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**Datasheet for the decision
of 7 June 2017**

Case Number: T 1637/11 - 3.4.01

Application Number: 09152360.5

Publication Number: 2085966

IPC: G10L19/14

Language of the proceedings: EN

Title of invention:

Selection of scalar quantization(SQ) and vector quantization
(VQ) for speech coding

Applicant:

Samsung Electronics Co., Ltd.

Headword:

Relevant legal provisions:

RPBA Art. 13(1)
EPC Art. 84, 76(1), 123(2)

Keyword:

Late-filed request - request clearly allowable (no) - admitted
(no)

Decisions cited:

Catchword:



Beschwerdekammern
Boards of Appeal
Chambres de recours

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Case Number: T 1637/11 - 3.4.01

D E C I S I O N
of Technical Board of Appeal 3.4.01
of 7 June 2017

Appellant: Samsung Electronics Co., Ltd.
(Applicant) 129, Samsung-ro
Yeongtong-gu
Suwon-si, Gyeonggi-do, 443-742 (KR)

Representative: Appleyard Lees IP LLP
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Decision under appeal: Decision of the Examining Division of the
European Patent Office posted on 2 February 2011
refusing European patent application No.
09152360.5 pursuant to Article 97(2) EPC.

Composition of the Board:

Chairman G. Assi
Members: T. Zinke
J. Geschwind

Summary of Facts and Submissions

- I. The examining division refused European patent application No. 09 152 360.

In its decision the examining division held that the independent claims of a main request and an auxiliary request then on file did not meet the requirements of Art. 84, 123(2), 76(1) (as compared to the earlier European patent application No. 99 946 655) and R. 42(1)(e) EPC.

- II. The appellant (applicant) filed an appeal against the decision.

With the statement setting out the grounds of appeal, the appellant requested that the decision be set aside and that a patent be granted on the basis of an enclosed set of claims according to a main request, an auxiliary request I or an auxiliary request II.

- III. At the appellant's request, a summons to attend oral proceedings was issued.

- IV. In a communication of 31 March 2017 pursuant to Art. 15(1) RPBA, objections were raised under Art. 123(2) and 76(1) EPC for all requests then on file.

- V. In reply, by letter of 8 May 2017, the appellant withdrew all previous requests, filed a revised claim set for a new sole main request and provided arguments with regard to the admissibility of the revised claim set and the basis in the earlier application of the amendments made.

VI. At the oral proceedings before the Board on 7 June 2017 the appellant's final request was that the decision under appeal be set aside and that a patent be granted based on claims 1 to 4 as filed with letter of 8 May 2017.

VII. Claim 1 of the pending request reads as follows:

"1. A method for use in a multi-rate CELP speech coder having an adaptive codebook (257) and a fixed codebook (261), the multi-rate speech CELP coder configured to operate at a coding rate selected from 4.55, 5.8, 6.65, 8.0 or 11.0kbps for encoding a speech signal, the method comprising:

if the coding rate is a first coding rate of 11.0kbps, generating a quantized adaptive codebook gain and a quantized fixed codebook gain by a scalar quantizing, using 4 bits for the adaptive codebook gain and 5 bits for the fixed codebook gain;

wherein a search of the adaptive codebook is used to generate the quantized adaptive codebook gain \bar{g}_p by minimizing the error:

$$Err = abs(g_p - \bar{g}_p)$$

where g_p is the adaptive codebook gain; and wherein a search of the fixed codebook is used to generate the quantized fixed codebook gain \bar{g}_c by minimizing the error Err:

$$Err = \|\bar{T}_{sm} - \bar{g}_p \bar{C}_p - \bar{g}_c \bar{C}_c\|^2$$

where \bar{T}_{sm} is the target speech signal, \bar{C}_p is a filtered adaptive codebook excitation and \bar{C}_c is a filtered fixed codebook excitation, where the filtered adaptive codebook excitation is calculated by applying a

