STRUMENTI DI SOSTEGNO E FINANZIAMENTO PER LA TUTELA DEI SOFTWARE E NOMI A DOMINIO

Protezione e valorizzazione economica

Cuneo - Mercoledì 5 ottobre 2016, ore 9.45
Camera di commercio, Salone d'Onore - Via Emanuele Filiberto 3, Cuneo

Dall'invenzione al brevetto

Stéphane Chauvie

Stéphane Chauvie

co-founder of

dIXit

responsabile ff della

SC Fisica Sanitaria

Ospedale Santa Croce e Carle, Cuneo

a spin-off of

UNITO

INFN

born on Mar 4th, 2011

Team

Management

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10+ years of SW development

1 start up

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Head of Nuclear Medicine Unit, S. Croce e Carle Hospital, Cuneo

Dr. G. Barra

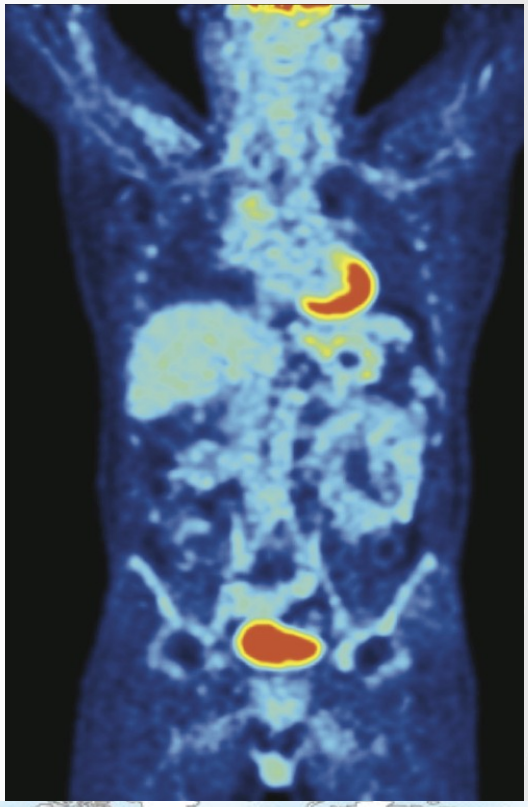
Senior Executive

Medical Imaging in Clinical Trials

Imaging in Clinical Trials

Medical Imaging:

- *diagnosi*
- *stadiazione*
- *risposta alla terapia*
- *follow-up*



Ogni farmaco o nuova tecnologia prima di arrivare al paziente deve essere testata in un

