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Veröffentlichung im Amtsblatt	Ja/Nein
Publication in the Official Journal	Yes/No
Publication au Journal Officiel	Oui/Non

Aktenzeichen / Case Number / N° du recours : T 129/83 - 3.5.1

Anmeldenummer / Filing No / N° de la demande : 79 301 137.0

Veröffentlichungs-Nr. / Publication No / N° de la publication : 0 006 715

Bezeichnung der Erfindung: Method of processing image data
Title of invention:
Titre de l'invention :

Klassifikation / Classification / Classement : H04N 1/40, H04N 1/00

ENTSCHEIDUNG / DECISION

vom / of / du 13 June 1989

Anmelder / Applicant / Demandeur : Xerox Corporation

Patentinhaber / Proprietor of the patent /
Titulaire du brevet :

Einsprechender / Opponent / Opposant :

Stichwort / Headword / Référence :

EPÜ / EPC / CBE Article 56

Schlagwort / Keyword / Mot clé : Inventive step (yes)

Leitsatz / Headnote / Sommaire

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Case Number : T 129/83 - 3.5.1

D E C I S I O N
of the Technical Board of Appeal 3.5.1
of 13 June 1989

Appellant : Xerox Corporation
Xerox Square, Rochester
New York 14644, U.S.A.

Representative : Goode, Ian Roy
Rank Xerox Limited,
Patent Department
364 Euston Road
London NW1 3BL
U.K.

Decision under appeal : Decision of Examining Division 058 of the European Patent Office dated 25 February 1983 refusing European patent application No. 79 301 137.0 pursuant to Article 97(1) EPC.

Composition of the Board :

Chairman : P.K.J. van den Berg
Members : Y.J.F. van Henden
P. Ford

Summary of Facts and Submissions

I. European patent application No. 79 301 137.0 was filed on 14 June 1979, claiming the priority of US application No. 917 626 of 21 June 1978.

The application was refused by decision of the Examining Division dated 25 February 1983 and based on Claims 1-3, submitted on 10 August 1981. The reason given for the refusal was that, having regard to the state of the art disclosed in US-A-2 921 124, the subject-matter of these claims lacked an inventive step and, therefore, was not patentable.

II. The Appellant lodged an appeal against the decision. The Notice of Appeal was received on 21 April 1983 with simultaneous payment of the fee, and the Statement of Grounds was submitted on 2 July 1983.

III. In response to communications from the Board, the Appellant submitted on 28 February 1989 new Claims 1 and 2 reading as follows:

"1. A method of processing image data in pixels comprising

scanning an original (6) to provide a succession of analog pixels (10) for each line scanned,

sampling (24) the voltage levels of said succession of analog pixels, forming a boxcar signal wave (28) for said sampled voltage levels by holding each voltage level for a preset interval,

interpolating linearly (30) between adjacent ones of said sampled voltage levels of the same line to produce a signal waveform (31),

frequency enhancing (36) said signal waveform,

thresholding (40) said signal waveform (37) to convert the signal waveform to a binary signal wave,

sampling (46) the binary signal wave at a frequency greater than the input frequency of said analog pixels so as to produce a succession of digital pixels (49) with more of said digital pixels per line than the number of said analog pixels per line, and

transmitting said digital pixels to a remote output station.

2. The method of Claim 1 including interpolating additional lines of digital pixels at the output station."

IV. The Appellant requests a European patent to be granted on the basis of the following documents:

- description, pages 1 and 1a received on 28 February 1989 with letter of 22 February 1989 and pages 2-10 originally filed, with the amendments proposed by the rapporteur during a conversation by telephone of 4 April 1989 and those requested in said letter of 22 February 1989.

- Claims 1 and 2 submitted on 28 February 1989;

- drawings, sheets 1/6 to 6/6 originally filed, with the amendments to Figure 4 proposed by the rapporteur during the conversation of 4 April 1989.

V. To support his view, the Appellant essentially argues as follows:

The inventive concept derives from the realisation that one can scan an original at relatively low resolution and that, during the conversion process to digital signals and previous to transmitting the latter to a remote output station, one can accurately interpolate additional pixels without the need to use prediction matrices or other data manipulation techniques. A relatively low resolution scanner, as well as a transmission channel with moderate bandwidth, can thus be used, and additional lines of pixels can be interpolated at the receiving station, so as to achieve yet better resolution than the channel bandwidth would otherwise allow. The document US-A-2 921 124 teaches, on the contrary, to remove image pixels from each scanned line at the transmitting station and to interpolate pixels into the lines at the output station. Said document, therefore, leads away from the invention.

Reasons for the Decision

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC, and, therefore, is admissible.

