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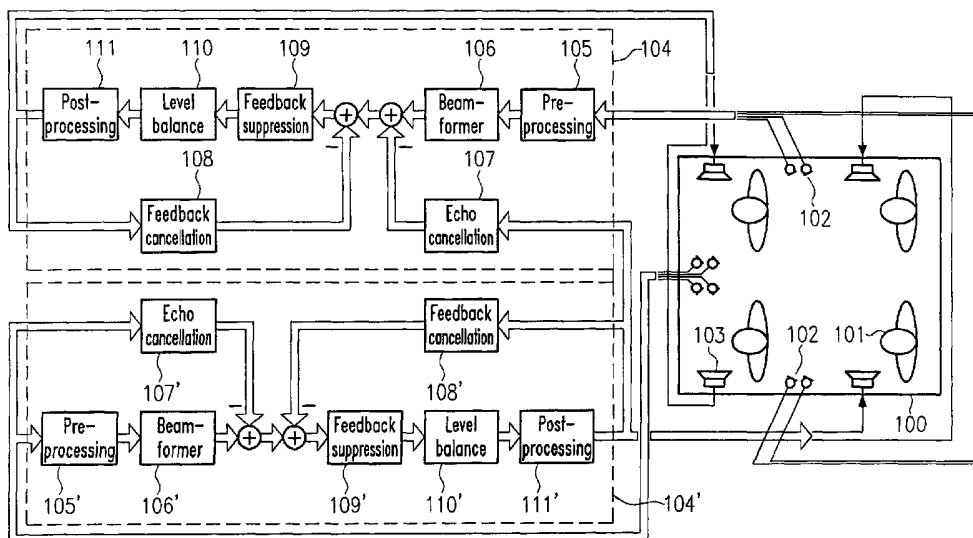
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(54) Title: METHOD AND SYSTEM FOR COMMUNICATION ENHANCEMENT INA NOISY ENVIRONMENT



(57) Abstract: The invention is directed to a method comprising receiving input signals emanating from at least two microphone arrays each comprising at least two microphones, processing the input signals of each microphone array by a beamformer to determine temporal and spatial information about the input signals of each microphone array.

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP2004/004980

<p>A. CLASSIFICATION OF SUBJECT MATTER IPC 7 H04R3/00</p> <p>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) IPC 7 H04R H04B H03G H03F G10L G01S</p> <p>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched</p> <p>Electronic data base consulted during the international search (name of data base and, where practical, search terms used) EPO-Internal, PAJ, WPI Data</p>														
<p>C. DOCUMENTS CONSIDERED TO BE RELEVANT</p> <table border="1"> <thead> <tr> <th>Category °</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>EP 1 116 961 A (NOKIA MOBILE PHONES LTD) 18 July 2001 (2001-07-18)</td> <td>1</td> </tr> <tr> <td>Y</td> <td>abstract; figures 1-4 column 1, line 36 - line 57 column 3, line 6 - line 68 column 4, line 40 - line 58 column 5, line 26 - line 55 column 6, line 4 - line 23; claims 1-4,7-9,13-19</td> <td>2-20</td> </tr> <tr> <td>Y</td> <td>----- PATENT ABSTRACTS OF JAPAN vol. 1995, no. 10, 30 November 1995 (1995-11-30) & JP 7 176178 A (ALPINE ELECTRON INC), 14 July 1995 (1995-07-14) abstract; figure 1 ----- -/--</td> <td>2-20</td> </tr> </tbody> </table>			Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	EP 1 116 961 A (NOKIA MOBILE PHONES LTD) 18 July 2001 (2001-07-18)	1	Y	abstract; figures 1-4 column 1, line 36 - line 57 column 3, line 6 - line 68 column 4, line 40 - line 58 column 5, line 26 - line 55 column 6, line 4 - line 23; claims 1-4,7-9,13-19	2-20	Y	----- PATENT ABSTRACTS OF JAPAN vol. 1995, no. 10, 30 November 1995 (1995-11-30) & JP 7 176178 A (ALPINE ELECTRON INC), 14 July 1995 (1995-07-14) abstract; figure 1 ----- -/--	2-20
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<p><input checked="" type="checkbox"/> Further documents are listed in the continuation of box C. <input checked="" type="checkbox"/> Patent family members are listed in annex.</p>														
<p>° Special categories of cited documents :</p> <table border="0"> <tr> <td style="vertical-align: top;"> <p>*A* document defining the general state of the art which is not considered to be of particular relevance</p> <p>*E* earlier document 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="vertical-align: top;"> <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 document 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>										
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<p>Date of the actual completion of the international search 27 October 2004</p>		<p>Date of mailing of the international search report 08/11/2004</p>												
<p>Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016</p>		<p>Authorized officer Timms, O</p>												

INTERNATIONAL SEARCH REPORT

 Intl. Patent Application No
 PCT/EP2004/004980

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2003/072461 A1 (MOORER JAMES A) 17 April 2003 (2003-04-17) abstract; claims 1,35,41; figure 9 -----	1-20
A	GB 2 097 121 A (FERRANTI LTD) 27 October 1982 (1982-10-27) abstract; figure 1 page 1, line 5 - line 17 page 3, line 105 - line 116 page 5, line 25 - line 30 -----	1-20
A	EP 1 083 543 A (VOLKSWAGENWERK AG) 14 March 2001 (2001-03-14) abstract; claims 1-4,7-9; figure 1 -----	1,2,16, 20
P,X	DE 101 56 954 A (DAIMLER CHRYSLER AG) 18 June 2003 (2003-06-18) the whole document -----	1-20
P,X	EP 1 343 351 A (ERICSSON TELEFON AB L M) 10 September 2003 (2003-09-10) the whole document -----	1,2, 16-18,20

INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1116961	A	18-07-2001	US 6449593 B1 10-09-2002 EP 1116961 A2 18-07-2001 JP 2001245382 A 07-09-2001
JP 7176178	A	14-07-1995	JP 3411648 B2 03-06-2003
US 2003072461	A1	17-04-2003	NONE
GB 2097121	A	27-10-1982	NONE
EP 1083543	A	14-03-2001	DE 19942868 A1 15-03-2001 EP 1083543 A2 14-03-2001
DE 10156954	A	18-06-2003	DE 10156954 A1 18-06-2003
EP 1343351	A	10-09-2003	EP 1343351 A1 10-09-2003