trial clinico

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TM

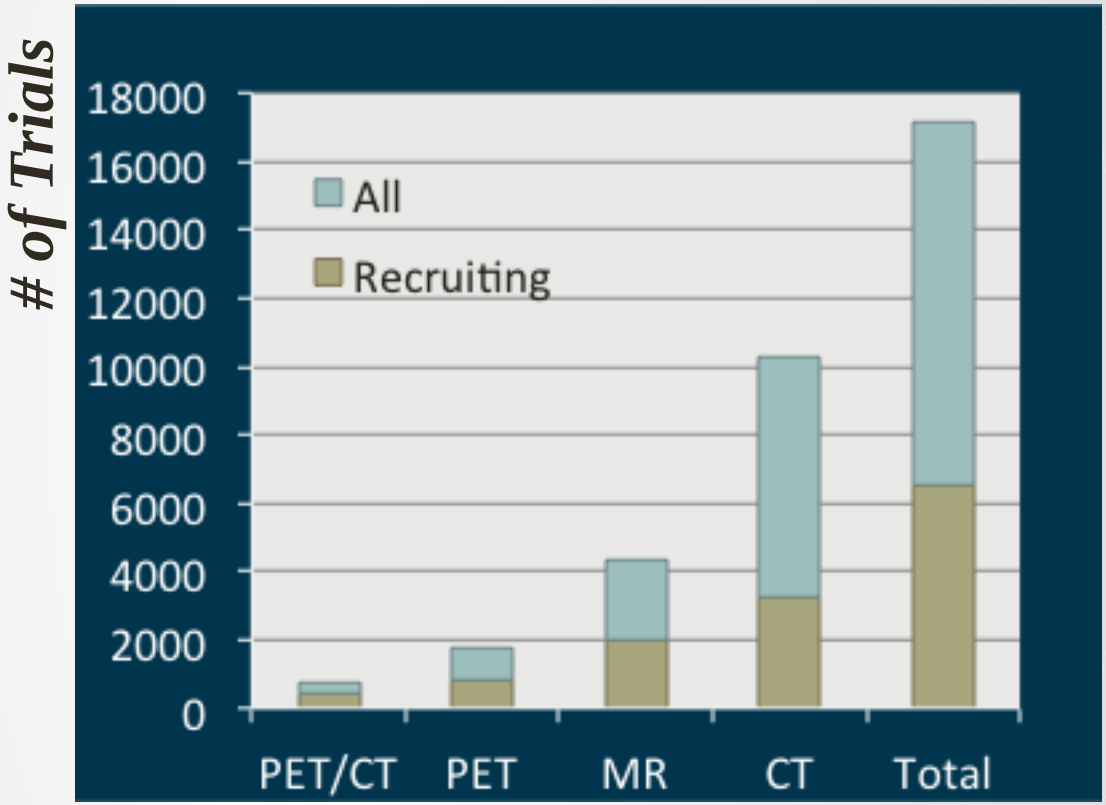
www.widen.it

e' una piattaforma per lo scambio, la verifica, la revisione, il management, l'analisi di immgini in clinical trials

