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Bezeichnung der Erfindung: Method and apparatus for improved  
Title of invention: digital image processing  
Titre de l'invention :

Klassifikation / Classification / Classement : G06F15/20

**ENTSCHEIDUNG / DECISION**

vom / of / du 15 July 1986

Anmelder / Applicant / Demandeur : VICOM Systems Inc.

Patentinhaber / Proprietor of the patent /  
Titulaire du brevet :

Einsprechender / Opponent / Opposant :

Stichwort / Headword / Référence : computer-related invention/VICOM

EPÜ / EPC / CBE Art. 52(2) (3), 54 (2)

"mathematical method - computer program"

**Leitsatz / Headnote / Sommaire**

- I. Even if the idea underlying an invention may be considered to reside in a mathematical method a claim directed to a technical process in which the method is used does not seek protection for the mathematical method as such.
- II. A computer of known type set up to operate according to a new program cannot be considered as forming part of the state of the art as defined by Article 54(2) EPC.
- III. A claim directed to a technical process which process is carried out under the control of a program (whether by means of hardware or software), cannot be regarded as relating to a computer program as such.
- IV. A claim which can be considered as being directed to a computer set up to operate in accordance with a specified program (whether by means of hardware or software) for controlling or carrying out a technical process cannot be regarded as relating to a computer program as such.

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Case Number : T 208 /84

**D E C I S I O N**  
of the Technical Board of Appeal 3.5.1  
of 15 July 1986

**Appellant :** VICOM Systems Inc.  
2520 Junction Ave.  
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USA California 95134-1989

**Representative :** Ayers, Martyn Lewis Stanley  
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**Decision under appeal :** Decision of Examining Division 058 of the European  
Patent Office dated 13.04.84 refusing European  
patent application No 79 300 903.6 pursuant to  
Article 97(1) EPC

**Composition of the Board :**

**Chairman :** G. Korsakoff  
**Member :** J. van Voorthuizen  
**Member :** P. Ford

Summary of Facts and Submissions

- I European patent application 79 300 903.6 filed on 22.05.79 (Publication No. 0 005 954), claiming priority of 26.05.78 (US) was refused by a decision of the Examining Division 065 of the European Patent Office dated 13.04.84. That decision was based on Claims 1-12 filed on 25.01.84.
- II The reasons given for the refusal were that the independent method Claims 1, 3, 5, 12 related to a mathematical method which is not patentable by virtue of Article 52(2) (a) and (3) EPC, that the dependent method Claims 2, 4, 6, 7 did not add technical features as required by Rule 29(1) EPC and that the apparatus Claims 8-11 in the absence of supporting disclosure of novel apparatus were unacceptable in view of Article 52(1) and 54 EPC.
- Furthermore, the Examining Division considered that the normal implementation of the claimed methods by a program run on a known computer could not be regarded as an invention in view of Article 52(2)(c) and (3) EPC.
- III The applicants lodged an appeal against this decision on 12.06.84. The appeal fee was paid on the same date. The statement of grounds was filed on 16.08.84.
- IV In the statement of grounds the appellants argued essentially as follows:

The Examining Division appears to have reasoned that the disclosure is talking about mathematical operations which can be carried out on a conventional general purpose computer and since there is no detailed discussion of the circuitry of special purpose hardware, there is no basis for claiming the apparatus as being anything other than a suitably programmed conventional computer. The disclosure,

however, relates to special purpose hardware which is to be put into practice by the skilled man designing circuitry which can perform the specific operations detailed in the specification. These operations are precisely defined there by mathematical expressions; there is no basis for an objection of lack of support on this point as it is entirely conventional to define filters in terms of mathematical operations since it is one of the expected skills of a filter designer to be able to "reduce" a mathematically specified filter to its circuit form. For purposes of convenience, and as is conventional in this complex area of technology, the description of the point operator and the mask circuits are given mathematically, which is then understood by those skilled in this art to refer to a series of logic circuits which can perform the function specified by the mathematical description. Thus, the mathematics is merely a shorthand by which to describe a technical function, and not the totality of the invention. In the claims the process steps might be said to be defined in terms of a novel algorithm. The Examining Division appears to take the view that something defined in terms of an algorithm is inherently unpatentable. The appellants consider that although an algorithm per se might be excluded by Article 52(2) EPC, a process carried out in accordance with an algorithm is clearly not excluded by Article 52(2) EPC. A definition in terms of an algorithm is no different in principle from any other sort of technical definition of a process and Article 52(2) EPC provides no basis for discriminating between algorithmically based definitions and others, particularly in view of Article 52(3) EPC. What should determine patentability is the substance of what is being claimed, not its manner of definition.

