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Datasheet for the decision of 17 February 2016

Case Number: T 1997/11 - 3.2.02

Application Number: 04707376.2

Publication Number: 1703842

IPC: A61B8/14

Language of the proceedings: EN

Title of invention:
SYSTEM AND METHOD FOR DETERMINING A TRANSFER FUNCTION

Applicant:
THE CLEVELAND CLINIC FOUNDATION

Headword:

Relevant legal provisions:
EPC Art. 83
EPC R. 42(1)(e)

Keyword:
Sufficiency of disclosure (no)

Decisions cited:

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It can be changed at any time and without notice.

Catchword:

This datasheet is not part of the Decision.
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Case Number: T 1997/11 - 3.2.02

D E C I S I O N
of Technical Board of Appeal 3.2.02
of 17 February 2016

Appellant: (Applicant)	THE CLEVELAND CLINIC FOUNDATION 9500 Euclid Avenue Cleveland, OH 44195 (US)
Representative:	Boult Wade Tennant Verulam Gardens 70 Gray's Inn Road London WC1X 8BT (GB)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 24 March 2011 refusing European patent application No. 04707376.2 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	E. Dufrasne
Members:	M. Stern
	C. Körber

Summary of Facts and Submissions

I. The applicant lodged an appeal against the decision of the Examining Division, dispatched on 24 March 2011, refusing European application No. 04 707 376.2. The application was refused mainly because it was found not to comply with Articles 83 and 56 EPC.

II. Notice of appeal was filed on 26 May 2011 and the fee for appeal was paid the same day. A statement setting out the grounds of appeal was received on 3 August 2011.

The appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the main request or, in the alternative, of one of the first to third auxiliary requests, all filed with the letter dated 3 August 2011.

III. The Board summoned the appellant to oral proceedings and presented in an annexed communication dated 9 October 2015 its provisional opinion concerning sufficiency of disclosure (Article 83 EPC).

IV. In a letter dated 14 January 2016, the appellant informed the Board that it would not be attending the oral proceedings and that it did not intend to file any further written submissions.

V. Oral proceedings took place on 17 February 2016 in the absence of the appellant in accordance with Rule 115(2) EPC and Article 15(3) RPBA.

VI. The following documents are cited in the present decision:

D0: A. Nair and D.G. Vince: "'Blind' Data Calibration of Intravascular Ultrasound Data for Automated Tissue Characterization", 2004 IEEE International Ultrasonics, Ferroelectrics, and Frequency Control Joint 50th Anniversary Conference, Vol. 2, 23 August 2004, pages 1126-1129

D3: K.F. Kaaresen and E. Bolviken: "Blind Deconvolution of Ultrasonic Traces Accounting for Pulse Variance", IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control, Vol. 46, No. 3, May 1999, pages 564-573.

VII. Claim 1 of the different requests reads as follows:

Main request:

"An intravascular-ultrasound (IVUS) data-acquisition system, comprising
a catheter (120, 320) comprising at least one transducer (122, 322) and adapted to transmit an ultrasound signal and to receive a backscatter of said ultrasound signal; and
a computing device (110, 330) electrically connected to said catheter (120) and comprising a transfer-function application (114, 332) adapted to:
receive ultrasound data (Z) from said catheter, said ultrasound data being backscattered from vascular tissue;
estimate a transfer function (H) of said catheter and a first set of ultrasound response data (X) for said vascular tissue from said ultrasound data; and
calculate a final set of ultrasound response data for said vascular tissue from at least said estimated first set of ultrasound response data, said estimated transfer function, and said ultrasound data,

wherein the system is arranged to continuously estimate the transfer function for at least a portion of the time that the catheter is within a particular vascular structure."

