15-22 and 26-29, which are dependent therefrom, under 35 U.S.C. § 103(a) over Horna in view of Sugiyama.

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CONCLUSION

In view of the foregoing, the decision of the Examiner rejecting claims 1-29 under 35 U.S.C. § 103 is reversed.

REVERSED

JERRY SMITH)	
Administrative Patent Judge)	
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)	BOARD OF PATENT
JOSEPH L. DIXON)	APPEALS
Administrative Patent Judge)	AND
)	INTERFERENCES
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MAHSHID D. SAADAT)	
Administrative Patent Judge)	

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Scott F. Diring
Williams, Morgan & Amerson, P.C.
7676 Hillmont
Suite 250
Houston, TX 77040