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**Datasheet for the decision  
of 16 July 2020**

**Case Number:** T 0901/16 - 3.5.03

**Application Number:** 11776678.2

**Publication Number:** 2630812

**IPC:** H04S3/02

**Language of the proceedings:** EN

**Title of invention:**

Estimation of synthetic audio prototypes

**Applicant:**

Bose Corporation

**Headword:**

Estimation of synthetic audio prototypes/BOSE

**Relevant legal provisions:**

EPC Art. 54, 84, 123(2)  
RPBA 2020 Art. 11, 13(1)

**Keyword:**

Late-filed request admissible - (yes)  
Clarity - (yes, after amendment)  
Added subject-matter - (no, after amendment)  
Novelty - (yes, after amendment)  
Remittal to the first instance for further prosecution - (yes)



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Case Number: T 0901/16 - 3.5.03

**D E C I S I O N**  
**of Technical Board of Appeal 3.5.03**  
**of 16 July 2020**

**Appellant:** Bose Corporation  
(Applicant) The Mountain  
Framingham, Massachusetts 01701 (US)

**Representative:** Huisman, Aurélien  
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**Decision under appeal:** **Decision of the Examining Division of the  
European Patent Office posted on 1 December 2015  
refusing European patent application  
No. 11776678.2 pursuant to Article 97(2) EPC.**

**Composition of the Board:**

**Chair** K. Bengi-Akyürek  
**Members:** T. Snell  
R. Winkelhofer

## Summary of Facts and Submissions

- I. This appeal concerns the decision of the examining division refusing the patent application on the grounds, *inter alia*, that the subject-matter of claim 1 of the main request was not new (Articles 52(1) and 54 EPC) and that claim 1 of the third auxiliary request did not comply with Article 84 EPC.
- II. In the impugned decision, the following prior-art documents are referred to in connection with the objection of lack of novelty:
- D1:** WO 2008/155708 A1;  
**D3:** US 2008/0152155 A1;  
**D4:** US 2006/045294 A1.
- III. With the statement of grounds of appeal, the appellant requested that the decision under appeal be set aside and a patent granted on the basis of the claims of the third auxiliary request refused by the examining division.
- IV. In response to a communication from the board pursuant to Rule 100(2) EPC, the appellant filed an amended set of claims with the submission dated 11 June 2020, which form the basis of this decision.
- V. **Claim 1** reads as follows:
- "A method for forming one audio output signal (114) from a plurality of audio input signals (112) comprising:

synthesizing a prototype signal, wherein the synthesis of the prototype signal includes a non-linear function of the input signals, and

forming one output signal, including forming the output signal as a linear estimate of the prototype signal, the linear estimate is [sic] formed as a linear combination of the input signals that best approximates the prototype signal in a minimum mean-squared error sense."

### **Reasons for the Decision**

#### *1. Admittance of the late-filed claim request*

1.1 The request comprising a new set of claims was filed in response to objections raised by the board under Articles 84 and 123(2) EPC (cf. point IV above). It was readily apparent that these objections had been overcome essentially by deleting the offending wording. The board was also able to establish with minimal effort that the amendments to claim 1 did not introduce any new issues of compliance with respect to Articles 84 and 123(2) EPC.

1.2 In addition, *prima facie*, the subject-matter of claim 1 appeared to be new having regard to the documents cited by the examining division against claim 1 of the refused main request, which meant that it was highly likely that none of the objections raised hitherto prejudiced the grant of a patent, meaning that the case could be remitted for examination of inventive step (cf. point 5 below). The likelihood that the appeal would be allowable if the request were admitted also

contributed to procedural economy by avoiding the need for oral proceedings.

1.3 The board therefore used its discretionary power under Article 13(1) RPBA 2020 to admit the request into the proceedings.

2. *Claim 1 - Article 123(2) EPC*

2.1 Present claim 1 comprises the following limiting features (board's labelling):

- (a) A method for forming one audio output signal from a plurality of audio input signals comprising:
- (b) synthesising a prototype signal, wherein the synthesis of the prototype signal includes a non-linear function of the input signals,
- (c) forming one output signal, including forming the output signal as a linear estimate of the prototype signal,
- (d) wherein the linear estimate is formed as a linear combination of the input signals that best approximates the prototype signal in a minimum mean-squared error sense.

2.2 Claim 1 is based on page 3, lines 7-13; page 4, line 18 to page 5, line 3; page 11, lines 3-5; page 13, lines 7-18 and Fig. 2 of the application as filed.

The feature "wherein the synthesis of the prototype signal includes a non-linear function of the input signals" (i.e. not merely is a non-linear function) is based on page 4, lines 18-19 and claim 17 as filed.

2.3 Claim 1 therefore complies with Article 123(2) EPC.

3. *Claim 1 - clarity (Article 84 EPC)*

3.1 Claim 1 now expresses in sufficiently clear language the essential features of the invention as set out in the paragraphs referred to above, point 2.1 (see in particular page 3, lines 7-13) and therefore complies with Article 84 EPC.

3.2 For completeness' sake, however, it is noted that to avoid any ambiguity and for linguistic consistency, the final clause of the claim should read "forming *said* one output signal, including forming *said* output signal as a linear estimate of the prototype signal, the linear estimate *being* formed as a linear combination of the input signals that best approximates the prototype signal in a minimum mean-squared error sense" (suggested clarifications in italics).