ma e' soprattutto un

prodotto commerciale

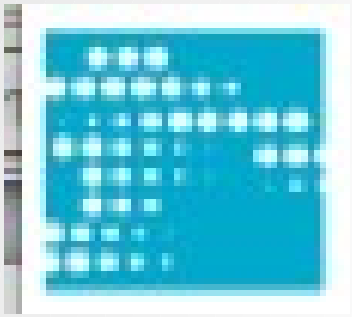
1. Market



Clienti: gruppi cooperativi e industrie farmaceutiche

II Customers

III Competitors



Societa' di Imaging

CoreLab PARTNERS

ICON

WorldCare Clinical
A ProScan Imaging Company

Contact Research Organization

KEOSYS
Medical Imaging

ICT provider only

IV. Competitive Advantages

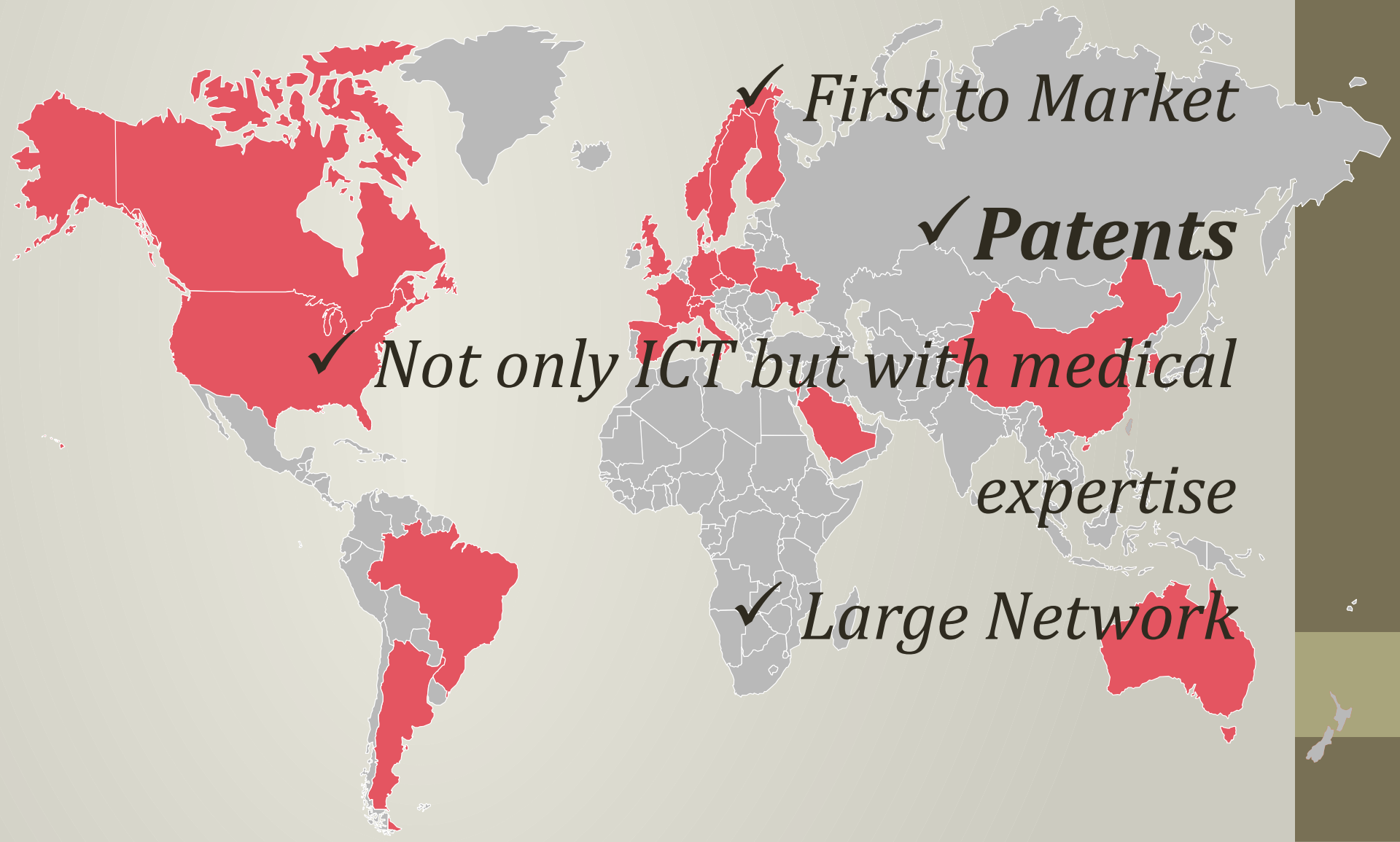
Time/Cost Saving

No hardware/software requirements on Trial Sites

Quality Assurance

- *Medical Expertise, not just ICT provider*
- *Common standard PET Scanner Calibration*
- *Custom Real time Imaging Quality Assessment*
- *Custom Real time metaData/Image Analysis*

V. Barriers to Competition



✓ *First to Market*

✓ ***Patents***

✓ *Not only ICT but with medical expertise*

✓ *Large Network*

What is a patent?

- A patent is the right to exploit an invention

  - NO!

- *ius excludendi alios:* the right to **exclude others** from making, using, selling or importing an invention. It confers no enabling right.

Myth - IP is just for (large) companies

Patent Attack Plan

- 1) software
  - to cover an unsettled issue
- 2) hardware
  - a phantom and its analysis
- 3) business method (US only)
  - deprecated
- 4) algorithm
  - what is today about

Smart search
Advanced search
Classification search

Quick help

- Can I subscribe to an RSS feed of the result list?
- What does the RSS reader do with the result list?
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4 results found in the Worldwide database for:
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Sort by Upload date | Sort order Descending | Sort

1. METHOD FOR THE AUTOMATIC RECOGNITION OF ANATOMICAL STRUCTURES IN IMAGES OBTAINED BY POSITRON EMISSION TOMOGRAPHY, SYSTEM AND COMPUTER PROGRAM FOR PERFORMING SAID METHOD

Inventor:	Applicant:	CPC:	IPC:	Publication info:	Priority date:
BERTONE ELISA [IT] CERELLO PIERGIORGIO [IT] (+3)	DIXIT S R I [IT]	A61B6/037 A61B6/50 G06T2207/10104 (+5)	A61B6/00 A61B6/03 G06T7/00 (+1)	US2016055633 (A1) 2016-02-25	2013-04-17

2. PHANTOM AND METHOD FOR VERIFYING THE CALIBRATION OF PET SCANNERS

Inventor:	Applicant:	CPC:	IPC:	Publication info:	Priority date:
CERELLO PIERGIORGIO [IT] CHAUVIE STEPHANE [IT] (+2)	DIXIT S R L [IT]	A61B6/037 A61B6/583 G01T7/005	G01T7/00	US2015212219 (A1) 2015-07-30	2012-08-10

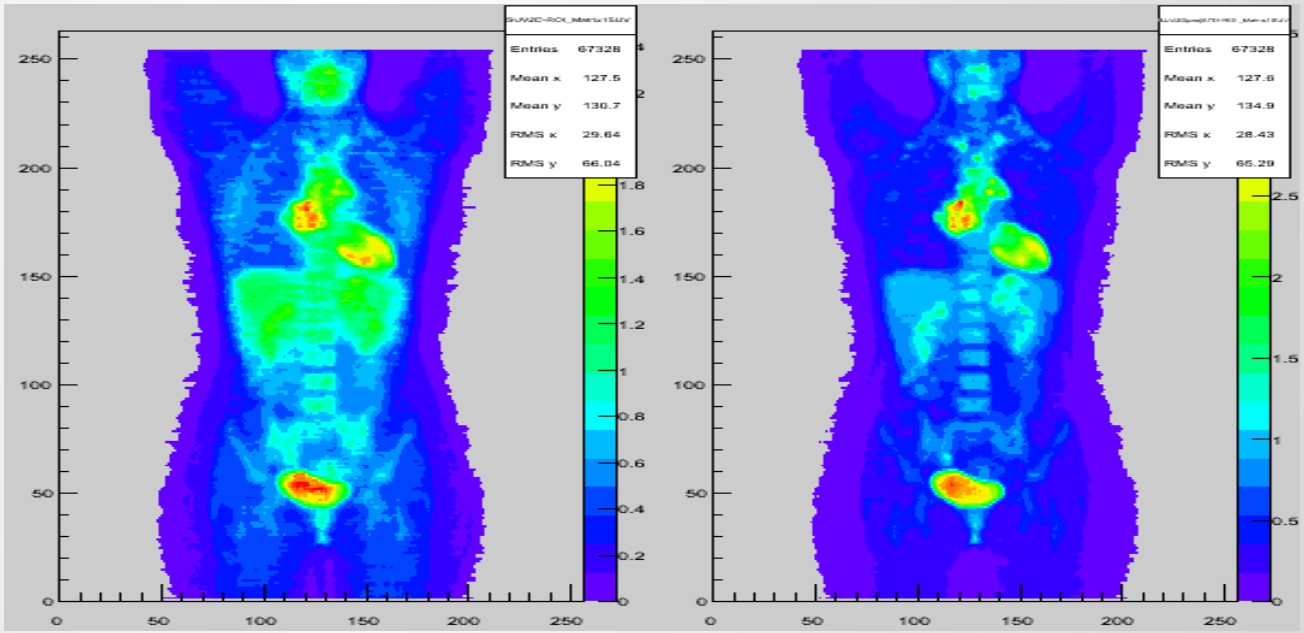
3. Method And System For Clinical Trial Management