2. The new claims are supported by the description as originally filed. The Board, therefore, has no objection to raise against Claims 1 and 2 on the ground of Article 123(2) EPC. The Board furthermore takes the view that said claims meet the requirements of Article 84 EPC.

3. Novelty.

3.1 The US-A-2 921 124 discloses a method of processing image data in pixels comprising

- repeatedly sampling at a reduced rate a conventionally generated video signal;

- transmitting the sampled signal to a remote station;

- resampling the signal received by said station to produce a succession of samples identical to those obtained while carrying out the first step;

- interpolating the samples which are missing due to the reduced sampling rate applied to the original conventional video signal in the signal formed by said succession of samples, and

- feeding to a utilisation device the signal including the interpolated samples.

The step of interpolating in this method clearly only concerns interpolating additional pixels in existing lines of pixels.

3.2 The method disclosed in US-A-4 068 266 comprises the steps of

- scanning an original to provide a video signal;

- performing an analog to digital conversion of said signal;

- performing digital data compression to eliminate redundant data from the digital signal;

- transmitting the compressed signal to a remote station via a communication channel;

- decompressing the received signal, whereby the redundant data is restored;

- buffering the restored digital video signal;

- interpolating additional pixel lines and

- outputting existing lines and interpolated lines.

3.3 In the method known from US-A-4 032 977, only the steps to be performed after buffering the restored digital video signal are different from those of the method according to US-A-4 068 266. The result to be achieved is a prediction of gray scale values for successive video output data elements. Nevertheless, from the fact that each output data element spatially corresponds to an input data element - see Claim 1 - and that the prediction matrix, which has odd numbers of columns and lines, is symmetrical with respect to the corresponding output data element - see Claim 2 - it can be inferred that interpolating additional pixels is not envisaged there.

3.4 The method according to Claim 1 is novel with respect to the prior art disclosed in the above cited documents - Article 54(1) EPC. Because said method does not comprise all the steps of any of the known methods and, among the steps it comprises, some are not performed in the same order as in the methods according to said prior art, the Board takes the view that the one part formulation of Claim 1, i.e. without a characterising clause, is allowable.

4. Inventive step.

The illustrations of prior art available in the file point away from the claimed invention in that they teach to cancel existing pixels from a scanned line before transmitting the remaining video information to a remote station, and then to restore or at least to approximate the missing information at said remote station. Considering

that the interpolation of additional pixels in a line at the emitting station involves the need of a transmission channel with a broader bandwidth, this is already an incentive for the skilled man not to further investigate the matter.

Apart from this, the Board observes that, although the step of interpolating linearly between adjacent sampled analog voltage levels of a videosignal is known as such from the cited US-A-2 921 124, in particular Figs. 2 and 3, columns 7 and 8, ($^{R+L}/_{2}$ interpolation), combining this step with the steps of frequency enhancing the waveform resulting from the interpolation, converting the enhanced waveform by thresholding into a binary signal and sampling that binary signal at a frequency higher than the input frequency of said sampled analog voltage levels, constitutes a surprisingly simple and efficient measure to which there is not the slightest hint to be found in the cited prior art.

The Board takes therefore the view that the method according to Claim 1 involves an inventive step within the meaning of Article 56 EPC.

5. Hence, Claim 1 is allowable - Article 52(1) EPC.

6. Claim 2 is dependent upon Claim 1 and concerns a further step of the method according to that claim to be carried out at the receiving station. The subject-matter of Claim 2 is also patentable, since it comprises, in identical succession, all the steps of the method according to Claim 1 and adds to it a useful feature.

Order

For these reasons, it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance with the order to grant a European patent on the basis of the following documents:

2.1 Pages 1 and 1a filed on 28 February 1989 and pages 2-10 as originally filed, with the following amendments:

Page 1, line 3, replace "in to" by "into";
Page 1, last but one line and page 1a, delete the reference numbers and brackets;
Page 3, deletion of the sentence starting at line 21;
Page 7, line 2, replace the reference (70) by (74);
Page 7, line 12, replace the reference (73) by (75);
Page 10, at the end of line 30, add the sentence "In our copending EP-A-0 006 351 there is described and claimed a method of processing image data in pixels in which entire lines of pixels are interpolated between existing lines."

2.2 Claims 1 and 2 received on 28 February 1989;

2.3 Drawings, sheets 1/6 to 6/6 as originally filed with the following amendments to Figure 4:

delete the reference number (72) related to the lead connecting resistor (73) and output of amplifier (60);

on the graphic representing the output (37) of the circuit, replace the reference numbers (70, 73) by (74) and (75), respectively.

The Registrar: The Chairman:

S. Fabiani P.K.J. van den Berg