synthesis filter (249) and a weighting filter (251) to an adaptive codebook excitation and the filtered fixed codebook excitation is calculated by applying a synthesis filter (267) and a weighting filter (268) to an fixed codebook excitation;
 if the coding rate is a second coding rate selected from 4.55, 5.8, 6.65 and 8.0 kbps, generating a quantized adaptive codebook gain and a quantized fixed codebook gain by vector quantizing, using 6 bits for 4.55 kbps an 7 bits for any of 5.8, 6.65 and 8.0 kbps; wherein a search of the adaptive codebook and the fixed codebook is done to generate the quantized adaptive codebook gain and the quantized fixed codebook gain by minimizing the mean squared error, Err between the original and reconstructed speech signals:

$$Err = \|\bar{T}_{gs} - g_p \bar{C}_p - g_c \bar{C}_c\|^2$$

wherein the vector quantizing further comprises predicting the fixed codebook gain from:

$$g_c' = 10^{(0.05(\tilde{E}(n) + \bar{E} - E_i))}$$

where g_c' is the predicted fixed codebook gain, $\tilde{E}(n)$ is the predicted energy, $\bar{E} = 30$ dB and E_i is the mean energy of the unscaled fixed codebook excitation and the predicted energy is given by:

$$\tilde{E}(n) = \sum_{i=1}^4 b_i \hat{R}(n-i)$$

where $[b_1, b_2, b_3, b_4] = [0.68, 0.58, 0.34, 0.19]$ are the

MA predication coefficients and $\hat{R}(n)$ is the quantized prediction error at subframe n , and the mean energy is given by

$$E_i = 10 \log \left(\frac{1}{40} \sum_{i=0}^{39} c^2(i) \right)$$

where $c(i)$ is the unscaled fixed codebook excitation; wherein a first step of the search is a binary search of a single entry table representing the quantized prediction error and a second step of the codebook search uses an index of an optimum entry which is closest to the unquantized prediction error $R(n)$ to limit a search of a two-dimensional VQ table representing the adaptive codebook gain and the prediction error,

wherein $R(n)$ is defined by

$$R(n) = E(n) - \tilde{E}(n) = 20 \log \gamma$$

where γ is a correction factor between the gain, g_c , and the estimated gain g_c' and is given by:

$$\gamma = \frac{g_c}{g_c'}$$

the method further comprising:

generating an excitation signal $u(n)$ defined by:

$$u(n) = \bar{g}_p v(n) + \bar{g}_c c(n)$$

where $v(n)$ is an excitation vector from the adaptive codebook (257), \bar{g}_p is the quantized adaptive codebook gain, $c(n)$ is the excitation vector from the fixed codebook (261) and \bar{g}_c is the quantized fixed codebook gain."

Claims 2, 3 and 4 are correspondingly formulated independent claims for a multi-rate CELP speech encoder, a method for use in a multi-rate CELP speech decoder and a multi-rate CELP speech decoder, respectively.

Reasons for the Decision

1. The appeal is admissible.
2. Admissibility of the present main request
 - 2.1 The amended claims of the present main request were filed in response to the Board's communication under Art. 15(1) RPBA.
 - 2.2 According to Art. 13(1) RPBA, *"Any amendment to a party's case after it has filed its grounds of appeal ... may be admitted and considered at the Board's discretion"*.

In accordance with established jurisprudence of the boards of appeal (cf. Case Law of the Boards of Appeal of the EPO, 8th edition, July 2016, section IV.E.4.4, *"Criteria for consideration of amended claims"*, pages 1151-1160), *"As a rule, the boards' decisions should be based on the issues in dispute at first instance, which does not rule out the admission of new submissions, but does subject it to the fulfillment of certain criteria, given that no entirely "fresh case" should be created on appeal Thus, in addition to the factors referred to in Art. 13(1) RPBA, the following criteria may ... likewise be decisive: there must be sound reasons for filing a request at a late stage in the proceedings, as may be the case where amendments are occasioned by developments during the proceedings or where the request addresses still outstanding objections. The amendments must be prima facie clearly allowable, ..."*, i.e. it must be immediately apparent to the board that the amendments made successfully address the issues raised, without giving rise to new ones.