Inventor:	Applicant:	CPC:	IPC:	Publication info:	Priority date:
CERELLO PIERGIORGIO [IT] CHAUVIE STÉPHANE [IT] (+2)	DIXIT S R L [IT]	G06F19/363 G06Q10/00 G06Q50/22	G06F19/00 G06Q10/00 G06Q50/22	US2014222444 (A1) 2014-08-07	2013-02-04

4. METODO DI TRATTAMENTO DI DATI RELATIVI A IMMAGINI MEDICALI

Inventor:	Applicant:	CPC:	IPC:	Publication info:	Priority date:
CERELLO PIERGIORGIO CHAUVIE STEPHANE (+2)	DIXIT S R L	G06F19/321 G06T1/0007		ITTO20120699 (A1) 2014-02-04	2012-08-03

Algoritmo per l'identificazione delle strutture anatomiche e funzionali in immagini PET/CT



Refertazione di un esame PET

Analisi visiva: il medico analizza l'immagine identificando possibili regioni patologiche basandosi su un eccessivo accumulo di attività

Analisi semi-quantitativa: si confrontano i conteggi delle zone indicate dal medico con i conteggi in zone di riferimento; ad es fegato e MBPS

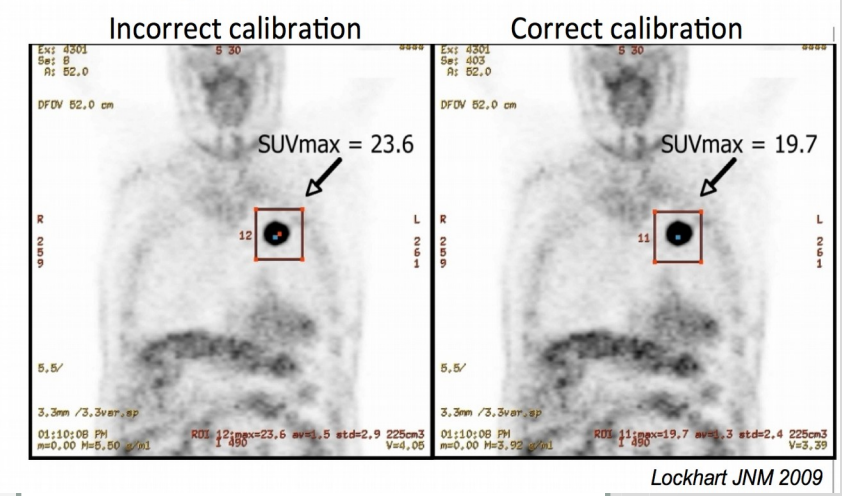
$$SUV = \frac{[A_{misurata}(Bq/ml)]}{A_{iniettata}(Bq)/peso(g)}$$

Analisi quantitativa: si assegna alla regione analizzata un valore che permetta di stabilire se si tratti di malattia oppure di tessuto sano

PET quantitativa

Molti fattori che influiscono sul SUV

1. Attività iniettata
2. Sincronizzazione degli orologi
3. Peso del paziente
4. Tempo di uptake
5. Attività residua
6. Stravasi
7. Scanner PET
8. Ricostruzione delle immagini
9.....



