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**D E C I S I O N**  
**of 26 June 2003**

**Case Number:** T 0062/01 - 3.5.2

**Application Number:** 93913500.0

**Publication Number:** 0654909

**IPC:** H03M 7/30

**Language of the proceedings:** EN

**Title of invention:**

Code excitation linear prediction encoder and decoder

**Applicant:**

Oki Electric Industry Company, Limited

**Opponent:**

-

**Headword:**

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**Relevant legal provisions:**

EPC Art. 54

**Keyword:**

"Novelty (no)"

**Decisions cited:**

-

**Catchword:**

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Case Number: T 0062/01 - 3.5.2

**D E C I S I O N**  
of the Technical Board of Appeal 3.5.2  
of 26 June 2003

**Appellant:** Oki Electric Industry Company, Limited  
7-12, Toranomom 1-chome  
Minato-ku  
Tokyo 105 (JP)

**Representative:** Williams, Ceili  
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**Decision under appeal:** Decision of the Examining Division of the  
European Patent Office posted 4 August 2000  
refusing European patent application  
No. 93913500.0 pursuant to Article 97(1) EPC.

**Composition of the Board:**

**Chairman:** W. J. L. Wheeler  
**Members:** M. Ruggiu  
P. Mühlens

## Summary of Facts and Submissions

- I. The applicant appealed the decision of the examining division to refuse European patent application No 93 913 500.0.
- II. The following documents of the state of the art according to the international search report and supplementary European search report were cited in a communication of the board sent with summons to oral proceedings:
- D5: EP-A-0 405 548; and
- D6: EP-A-0 492 459.
- III. In response to the summons, the appellant filed a set of claims 1 to 6 on 22 May 2003 and requested that the decision under appeal be set aside and a patent be granted on the basis of these claims.

In a telephone conversation, the record of which was faxed to the appellant on 11 June 2003, the rapporteur of the board indicated that there were doubts regarding the novelty of the subject-matter of claims 1 and 2.

A fax received on 17 June 2003 indicated that the appellant did not wish to make any further amendments to the claims nor to be represented at the oral proceedings which took place in their absence on 26 June 2003.

IV. Independent claims 1 and 2 read as follows:

"1. A code excitation linear predictive coding apparatus which uses an excitation signal of an excitation codebook (108) as an excitation source information of a speech signal, the apparatus being characterised in that it comprises:-

a code vector conversion circuit means (109) arranged to generate an impulse response of a transfer function which is determined in accordance with a vocal tract parameter of a speech signal input and to convolutionally compute an excitation code vector, selected from the excitation codebook (108), with the impulse response, and thereby to convert the excitation code vector into a frequency characteristic which is determined at the time of output of said excitation code vector, said frequency characteristic serving as the input of a synthesis filter (105)."

"2. A code excitation linear predictive decoding apparatus which uses an excitation signal of an excitation codebook (205) as an excitation source information of a speech signal, the apparatus being characterised in that it comprises:-

a code vector conversion circuit means (206) arranged to generate an impulse response of a transfer function which is determined in accordance with a vocal tract parameter of a speech signal input and to convolutionally compute an excitation code vector, selected from the excitation codebook (205), with the impulse response, and thereby to convert the excitation code vector into a frequency characteristic which is determined at the time of output of said excitation

code vector, said frequency characteristic serving as the input of a synthesis filter (105)."

Claims 3 to 6 are dependent on claim 1 or claim 2.

V. The appellant essentially argued as follows:

An advantage provided by the invention was that the transformation applied by the code vector conversion circuit means provided an excitation signal whose frequency characteristic more closely resembled that of the input speech vectors. The pitch prediction unit of Figures 1, 2 and 5 of D5 did not convert the selected excitation code vector. The pitch prediction unit of D5 made use of filter parameters (pitch prediction coefficient, pitch frequency) extracted from the input speech signal by a reverse linear prediction filter. These parameters were used to provide an input excitation representing long term correlations within the speech signal (formants). A second excitation was extracted from a white noise codebook. The pitch prediction unit provided an input excitation that was periodic instead of white noise, derived from an estimate/prediction of pitch frequency and for use by a filter modelling the vocal tract which generated the reproduced signal. The pitch prediction unit did not alter the frequency characteristic of the white noise codebook excitation and was used in the absence of a codebook containing impulse signals to provide a separate input excitation representative of voiced sounds. The pitch prediction unit described in D5 did not generate a transfer function determined in accordance with vocal tract parameters. It was

representative of long term correlations, ie. of vocal chord parameters.

### **Reasons for the Decision**

1. The appeal is admissible.
2. Figures 1 and 2 of document D5 illustrate code excitation linear predictive coding and decoding apparatuses, each of which uses as excitation signal a vector selected from a white noise codebook 10 or 20. A pitch prediction unit 12 or 22 receives the code vector selected from the codebook. The code vector obtained at the output of the pitch prediction unit 12 or 22 serves as input to a linear prediction unit 13 or 23 (which may be regarded as a synthesis filter). The index of the codebook 10, the frequency and coefficient of the pitch prediction unit 12 and the coefficients of the linear prediction unit 13 are determined from an input speech signal in the coding apparatus and transmitted to the decoding apparatus.
3. According to column 2, lines 46 to 50 of D5, the pitch prediction unit is used for giving periodicity at the pitch frequencies to the excitation signal. In the judgment of the board, the pitch prediction unit 12 or 22 of D5 can therefore be regarded as a code vector conversion circuit means which operates to convert the excitation code vector selected from codebook 10 or 20 into a frequency characteristic which is determined at the time of the output of said excitation code vector. The pitch prediction unit 12 or 22 of D5 is formed by a digital circuit and thus has an impulse response. As is

well known, the output of a digital circuit is obtained by convolutionally computing the input signal, in this case the excitation code vector selected from the codebook, with the impulse response of the circuit.

4. Both independent claims specify conversion means arranged to generate an impulse response of a transfer function which is determined in accordance with a vocal tract parameter of a speech signal input; they do not require this vocal tract parameter to be a parameter of the synthesis filter. In the art, the coefficients of a linear prediction synthesis filter of a CELP coding or decoding apparatus, like unit 13 or 23 of D5, are frequently referred to as vocal tract parameters and the linear prediction synthesis filter is frequently regarded as simulating the vocal tract of the speaker. A code vector provided to a linear prediction synthesis filter, like the code vector selected from codebook 10 or 20 of D5, is frequently regarded as an excitation of the vocal tract simulated by the linear prediction unit. As appears from document D6, see column 7, lines 9 to 29, a long-term prediction filter of a code excitation linear prediction (CELP) system which introduces into the excitation signal characteristics depending on the periodicity of voiced sounds can also be regarded as simulating the vocal tract. Thus, in the view of the board, the skilled person, notwithstanding the different terminology, would regard the pitch prediction unit 12 or 22 of D5 as simulating the vocal tract of the speaker. The skilled person would therefore regard the transfer function of the pitch prediction unit 12 or 22 of D5 as determined in accordance with a vocal tract parameter of the speech signal input.

5. The board has therefore come to the conclusion that all features of claims 1 and 2 form part of the state of the art according to document D5. Consequently, the subject-matter of claims 1 and 2 cannot be considered to be new in the sense of Article 54(1) EPC.

## **Order**

**For these reasons it is decided that:**

The appeal is dismissed.

The Registrar:

The Chairman:

D. Sauter

W. J. L. Wheeler