

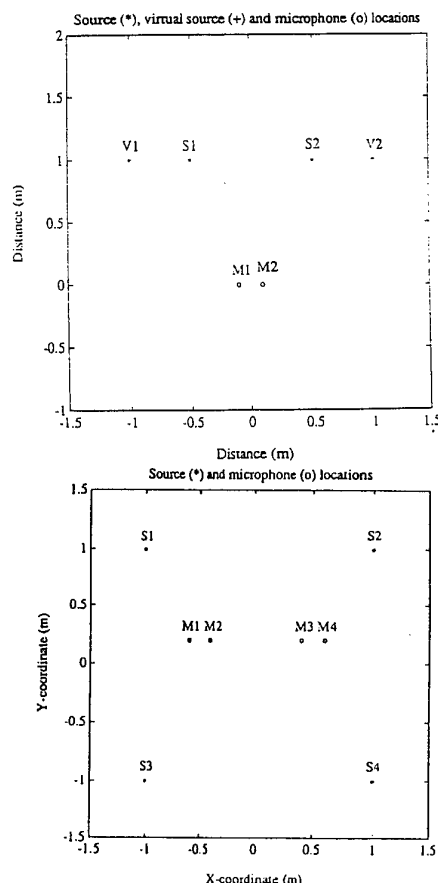
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁵ : H04S 7/00, 1/00, H03H 21/00		A3	(11) International Publication Number: WO 94/01981
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(54) Title: ADAPTIVE AUDIO SYSTEMS AND SOUND REPRODUCTION SYSTEMS

(57) Abstract

An algorithm is described for sparsely updating the filter coefficients of an adaptive filter of an adaptive audio system to facilitate a high sampling rate without excessive processing capacity. Computer simulations are used to illustrate the potential for using an inverse filter matrix to manipulate the position of stereophonic images. The possibilities suggested could be used in conjunction with existing stereophonic recordings in order to improve stereophonic imaging in situations where the relative locations of loudspeakers and listener are constrained to be non-ideal. In one arrangement, real sound sources (S1, S2) provide to the listener the impression that the sources are at more widely-spaced positions (V1, V2). In another arrangement, employing four sound sources (S1, S2, S3, S4) the impression is created at two listener locations (M1, M2; M3, M4) that the sound is coming from a pair of sound sources positioned symmetrically of those listener locations.



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INTERNATIONAL SEARCH REPORT

International Application No. **PCT/GB 93/01402**

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC: Int.C1.5 H 04 S 7/00 H 04 S 1/00 H 03 H 21/00		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
Int.C1.5	H 04 S H 04 R	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸		
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹		
Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
Y,D	WO,A,9000851 (ADAPTIVE CONTROL LIMITED) 25 January 1990 cited in the application	1,5
A	see claims ---	2-4
Y	US,A,4219696 (KOGURE ET AL.) 26 August 1980	1,5
A	see column 2, line 11 - column 5, line 29 ---	2-4
A	EP,A,0357402 (Q SOUND LTD) 7 March 1990 see page 3, line 46 - page 4, line 40; figures --- -/-	1,5
¹⁰ Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "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) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "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 "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step "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. "&" document member of the same patent family		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
05-11-1993	11.02.94	
International Searching Authority	Signature of Authorized Officer	
EUROPEAN PATENT OFFICE	G.L. GASTALDI	

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category "	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
A	US,A,3956709 (OSAKABE ET AL.) 11 May 1976 see column 1, line 6 - column 2, line 30; figures ---	1,5
A	DE,A,4027338 (DRESCHER) 12 March 1992 see claims ---	1,5
A,D	US,A,3236949 (ATAL ET AL.) 22 February 1966 cited in the application see column 1, line 45 - column 2, line 14 -----	1,5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/GB93/01402

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. claims 1-5
2. claims 6-10

For further information see form PCT/ISA/206 dated 06-12-93.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-5

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO.

GB 9301402
SA 77010

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 07/02/94. The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO-A- 9000851	25-01-90	AU-A- 3981489	05-02-90
		EP-A- 0434691	03-07-91
		GB-A- 2221595	07-02-90
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		DE-A- 2460278	10-07-75
		FR-A, B 2256618	25-07-75
		GB-A- 1480620	20-07-77
		NL-A- 7416968	01-07-75
DE-A- 4027338	12-03-92	None	
US-A- 3236949		None	