Lockhart JNM 2009

Inter-calibrazione degli scanner PET

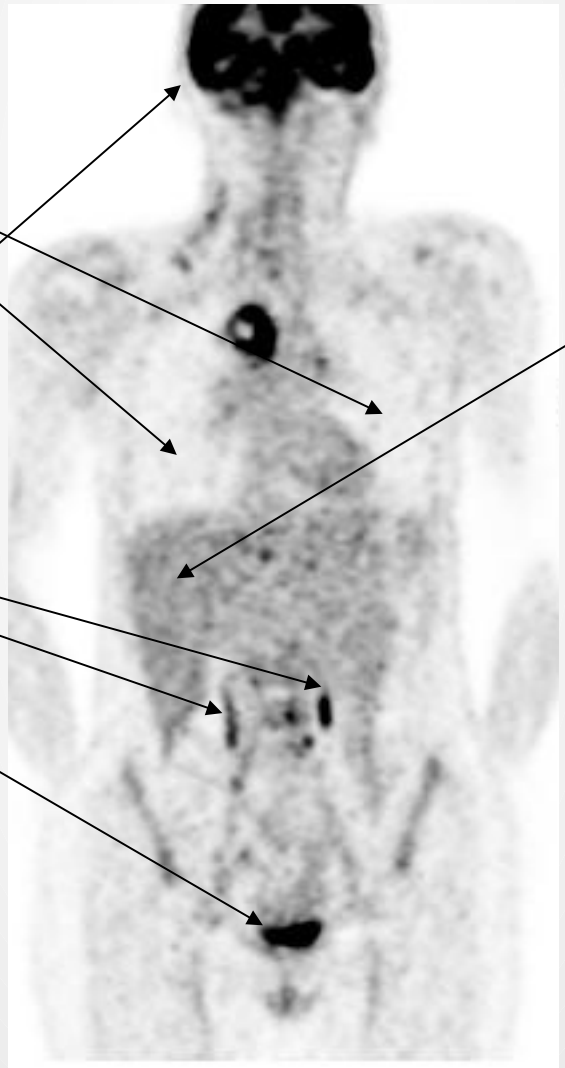
Patented

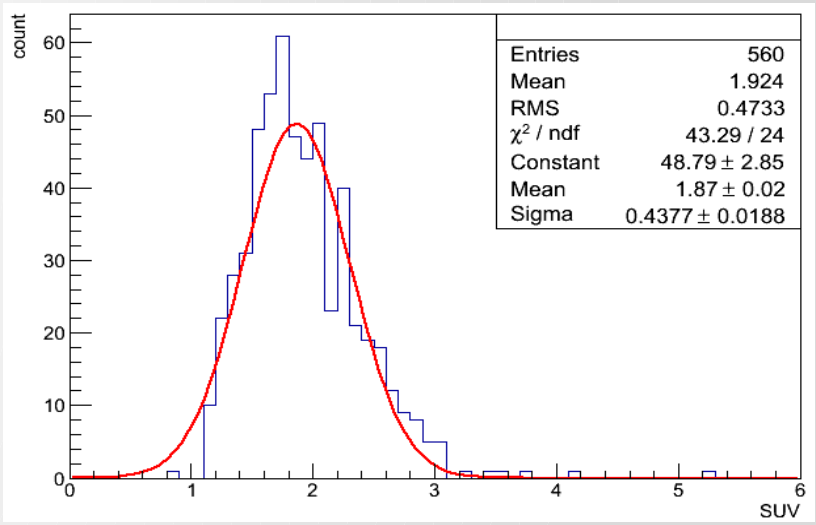
Verifica in tempo reale della qualita' dell'immagine