Under Article 52(1) EPC, patents shall be granted for inventions which are (a) susceptible of industrial application, (b) are new and (c) involve an inventive step. The appellants sell a product covered by the claims of the application, and this clearly demonstrates that the present invention is susceptible of industrial application.

In the section on "Mathematical Methods" of the Guidelines for Examination (Part C, Chapter 4, page 24) it is stated:

"A mathematical method for designing electrical filters is not patentable; nevertheless filters designed according to this method could be patentable provided they had a novel technical feature to which a product claim can be directed."

A novel technical feature clearly exists in not only the hardware, but also in the method recited in the claims presented by this appeal. The invention furthermore confers a technical benefit namely a substantial increase in processing speed compared with the prior art.

Digital filtering in general and digital image processing in particular are "real world" activities that start in the real world (with a picture) and end in the real world (with a picture). What goes on in between is not an abstract process, but the physical manipulation of electrical signals representing the picture in accordance with the procedures defined in the claims. There is no basis in the EPC for treating digital filters differently from analogue filters.

The appellants have thus made a new and valuable contribution to the stock of human knowledge and patent protection for this contribution cannot be denied merely on the basis that the manner in which the invention is defined would appear to bring it within the exclusions of Article 52(3) EPC.

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The invention contemplates and adequately discloses to those skilled in the art the use of novel special hardware and method steps, and those technical features are found in the claims.

V In a communication of 30.09.85, the Rapporteur of the Board informed the appellants that if they were to amend their method claims so that these would relate to the digital processing of images in the form of a two-dimensional data array, the grant of a patent was conceivable. At the same time, it was indicated that the Board would probably remit the case to the Examining Division to deal with any requirements of the EPC which might not be met other than the allowability of the claims under Article 52(2) and 52(3) EPC.

VI The appellants thereupon filed amended Claims 1-12 on 11.11.85 and requested the grant of a European patent on the basis of these claims, Claims 1 and 8 of which read as follows:

1. A method of digitally processing images in the form of a two-dimensional data array having elements arranged in rows and columns in which an operator matrix of a size substantially smaller than the size of the data array is convolved with the data array, including sequentially scanning the elements of the data array with the operator matrix, characterised in that the method includes repeated cycles of sequentially scanning the entire data array with a

small generating kernel operator matrix to generate a convolved array and then replacing the data array as a new data array; the small generating kernel remaining the same for any single scan of the entire data array and although comprising at least a multiplicity of elements, nevertheless being of a size substantially smaller than is required of a conventional operator matrix in which the operator matrix is convolved with the data array only one, and the cycle being repeated for each previous new data array by selecting the small generating kernel operator matrices and the number of cycles according to conventional error minimisation techniques until the last new data array generated is substantially the required convolution of the original data array with the conventional operator matrix.

8. Apparatus for carrying out the method in Claim 1 including data input means (10) for receiving said data array, and said data array to generate an operator matrix for scanning said data array to generate the required convolution of the operator matrix and the data array, characterised in that there are provided feedback means (50) for transferring the output of the mask means (20) to the data input means, and control means (30) for causing the scanning and transferring of the output of the mask means (20) to the data input means to be repeated a predetermined number of times.

#### Reasons for the decision

1. The appeal complies with Articles 106 to 108 and Rule 64 EPC and is therefore admissible.
2. In the decision under appeal the Examining Division has held that the method of digitally filtering a two-dimensional data array (representing a stored image) according to Claim 1 which was submitted to the Examining Division was a

mathematical method because at least the characterising part of the claim would only add a different mathematical concept and would not define new technical subject-matter in terms of technical features. It was further considered that such claims concerned only a mathematical way of approximation of the transfer function of a two-dimensional finite impulse response (FIR) filter implemented by direct or conventional convolution. Finally, the Examining Division considered that digital image processing as such was just a calculation carried out on two-dimensional arrays of numbers (representing points of an image) using certain algorithms for smoothing or sharpening the contrast between neighbouring data elements in an array. Digitally filtering had therefore to be considered as a mathematical operation.

3. Although the question as to whether a method for image processing is susceptible of industrial application (Article 57 EPC) has not been explicitly raised in the procedure before the Examining Division it seems desirable to consider this issue first before addressing the point of allowability of the claims under Articles 52(2) and (3) EPC.