3.3 With further respect to clarity, the examining division raised the following objections (cf. Reasons, point 5.1.2.1; see also *obiter dictum*, point 1.1), albeit with respect to claim 1 of the fourth auxiliary request only:

"It is unclear how the steps of claim 1 solve the problem of addressing the need to perform upmixing in a manner that accurately renders spatially separated audio channels from a multichannel source in a manner that reduces sonic artefacts and has low processing latency, see p. 3, l. 1-3 of the application.

Claim 1 neither refers to upmixing nor to a multichannel source. In this respect it is noted that a plurality of input channels need not necessarily originate from a multichannel source.

Furthermore, there is no specification of how the prototypes, the non-linear function and the linear estimate are selected to reduce sonic artefacts and lower processing latency.

As such, the claim is devoid of virtually all essential features necessary to solve the addressed problem".

3.4 The breadth of claim 1 however does not render it unclear in the present case. Article 84 EPC is essentially concerned with setting clearly defined limits on the scope of protection conferred as well as indicating the essential technical features of the solution.

In the present case, the wording of the features of claim 1 is technically and linguistically not ambiguous, and the broad claim is also supported by the numerous embodiments set out in the description. In this latter respect, although embodiments relating to upmixing predominate in the description, there are indications of other applications (cf. page 3, lines 14-21; page 10, line 16 - page 11, line 5). The input signals also need not be a multichannel source (e.g. a stereo signal), but for example may be signals from a microphone array (cf. page 7, line 1).

Further, the problem of "performing upmixing in a manner that accurately renders spatially separated audio channels from a multichannel source" is not the most general problem to which the claimed subject-matter is said to provide a solution, which is "synthesizing output signals that both permit flexible and temporal and/or frequency local processing while limiting or mitigating artifacts in such output

signals" (cf. page 3, lines 5-7). Finally, claim 1 defines how the input signals, the prototype signal, the non-linear function and the linear estimate interact to generate the output signal. These are the essential features which result in an improved performance as regards the presence of sonic artefacts and/or processing latency (cf. page 11, lines 3-5), whereby it is not necessary, having regard to the requirement of clarity, that every possible embodiment embraced by the claim provide an improved performance, since this is not claimed.

4. *Claim 1 - novelty (Articles 52(1) and 54 EPC)*

4.1 None of cited documents D1, D3 or D4 (see point II above) discloses all the features of the subject-matter of claim 1:

4.2 **D1** concerns an echo canceller. The circuit of Fig. 4 (cf. page 13, line 10 - page 14, line 7) comprises two microphone input signals 405 and 406 which undergo processing to synthesise "first and second intermediate echo signals" which have a linear and a non-linear component, although it is not clear that these are generated using a non-linear function of the input signals, since blocks 407 and 408 are FIR filters which are not necessarily non-linear processing blocks (cf. the impugned decision, reasons, 1.1.1). The intermediate echo signals undergo processing in blocks 410 and 411 which separate the intermediate echo signals into a non-linear component  $y_{n1}$  and a linear component  $y_{1in}$ .

Even if one of those intermediate echo signals is taken as the "prototype signal" according to claim 1, and even if the component  $y_{1in}$  is taken to be a linear



estimate of this signal (which is actually not the case since it includes also the linear estimate of the second intermediate echo signal),  $y_{lin}$  does not correspond to a linear estimate that best approximates the prototype signal in a minimum mean-squared error sense, as required by feature (d) of claim 1.

- 4.3 **D3** (cf. Fig. 12 and paragraph [0088]) discloses in one embodiment forming a centre channel when upmixing a stereo signal using a non-linear mapping based on a "panning index" ("panning" being the amplitude weighting of individual loudspeakers in order to create virtual sound sources). This centre channel can be read onto the "prototype signal" of claim 1.

However, a linear combination of the input signals that best approximates the prototype signal in a "minimum mean-squared error sense" is not performed in this embodiment, or in any other embodiment of D3. Thus, this document fails to disclose feature (d) either.

- 4.4 **D4** discloses arrangements in which there are additions, i.e. linear combinations, of input signals (cf. e.g. Figs. 38 to 40). Input signals are also filtered into subbands, which the examining division considered to be synthesising prototype signals including a non-linear function of the input signals.

However, there is likewise no disclosure of a linear combination of input signals which best approximates such a prototype signal in a minimum mean-squared error sense according to feature (d) of present claim 1.

- 4.5 Consequently, the subject-matter of claim 1 is new having regard to the state of the art cited by the

examining division in the impugned decision (Articles 52(1) and 54 EPC).

5. *Remittal to the examining division*

5.1 Claim 1 of the amended main request overcomes the objections which led to the refusal of the present application. The decision under appeal is therefore to be set aside.

5.2 However, the present claims still have to be examined for the first time with respect to inventive step (Article 56 EPC). Furthermore, in view of the amendments to claim 1, it may be necessary to consider other prior-art documents than those mentioned in this decision. This is however a matter for the examining division. The minor clarifications to claim 1 mentioned above (cf. point 3.2 above) also need to be taken into account.

5.3 Since the above observations constitute "special reasons" within the meaning of Article 11 RPBA 2020, the case is to be remitted to the examining division for further prosecution (Article 111(1) EPC).

## Order

### For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the examining division for further prosecution.

The Registrar:

The Chair:



B. Brückner

K. Bengi-Akyürek

Decision electronically authenticated