Patented

Verifica in tempo reale della qualita' dell'immagine

Controllo *di qualità usando riferimenti interni*





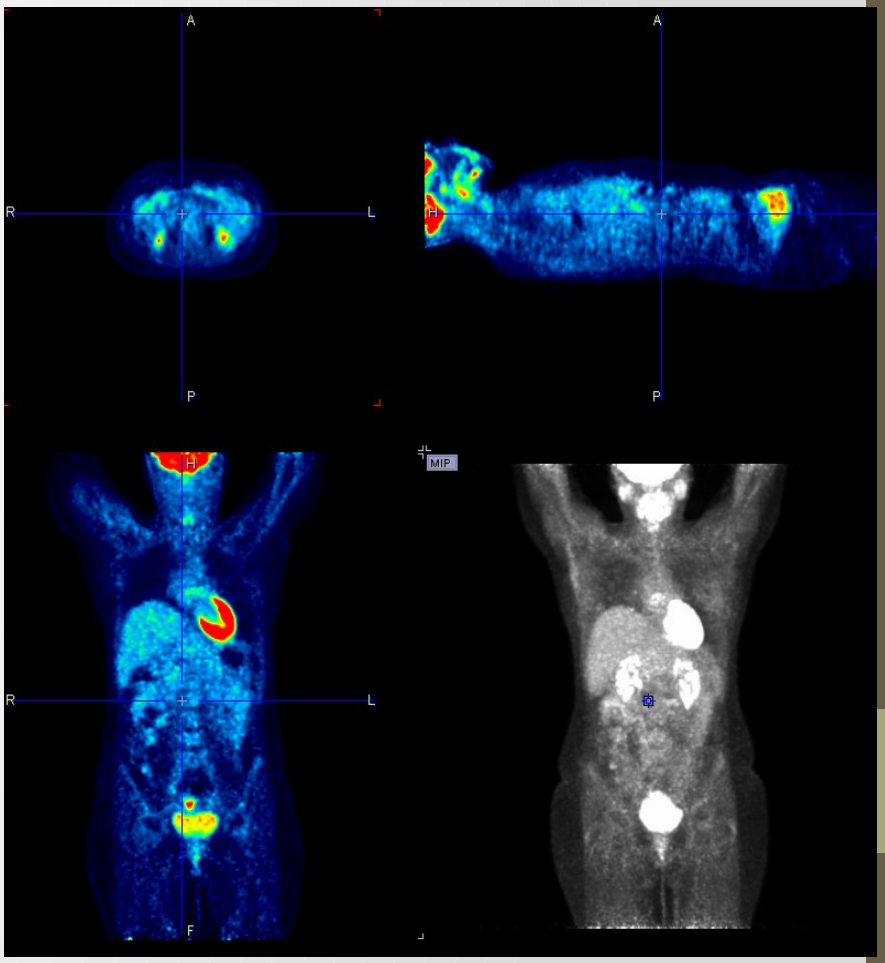
Il fegato è un organo riproducibile

Obiettivo: identificare in modo automatico il fegato in immagini PET

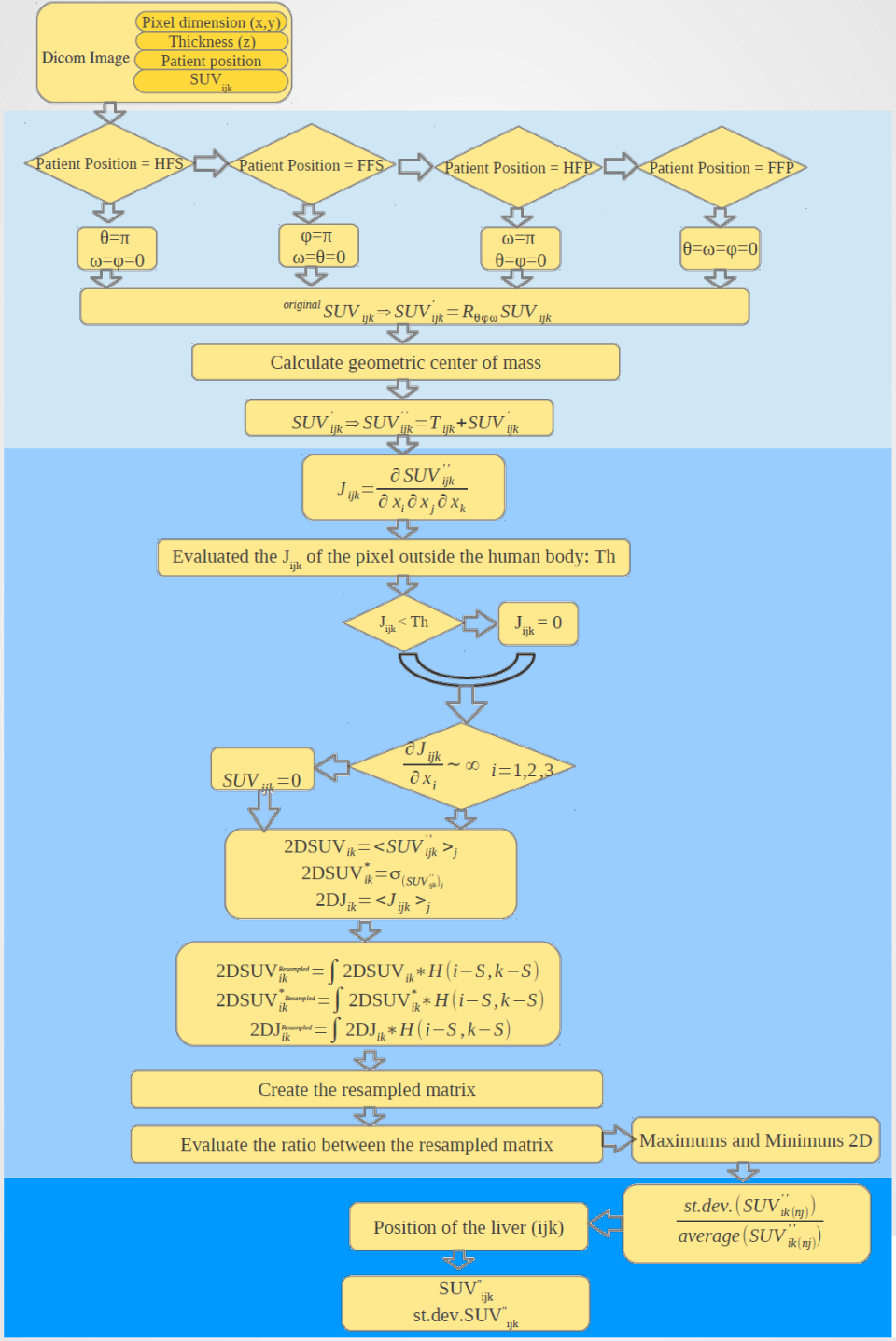
Come si può identificare il fegato?