The Board's present view is that the question should be answered affirmatively.

Clearly a method for obtaining and/or reproducing an image of a physical object or even an image of a simulated object (as in computer-aided design/computer-aided manufacturing (CAD/CAM) systems) may be used e.g. in investigating properties of the object or designing an industrial article and is therefore susceptible of industrial application. Similarly, a method for enhancing or restoring such an image, without adding to its informational content, has to be considered as susceptible of industrial application within the meaning of Article 57 EPC.



However, the appellants' argument that the fact that they sell a computer incorporating some new hardware and/or software is proof of industrial applicability cannot be accepted insofar as the process carried out under the control of such hard-or software is concerned. Even though a computer is an industrial product it does not inevitably follow that a process carried out under its control is industrially applicable. It might, e.g., relate exclusively to a game.

4. The now effective method Claims 1-7 and 12 are directed to methods for digitally processing images. One basic issue to be decided in the present appeal is, therefore, whether or not such a method is excluded from patentability under Article 52(2) and (3) EPC on the ground that it is a mathematical method as such.
5. There can be little doubt that any processing operation on an electric signal can be described in mathematical terms. The characteristic of a filter, for example, can be expressed in terms of a mathematical formula. A basic difference between a mathematical method and a technical process can be seen, however, in the fact that a mathematical method or a mathematical algorithm is carried out on numbers (whatever these numbers may represent) and provides a result also in numerical form, the mathematical method or algorithm being only an abstract concept prescribing how to operate on the numbers. No direct technical result is produced by the method as such. In contrast thereto, if a mathematical method is used in a technical process, that process is carried out on a physical entity (which may be a material object but equally an image stored as an electric signal) by some technical means

implementing the method and provides as its result a certain change in that entity. The technical means might include a computer comprising suitable hardware or an appropriately programmed general purpose computer.

6. The Board, therefore, is of the opinion that even if the idea underlying an invention may be considered to reside in a mathematical method a claim directed to a technical process in which the method is used does not seek protection for the mathematical method as such.
7. In contrast, a "method for digitally filtering data" remains an abstract notion not distinguished from a mathematical method so long as it is not specified what physical entity is represented by the data and forms the subject of a technical process, i.e. a process which is susceptible of industrial application.
8. <sup>Rule</sup> ~~Article~~ 29(1) EPC requires that the claims shall be drafted "in terms of the technical features of the invention". The Board considers that this condition is met if the features mentioned in the claims will be understood by those skilled in the art as referring to the technical means for carrying out the functions specified by such features. If convenient, therefore, the use of mathematical expressions (addition, multiplication, convolution, logic conjunctions etc.) is admissible, the overriding requirements always being that the claim be clear and concise (Article 84 EPC) and that the person skilled in the art can understand what technical means are necessary from the description and/or his general knowledge of the field concerned (in order to comply with Article 83 EPC).

9. For all these reasons, the Board has come to the conclusion that the subject-matter of Claim 1 (and similarly that of the other method Claims 2-7 and 12) is not barred from protection by Articles 52(2)(a) and (3) EPC.
10. The Board will now consider the Examining Division's argument that the implementation of the claimed methods for image processing by a program run on a computer could not be regarded as an invention under Article 52(2)(c) and (3) EPC which seems tantamount to saying that a claim directed to such subject-matter would seek protection for a computer program as such.
11. The appellants have stressed that the application discloses new hardware for carrying out the claimed methods but admit on the other hand that at least in principle it is possible to implement the method and apparatus according to the application by a suitably programmed conventional computer although such a computer may not be optimized for carrying out digital image processing (cf. page A-2 of the Statement of Grounds).
12. The Board is of the opinion that a claim directed to a technical process which process is carried out under the control of a program (be this implemented in hardware or in software), cannot be regarded as relating to a computer program as such within the meaning of Article 52(3) EPC, as it is the application of the program for determining the sequence of steps in the process for which in effect protection is sought. Consequently, such a claim is allowable under Article 52(2)(c) and (3) EPC.
13. Concerning the apparatus Claim 8, the Examining Division has held that it is not acceptable because a new apparatus is not clearly disclosed. According to the decision under appeal, the claim when interpreted in the light of the

description and the drawings seems to imply only the use of a conventional computer which could not provide the basis of an acceptable product claim in view of Articles 52(1) and 54 EPC. The Board understands this as meaning that the Examining Division was of the opinion that a conventional computer programmed so as to carry out a method according to one or more of the method claims is not novel.