First auxiliary request:

"An intravascular-ultrasound (IVUS) data-acquisition system, comprising
a catheter (120, 320) comprising at least one transducer (122, 322) and adapted to transmit an ultrasound signal and to receive a backscatter of said ultrasound signal; and
a computing device (110, 330) electrically connected to said catheter (120) and comprising a transfer-function application (114, 332) adapted to:
receive ultrasound data (Z) from said catheter, said ultrasound data being backscattered from vascular tissue;
estimate a transfer function (H) of said catheter and a first set of ultrasound response data (X) for said vascular tissue from said ultrasound data through use of the equation

$$Z = \sum_{i=1}^{I} X_i \, H_i + e$$

, wherein the transfer function (H) is estimated using a least-squares-fit algorithm after estimating the first set of ultrasound response data (Xest) by identifying a value for the first set of ultrasound response data that minimizes an error criteria; and
calculate a final set of ultrasound response data for said vascular tissue from at least said estimated first set of ultrasound response data, said estimated transfer function, and said ultrasound data, wherein said estimated transfer function (H) and said ultrasound data

(Z) are utilized to calculate a calculated response data (Xcal), and
wherein said calculated response data (Xcal) and said estimated first set of ultrasound response data (Xest) are utilized to calculate the final set of ultrasound response data (X),
the system being arranged to estimate the transfer function more than once during an acquisition of intravascular ultrasound by continuously estimating the transfer function for at least a portion of the time that the catheter is within a particular vascular structure."

Second auxiliary request:

"An intravascular-ultrasound (IVUS) data-acquisition system, comprising
a catheter (120, 320) comprising at least one transducer (122, 322) and adapted to transmit an ultrasound signal and to receive a backscatter of said ultrasound signal; and
a computing device (110, 330) electrically connected to said catheter (120) and comprising a transfer-function application (114, 332) adapted to:
receive ultrasound data (Z) from said catheter, said ultrasound data being backscattered from vascular tissue;
estimate a transfer function (H) of said catheter and a first set of ultrasound response data (X) for said vascular tissue from said ultrasound data; and
calculate a final set of ultrasound response data for said vascular tissue from at least said estimated first set of ultrasound response data, said estimated transfer function, and said ultrasound data,
wherein said computing device further comprises:

a database (336) adapted to store a plurality of parameters corresponding to a plurality of vascular tissue types; and
a characterization application (334) electrically connected to said database and said transfer-function application (332) and adapted to:
receive said final set of ultrasound response data (X);
transform said final set of ultrasound response data into the frequency domain;
analyze said transformed signal for a plurality of identifiable parameters; and
use said plurality of identifiable parameters and at least a portion of said plurality of parameters stored in said database to characterize at least a portion of said vascular tissue."

Third auxiliary request:

"An intravascular-ultrasound (IVUS) data-acquisition system, comprising
a catheter (120, 320) comprising at least one transducer (122, 322) and adapted to transmit an ultrasound signal and to receive a backscatter of said ultrasound signal; and
a computing device (110, 330) electrically connected to said catheter (120) and comprising a transfer-function application (114, 332) adapted to:
receive ultrasound data (Z) from said catheter, said ultrasound data being backscattered from vascular tissue;
estimate a transfer function (H) of said catheter and a set of estimated ultrasound response data (X_{est}) for said vascular tissue from said ultrasound data (Z);
calculate a set of calculated ultrasound response data (X_{cal}) for said vascular tissue from at least said

estimated transfer function (H) and said ultrasound data (Z); and
calculate a final set of ultrasound response data (X) for said vascular tissue from at least said set of estimated ultrasound response data (X_{est}), and said set of calculated ultrasound response data (X_{cal}),
wherein the system is arranged to continuously estimate the transfer function for at least a portion of the time that the catheter is within a particular vascular structure."

VIII. The arguments presented by the appellant which are relevant for the present decision may be summarised as follows:

In the same way as the skilled person would have implemented the invention given documents D0 and D3, he could have implemented it given the application description and having D3 available as part of the common general knowledge. D3 was part of the common general knowledge since it was an article published in the widely known journal "IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control". As such, it would have been readily available to the skilled person as part of his common general knowledge. From the case law of the Boards of Appeal it followed that information found, for example, in academic journals could also form part of the common general knowledge, depending on the circumstances.

Reasons for the Decision

1. The appeal is admissible.

2. *Sufficiency of disclosure (Article 83 EPC)*

2.1 The appellant argued in the statement of grounds of appeal that the skilled person could have implemented the invention given the application description and having D3 available as part of his common general knowledge.