Il fegato è una delle regioni:

- *più estese*
- *più omogenee*
- *nella parte destra del corpo*
- *intorno al baricentro*



L'algoritmo

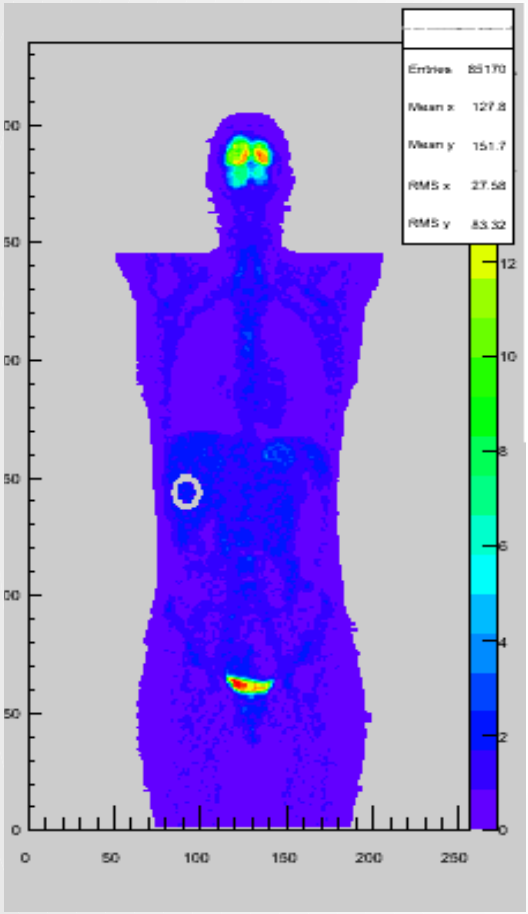


Trasformazioni geometriche

Ricerca della posizione del fegato 2D

Ricerca della posizione del fegato 3D

L'algoritmo:



- ha una sensibilità del 98.4% nell'identificare la posizione del fegato
- ha una precisione maggiore del 95% nell'estrarre il SUV del fegato
- è veloce e robusto

Ma e' brevettabile?

Patent Requirements

A patentable invention must be:

1. Novel/New (Not already been disclosed to the public)
2. Non obvious/Containing an inventive step
3. Useful/be susceptible of industrial application

Patent Requirements: 1. Novel/New

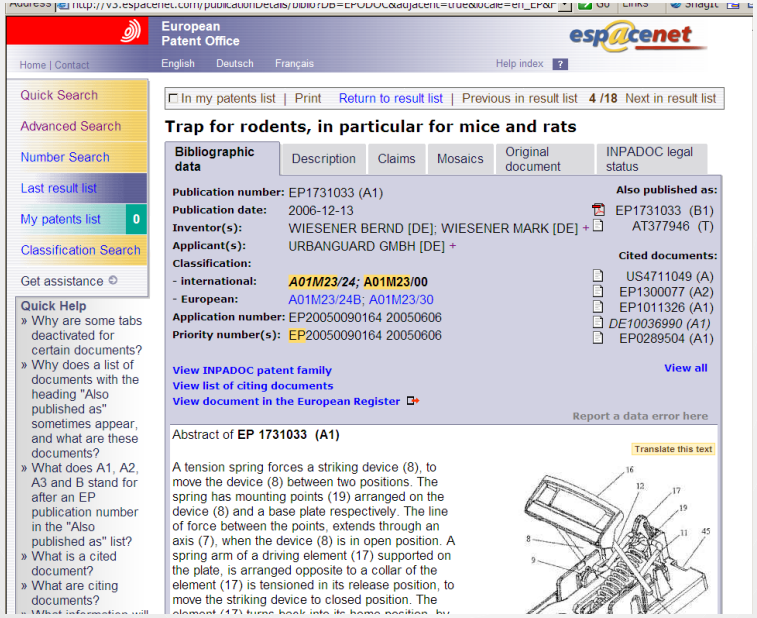
- New in relation to that which is known prior to the date of filing the application
  - Known = general availability through the written word (publications), spoken word (lectures to congress, etc.), usage, etc.