14. In the view of the Board, however, Article 54 EPC leaves no room for such an interpretation. A computer of known type set up to operate according to a new program cannot be considered as forming part of the state of the art as defined by Article 54(2) EPC.

This is particularly apparent in the present case as Claims 8-11 clearly embrace also the use of special hardware, for which some indications are given in the description and also mixed solutions combining some special hardware with an appropriate program.

15. In view of certain considerations by the Examining Division which appear to apply to the apparatus claims as well (cf. paragraph 10 above) it remains to be examined if the present apparatus Claim 8 would be objectionable under Article 52(2)(c) as qualified by (3) EPC. For reasons analogous to these given in paragraph 12 above, the Board holds that this is not the case and the same applies to the other apparatus Claims 9-11. Generally claims which can be considered as being directed to a computer set up to operate in accordance with a specified program (whether by means of hardware or software) for controlling or carrying out a technical process cannot be regarded as relating to a computer program as such and thus are not objectionable under Article 52(2)(c) and (3) EPC.

16. In arriving at this conclusion the Board has additionally considered that making a distinction between embodiments of the same invention carried out in hardware or in software is inappropriate as it can fairly be said that the choice between these two possibilities is not of an essential nature but is based on technical and economical considerations which bear no relationship to the inventive concept as such.

Generally speaking, an invention which would be patentable in accordance with conventional patentability criteria should not be excluded from protection by the mere fact that for its implementation modern technical means in the form of a computer program are used.

Decisive is what technical contribution the invention as defined in the claim when considered as a whole makes to the known art.

Finally, it would seem illogical to grant protection for a technical process controlled by a suitably programmed computer but not for the computer itself when set up to execute the control.

17. At least theoretically it could be questioned whether claims directed to apparatus for carrying out a certain function should be limited to the apparatus when indeed carrying out this function, which means in the present case that under the control of the program the computer steps through a succession of different configurations to effect operations on the electric signal representing the image. The Board, however, rejects this view as it would result in an undue limitation of the possibilities of the patent owner to assert his rights.

18. It may be mentioned in passing here that the computer program referred to on page 14, line 16 onwards of the description merely serves to calculate the element values of the small generating kernel and the weighting values. It does not form part of the image processing methods claimed, nor is it embodied in the apparatus claims. Indeed such a program would not be patentable in view of the Board's foregoing considerations.
19. In the course of the procedure, the Examining Division has also raised objections concerning the absence of inventive step and insufficient disclosure. The discussion on these matters between the Examining Division and the appellant does not seem definitely concluded.
20. In order not to deprive the appellants of an examination in two instances and in accordance with the request expressed by the appellants in the statement of grounds the Board deems it appropriate to remit the case to the Examining Division to deal with the said matters as it sees fit and to deal with any amendments which will be required to comply inter alia with the provisions of Articles 83 and 84 and Rules 27 and 29 EPC.


Order

For these reasons, it is decided that:

1. The decision of the Examining Division dated 13 April 1984 is set aside.

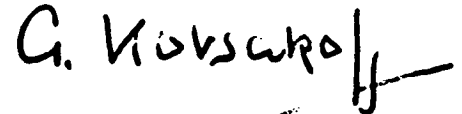
2. The case is remitted to the Examining Division for further prosecution on the basis of Claims 1-12 filed on 11 November 1985.

The Registrar



J. Rückerl

The Chairman



G. Korsakoff





Case Number: T 208 / 84

Correction order  
to the DECISION  
of the Technical Board of Appeal 3.5.1  
of 15 July 1986

**Appellant:** VICOM Systems Inc.  
2520 Junction Ave.  
San Jose  
USA California 95134-1989

**Representative:** Ayers, Martyn Lewis Stanley  
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**Decision under appeal:** Decision of Examining Division 058 of the European Patent  
Office dated 13.04.1984 refusing European patent  
application No 79 300 903.6 pursuant to Article 97(1)  
EPC

**Composition of the Board:**

Chairman: G. Korsakoff  
Member: J. van Voorthuizen  
Member: P. Ford



In accordance with Rule 89 EPC, the Decision is amended as follows:

Page 8, paragraph 8, line 1 now reads:

"Rule 29(1) EPC ....."

*B.A. Norman*

The Registrar

B.A. Norman

*G. Korsakoff*

The Chairman

G. Korsakoff