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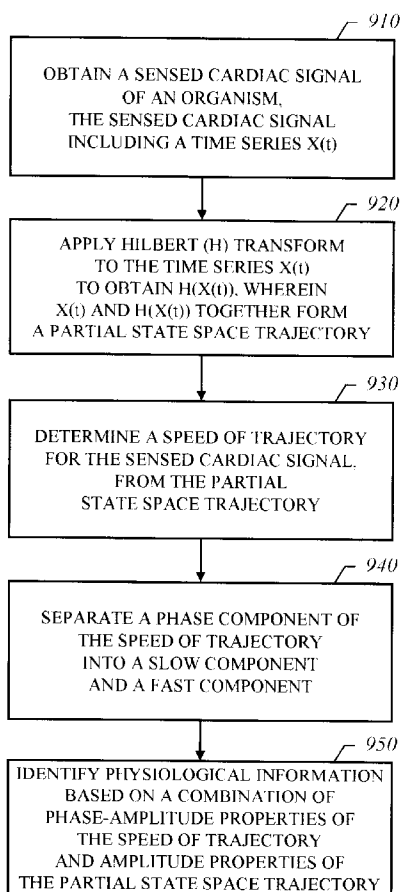
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[Continued on next page]

(54) Title: AUTOMATED ANALYSIS OF A CARDIAC SIGNAL BASED ON DYNAMICAL CHARACTERISTICS OF THE CARDIAC SIGNAL



(57) Abstract: Systems and techniques relating to locating cardiac wave forms in a cardiac signal, and to detecting a physiological condition, such as ventricular fibrillation. In general, in one aspect, a machine-implemented method includes obtaining a sensed cardiac signal of an organism, the sensed cardiac signal comprising a time series $x(t)$; applying a Hilbert (H) transform to the time series $x(t)$ to obtain $H(x(t))$, wherein $x(t)$ and $H(x(t))$ together forming a partial state space trajectory; determining a speed of trajectory, for the sensed cardiac signal, from the partial state space trajectory; and identifying physiological information concerning the organism based on a combination of first and second signal elements, the first signal element including a phase property or an amplitude property of the speed of trajectory, and the second signal element including an amplitude property of the partial state space trajectory.

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— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2007/063916

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61B5/04

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)
A61B

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 practical, search terms used)
EPO-Internal, EMBASE, INSPEC, BIOSIS, COMPENDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 03/071945 A (ST JUDE MEDICAL [SE]; NOREN KJELL [SE]) 4 September 2003 (2003-09-04) abstract page 4, line 17 - page 11, line 2 claims 1,6,15,16,24	1,3,13, 16,17, 20,21
P,A	WO 2006/044919 A (CARDIONET INC [US]; KORZINOV LEV [US]; KREMLIOVSKY MICHAEL [US]) 27 April 2006 (2006-04-27) the whole document	1,13,21
A	BENITEZ D., GAYDECKI P.A., ZAIDI A, FITZPATRICK A.P.: "The use of the Hilbert transform in ECG" COMPUTERS IN BIOLOGY AND MEDICINE, vol. 31, no. 5, 2001, pages 399-406, XP008089586 the whole document	1,13,21

Further documents are listed in the continuation of Box C.

See patent family annex.

* 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 document 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

- *T* 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.
- *Z* document member of the same patent family

Date of the actual completion of the international search 25 March 2008	Date of mailing of the international search report 03/04/2008
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer Cornelissen, P

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2007/063916

Box No. 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.: 10-12
because they relate to subject matter not required to be searched by this Authority, namely:
Rule 39.1(iv) PCT - Diagnostic method practised on the human or animal body
2. 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. 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:

1. As all required additional search fees were timely paid by the applicant, this international search report covers allsearchable claims.
2. As all searchable claims could be searched without effort justifying an 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.:

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.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2007/063916

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
WO 03071945	A	04-09-2003	EP	1480556 A1	01-12-2004
			US	2005107836 A1	19-05-2005

WO 2006044919	A	27-04-2006	AU	2005295313 A1	27-04-2006
			CA	2584503 A1	27-04-2006
			EP	1802230 A2	04-07-2007
			US	2006084881 A1	20-04-2006