2.2 Hence, the first question to answer is whether D3 forms part of the common general knowledge of the skilled person in the field of blind deconvolution. The Board considers that this is not the case for the following reasons.

2.2.1 Document D3 is a scientific article referring to blind deconvolution of ultrasonic pulses for non-destructive evaluation of an object. As indicated in the decision under appeal with reference to established jurisprudence (Case Law of the Boards of Appeal, 6th edition 2010, I.C.1.5), the common general knowledge is normally represented by encyclopaedias, textbooks, dictionaries and handbooks. Only by way of exception, patent specifications and scientific publications have been considered to form part of the common general knowledge, e.g. if the field of research was so new that technical knowledge was not yet available from textbooks. Blind deconvolution is however by no means a new field of research, a fact which is not in dispute. Indeed, the appellant during the first-instance proceedings cited numerous other scientific publications dealing with blind deconvolution algorithms (referred to as D15 to D24), and a monograph was filed with the statement of grounds of appeal likewise showing that blind deconvolution is well known.

2.2.2 Among the wealth of publications dealing with blind deconvolution algorithms, D3 may be relevant merely in order to explain certain specific aspects of the algorithm with which the present application is concerned. In fact, D3 could only have been found as a result of a comprehensive search among the many specialised scientific publications in the field.

2.2.3 The Board therefore concludes that D3 does not reflect the common general knowledge of the skilled person in the field of blind deconvolution.

2.3 In these circumstances, the next question to answer is whether the skilled person could have implemented the invention on the basis of the application alone using common general knowledge in the field of blind deconvolution.

2.3.1 In the claimed invention (of all requests), a final set of ultrasound response data for the vascular tissue is calculated from (at least) the estimated first set of ultrasound response data (X_{est}), the estimated transfer function, and the (received) ultrasound data (Z).

2.3.2 The description of the application fails to describe at least one example of how this calculation is carried out, as required by Rule 42(1)(e) EPC.

The description dedicates just three lines (on page 8, lines 7 to 10) to describing how the estimate of X (X_{est}) and the estimate of the transfer function H is obtained. It indicates that the algorithm of the invention searches first for an estimate of X (X_{est}) that minimizes a certain error criteria. This criteria measures the differences between the observed data (Z)

and the fitted model. Then H is estimated by a least-squares-fit algorithm.

2.3.3 It is pertinent to compare the present application to D0, an even more detailed publication by some of the inventors (with a publication date after the priority date) on how the present invention is implemented. Therein the authors explain (in the two first paragraphs of page 1128) that H is obtained in an iterative maximization estimation, and they refer the reader to citation [5] - which is document D3 - to obtain there the necessary details of the algorithm. D0 mentions a further particularly relevant aspect of the algorithm, i.e. the introduction of a cost function incorporating a penalty term which favours solutions with as few non-zero data X_i as possible, hence ensuring sparse reflectivity as occurs in intravascular ultrasound backscatter measurements (D3, page 564, right column, first portion of the third paragraph). Moreover, the appellant highlighted in the statement of grounds of appeal (point 4.3) the fact that D3 stresses that "sparsity of the reflectivity is fundamental to the approach" (page 572, last full paragraph of the left column; abstract; page 564, right column, second full paragraph; page 566, left column, last paragraph). Hence, according to D3, starting from the last paragraph on page 566, standard sparse matrix techniques are to be used. In section C of D3 these are applied to obtain the iterative estimate of H_i (h_i in D3).

It is therefore clear that without the reference to D3 in D0 the reader of D0 would not have been able to reproduce the blind deconvolution algorithm of D0.

Likewise, since the application omits all the detailed and complex aspects of the algorithm described in D0 in

combination with D3, the skilled person would not have been in a position to carry out the invention using just standard mathematical skills.

2.4 As a consequence, the Board finds that the application does not disclose the invention in a manner sufficiently complete for it to be carried out by a person skilled in the art, as required by Article 83 EPC.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

D. Hampe E. Dufrasne

Decision electronically authenticated