

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
14 September 2006 (14.09.2006)

PCT

(10) International Publication Number
WO 2006/096231 A3

- (51) International Patent Classification:
H04M 9/08 (2006.01)
- (21) International Application Number:
PCT/US2006/000512
- (22) International Filing Date: 6 January 2006 (06.01.2006)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
11/072,476 3 March 2005 (03.03.2005) US
- (71) Applicant (for all designated States except US): MIND-SPEED TECHNOLOGIES, INC. [US/US]; 4000 Macarthur Blvd., East Tower, Newport Beach, California 92660 (US).

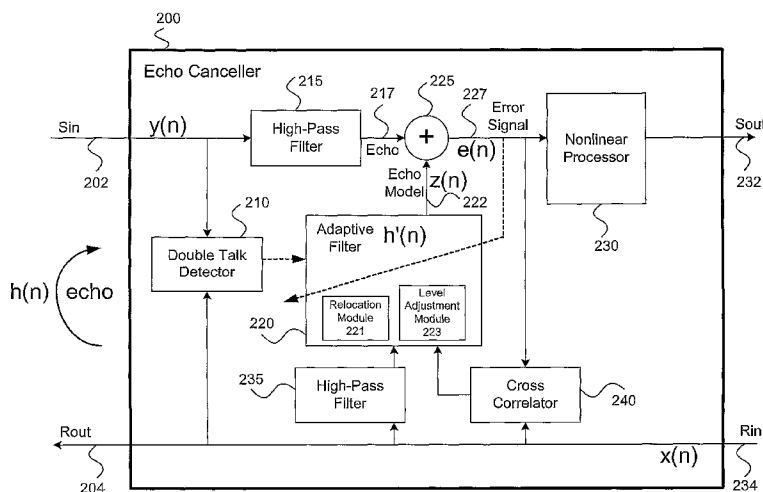
- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

- (72) Inventors; and
- (75) Inventors/Applicants (for US only): SU, Huan-yu [US/US]; 3009 Cale Frontera, San Clemente, California 92673 (US). BENYASSINE, Adil [US/US]; 40 Dinuba, Irvine, California 92602 (US). LAVROV, Nick [RU/US]; 23161 Rockrose, Mission Viejo, California 92692 (US).
- (74) Agent: FARJAMI, Farshad; FARJAMI & FARJAMI LLP, 26522 La Alameda Avenue, Suite 360, Mission Viejo, California 92691 (US).

- Published:
- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments
- (88) Date of publication of the international search report:
1 November 2007

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: FAST ECHO CANCELLER RECONVERGENCE AFTER TDM SLIPS AND ECHO LEVEL CHANGES



(57) Abstract: A method of adjusting an echo canceller comprises obtaining a first cross-correlation between a far-end signal and an error signal, wherein the error signal is generated by subtracting an output signal of an adaptive filter from a local-end signal; determining whether the first cross-correlation is above a pre-determined threshold; relocating the adaptive filter by a few samples if the determining determines that the first cross-correlation is above a pre-determined threshold; calculating a first improvement indicator parameter, wherein the first improvement indicator parameter is calculated after the relocating the adaptive filter by the few samples; determining whether the first improvement indicator parameter indicates a performance improvement by the adaptive filter after the relocating the adaptive filter by the few samples; calculating a gain based on the local-end signal and the error signal if the determining does not determine the performance improvement; and multiplying the adaptive filter by the gain.

WO 2006/096231 A3

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 06/00512

<p>A. CLASSIFICATION OF SUBJECT MATTER IPC(8) - H04M 09/08 (2007.01) USPC - 379/406.08 According to International Patent Classification (IPC) or to both national classification and IPC</p>											
<p>B. FIELDS SEARCHED</p> <p>Minimum documentation searched (classification system followed by classification symbols) USPC: 379/406.08</p> <p>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched USPC: 379/406.01-406.07; 370/286-292 (search terms below)</p> <p>Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) PubWEST(USPT,PGPB,EPAB,JPAB); Google Scholar Search Terms: echo canceller, TDM, ERLE, signal, level, adaptive filter</p>											
<p>C. DOCUMENTS CONSIDERED TO BE RELEVANT</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Category*</th> <th style="width: 70%;">Citation of document, with indication, where appropriate, of the relevant passages</th> <th style="width: 20%;">Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">X</td> <td>US 5,687,229 A (SIH) 11 November 1997 (11.11.1997), abstract, col 2, ln 64-65, col 3, ln 22-25, col 6, ln 18-22, col 9, ln 58-61, col 11, ln 5-11, ln 45-48, col 15, ln 39-41, col 17, ln 6-9, col 23, ln 37-42</td> <td style="text-align: center;">1-28</td> </tr> <tr> <td style="text-align: center;">A</td> <td>US 6,671,374 B1 (NEMRI et al.) 30 December 2003 (30.12.2003), entire document</td> <td style="text-align: center;">1-28</td> </tr> </tbody> </table>			Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	US 5,687,229 A (SIH) 11 November 1997 (11.11.1997), abstract, col 2, ln 64-65, col 3, ln 22-25, col 6, ln 18-22, col 9, ln 58-61, col 11, ln 5-11, ln 45-48, col 15, ln 39-41, col 17, ln 6-9, col 23, ln 37-42	1-28	A	US 6,671,374 B1 (NEMRI et al.) 30 December 2003 (30.12.2003), entire document	1-28
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.									
X	US 5,687,229 A (SIH) 11 November 1997 (11.11.1997), abstract, col 2, ln 64-65, col 3, ln 22-25, col 6, ln 18-22, col 9, ln 58-61, col 11, ln 5-11, ln 45-48, col 15, ln 39-41, col 17, ln 6-9, col 23, ln 37-42	1-28									
A	US 6,671,374 B1 (NEMRI et al.) 30 December 2003 (30.12.2003), entire document	1-28									
<p><input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/></p>											
<p>* Special categories of cited documents:</p> <table style="width: 100%;"> <tr> <td style="width: 50%;"> <p>“A” document defining the general state of the art which is not considered to be of particular relevance</p> <p>“E” earlier application or patent but published on or after the international filing date</p> <p>“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>“O” document referring to an oral disclosure, use, exhibition or other means</p> <p>“P” document published prior to the international filing date but later than the priority date claimed</p> </td> <td style="width: 50%;"> <p>“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>“&” document member of the same patent family</p> </td> </tr> </table>			<p>“A” document defining the general state of the art which is not considered to be of particular relevance</p> <p>“E” earlier application or patent but published on or after the international filing date</p> <p>“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>“O” document referring to an oral disclosure, use, exhibition or other means</p> <p>“P” document published prior to the international filing date but later than the priority date claimed</p>	<p>“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>“&” document member of the same patent family</p>							
<p>“A” document defining the general state of the art which is not considered to be of particular relevance</p> <p>“E” earlier application or patent but published on or after the international filing date</p> <p>“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>“O” document referring to an oral disclosure, use, exhibition or other means</p> <p>“P” document published prior to the international filing date but later than the priority date claimed</p>	<p>“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>“&” document member of the same patent family</p>										
<p>Date of the actual completion of the international search 25 April 2007 (25.04.2007)</p>		<p>Date of mailing of the international search report 05 SEP 2007</p>									
<p>Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201</p>		<p>Authorized officer: Lee W. Young</p> <p>PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774</p>									