Moreover, Art. 12(4) RPBA gives a board the power to hold inadmissible requests which could have been presented in the first instance proceedings.

- 2.3 In the present case, the appellant amended the claims with detailed features taken from the originally filed description describing the particular algorithm for determining a quantized adaptive codebook gain and a quantized fixed codebook gain with corresponding bit allocations for the five coding rates disclosed in the application (cf. pages 64 to 66 of the specification of the earlier application).

Since an objection had been raised in the communication under Art. 15(1) RPBA that the gain quantization as claimed in the claims then pending was too general as compared to the disclosure of the originally filed application and to the disclosure of the earlier application, said amendments could be considered as a sound reason for filing amended claims.

- 2.4 However, the amendments made give rise to new objections under Art. 84 EPC. For instance, having regard to claim 1:

With regard to the second equation, \bar{T}_m is considered to be the "*target speech signal*", whereas in the third equation an "*original speech signal*" is mentioned. It is unclear, whether these two signals are identical or not.

The claim wording does not specify which exact value is finally quantized for the fixed codebook gain. According to the claim wording it might be the

"quantized fixed codebook gain \bar{g}_c " or the "quantized prediction error $\hat{R}(n)$ ".

The last feature of the claim concerns the generation of an excitation signal $u(n)$. It is unclear for what reason this generation is needed for quantizing the gains.

The sixth equation includes a sum from $i=0$ to 39. However, in the claim there is no explanation, why exactly 40 values have to be summed.

- 2.5 The amendments also give rise to new objections under Art. 123(2) and 76(1) EPC. For instance, having regard to claim 1:

The current claim features describing the search of codebooks for the adaptive codebook gain and the fixed codebook gain refer to an "adaptive codebook (257)" and "a fixed codebook (261)". These codebooks, however, are described in the earlier application as being codebooks for the excitation signals and not for the gains (cf. Fig. 2 and the corresponding description on page 18, lines 10 to 15). According to the original description, instead of the adaptive codebook and the fixed codebook different codebooks are used for the gain quantization, i.e. a "gain codebook" (cf. page 64, line 5) and "scalar gain codebooks" (cf. page 66, line 1).

In the original specification, the last feature of the claims concerning the encoder, i.e. generating an excitation signal, is only disclosed in the context of updating the states of the synthesis and weighting filters in order to compute the target signal for the next subframe (cf. page 66, lines 5 to 11). This

context is missing in the claim wording, although it is not disclosed as being optional. Further, the claimed equation for the excitation signal is not identical to the equation on page 66, line 8, the feature " $n=0,39$ " being missing.

- 2.6 Said objections under Art. 84, 123(2) and 76(1) EPC were raised by the Board during the oral proceedings. The appellant, however, refrained from providing counter-arguments.
- 2.7 With regard to further criteria applicable, like the complexity of the new subject-matter submitted (Art. 13(1) RPBA), whether an additional search would be necessary, whether such an additional search would be contrary to the need for procedural economy (Art. 13(1) RPBA) and whether the amendments could have been made during the first instance proceedings (Art. 12(4) RPBA), the appellant submitted during oral proceedings that these further criteria would not necessarily result in the non-admissibility of the pending main request. These issues are, however, irrelevant since at least the criterion referred to above that the new claims should be "*prima facie clearly allowable*" is not met.
- 2.8 Since the amendments made to the claim set on file give rise to new objections under Art. 84, 123(2) and 76(1) EPC, the present main request is not *prima facie* clearly allowable.
- 2.9 Therefore, the Board did not admit the present main request into the appeal proceedings in accordance with Art. 13(1) RPBA.

3. Since the present main request is not admissible and all other requests had been withdrawn, there is no further request on file to be considered, so that the appeal has to be dismissed.

Order

For these reasons it is decided that:

1. The appeal is dismissed.

The Registrar:

The Chairman:



R. Schumacher

G. Assi

Decision electronically authenticated