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FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL,
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Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a
patent (Rule 4.17(U))
- of inventorship (Rule 4.17(iv))

Published:

- with international search report

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27 November 2008

(54) **Title:** APPLICATIONS OF SCALING LAWS OF TREE STRUCTURES

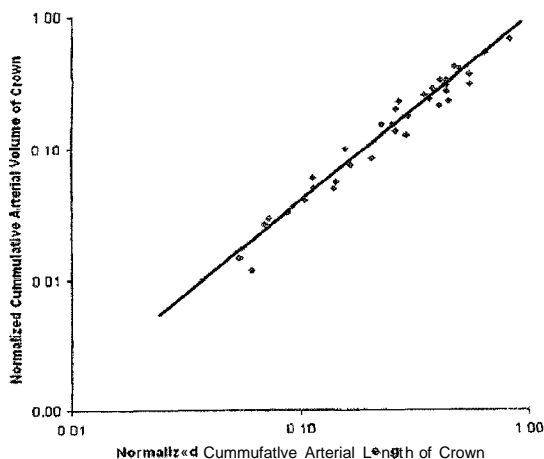


FIG. 1

(57) **Abstract:** In at least one embodiment, a method for diagnosing vascular disease is provided, the method comprising the steps of obtaining a vessel image showing a vasculature of a vessel, identifying at least two measurements from the vasculature of the vessel, the measurements relating to at least two parameters, calculating a relationship between the at least two parameters from the at least two measurements to generate one or more vasculature data points, and comparing the one or more vasculature data points to data relative to a model vasculature to determine the extent of vascular disease. In another embodiment, a method for diagnosing vascular disease in a patient's vascular tree is provided, the method comprising the steps of generating a model vascular tree from a minimum energy hypothesis calculation, and comparing the patient's vascular tree with the model vascular tree to determine the extent of vascular disease.

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INTERNATIONAL SEARCH REPORT

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A CLASSIFICATION OF SUBJECT MATTER
IPC(8) - A61 B 5/00; G06F 19/00 (2008.04)
USPC - 600/481: 702/19
According to International Patent Classification (IPC) or to both national classification and IPC

B FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
IPC(8) - A61B 5/00, G06F 19/00 (2008 04)
USPC - 600/481 , 702/19

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PubW@st; US Pat, US PGPUB, US OCR, EPO, JPO, Google Scholar, IEEE org (IEEE Explorer Journals and Proceedings), Keywords vessel, vein, artery, arterial, venous, vascular, vasculature, computed tomography, magnetic resonance, angiography, cross section area, length diameter, flow rate, volumetric

C DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No
X --- Y	US 7,069,068 B1 (Ostergaard) 27 June 2006 (27 06 2006) col 2, ln 43-49, col 4, ln 1-8, col 4, ln 13-18, col 6, ln 49-65, col 9, ln 24-60, col 10, ln 35-44, col 13, ln 35 - col 14, ln 4, col 28, ln 3-8	1, 2 and 14-15 ----- 3-13 and 31-47
Y	US 6,261,233 B1 (Kantorovich) 17 July 2001 (17 07 2001) col 15, ln 55 - col 16, ln 6, col 17, ln 43 - col 18, ln 5	3-13, 18-28, 31-47 and 50-60
X --- Y	US 2006/0235669 A1 (Charbel et al) 19 October 2006 (19 10 2006) para [0082], [0086], [0088], [0095], [0096], [0102], and [0120], [0139], and [0146], FIG 2	16, 17, 29, 30, 48, 49, and 61-64 ----- 18-28 and 50-60

D Further documents are listed in the continuation of Box C

- Special categories of cited documents
- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed
- "P" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search 21 August 2008 (21 08 2008)	Date of mailing of the international search report 29 AUG 2008
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Name and mailing address of the ISA/US Mail Stop PCT, Attn ISA/US, Commissioner for Patents P O Box 1450, Alexandria, Virginia 22313-1450 Facsimile No 571-273-3201	Authorized officer Lee W Young PCT H@pdask 571-272-4300 PCTOSP 571-272-7774
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Box Nn II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons

- 1 Claims Nos 65-66
because they relate to subject matter not required to be searched by this Authority, namely
- Claims 65-66 are directed to a program per se, which is nothing more than a mere presentation of information as it is not tangibly embodied in a computer readable medium. This subject matter is not subject to search by this ISA as per Rule 39 1(v)
- 2 **D** Claims Nos
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically
- 3 **D** Claims Nos
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6 4(a)

Box No III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13 1. In order for all inventions to be examined, the appropriate additional examination fees must be paid

Group I claims 1-64 directed to a method and system for diagnosing vascular disease

Group II claims 67-79, directed to a method to design an energy efficient microfluidic device

- Please see extra sheet for continuation -

- 1 As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims
- 2 As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees
- 3 As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos
- 4 No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims, it is covered by claims Nos 1-64

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation
- No protest accompanied the payment of additional search fees

Continuation of Box III

The inventions listed as Groups I - II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

The special technical feature of the Group I claims is a method and system for diagnosing vascular disease not shared by the claims of Group II. The special technical feature of the Group II claims is a method to design an energy efficient microfluidic device - not shared by the claims of Group I. Neither of these special technical features is common to the other group, nor do they correspond to a special technical feature in the other group.

The only common technical element shared by the above groups is that they are related to measuring and calculating parameters relating to vessels in which fluids may flow. Therefore, the inventions of Group I and Group II lack unity of invention under PCT Rule 13 because they do not share a same or corresponding special technical feature.