- What is known prior can include public information that is available anywhere in the world

New? Perform a patent search

- Patent information is an invaluable source of research information; much of what appears in patents does **not** appear in academic and technical journals
  - Data is publicly available (e.g. http://ep.espacenet.com/)

- Most of what is published in patents is **not** protected, and is therefore free to use (many patent are abandoned, refused or expired)



http://www.epo.org/patents/patent-information/free/espacenet.html

New? Perform a prior search

- *Known:*
  - *Literature*
  - *Congress*
  - *Demo*
  - *Internet (e.g. facebook!!!!)*

Le due facce del known:
quello che hanno fatto gli altri e quello che hai fatto tu!!!

NDA con tutti!

Patent Requirements: 2. The Inventive Step

- It is considered to be an inventive step if it solves a technical problem in a non-obvious way
- Non-obvious is in relation to a person skilled in the same field as the invention
- The skilled person is an **average expert**, not as expert as the inventor

Patent Requirements: 3. Industrial Application

- The invention must have at least one practical purpose (e.g. industrial application) and must be reproducible
  - No evaluation of quality or economical factors!
  - Only the technical qualities are relevant

Patent Sections

- Field of the Invention
- Background of the Invention (Prior Art)
- Summary of the Invention
- Description of the Drawings
- Detailed Description of the Invention (Specification)
- **Claims**
- Drawings or Figures (first in US)

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(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
23 October 2014 (23.10.2014)

WIPO | PCT

(10) International Publication Number
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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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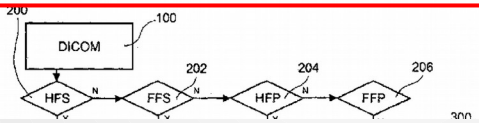
[Continued on next page]

(54) Title: METHOD FOR THE AUTOMATIC RECOGNITION OF ANATOMICAL STRUCTURES IN IMAGES OBTAINED BY POSITRON EMISSION TOMOGRAPHY, SYSTEM AND COMPUTER PROGRAM FOR PERFORMING SAID METHOD



(57) Abstract: A method is described for automatic recognition of anatomical structures in images obtained by positron emission tomography, comprising the steps of: - acquiring a 3D matrix of standardized uptake values, SUVs, associated

- Patent number
- Filing date
- Owner
- Potential countries
- Priority date
- Inventor(s)
- Title
- Abstract

Field of the Invention

FIELD OF TECHNOLOGY

[0001] The present invention relates to diagnostic investigation techniques for images and more specifically it relates to a method for automatic recognition of anatomical structures in images obtained by positron emission tomography.

Evidenziare il contesto in cui si muove il brevetto specificando quale bisogno va a coprire

NB: For the patent validity the invention has to be described in a manner which enables a person skilled in the art to perform the invention

Background of the Invention

BACKGROUND

[0002] Positron emission tomography is a non-invasive diagnostic investigation technique for images, based on acquisition of images of the body (or of an anatomical region being examined) of a patient who has been administered a radiopharmaceutical including a tracer radionuclide with short half-life, which is a positron emitter, bound to biologically active vector molecules. The images are acquired using suitable equipment (PET, Positron Emission Tomography, scanner) that detects pairs of gamma photons, originating from the annihilation of the positrons emitted with electrons.

Specificare qual'e' l'ambito in cui si muove il brevetto evidenziando gli elementi necessari ad individuare quale siano le mancanze della prior art che hanno portato gli inventori a proporre il brevetto.

Summary of the Invention

SUMMARY

[0004] The present invention generally relates to images obtained by positron emission tomography independently of the type of tracer/radiopharmaceutical that is used. By way of example, fluorodeoxyglucose positron emission tomography (FDG-PET) is a special technique of diagnostic investigation for images of the body of a patient who has been administered a positron-emitting radionuclide bound to biologically active molecules of FDG, for the purpose of studying their metabolic processes in tissues. This investigational technique has excellent diagnostic accuracy and is used in particular in oncology for staging, restaging and follow-up of numerous oncologic diseases.

[0005] The intensity of a patient's metabolic activity can be measured by an index called SUV (Standardized Uptake Value), which essentially represents the ratio of the concentration of the radioactivity in the tissue (organ) under examination to the total radioactivity administered, for every pixel or for a region of interest in an image.

[0006] The SUV is defined by the following expression:

[mathematical formula]

where:

[0007] APET is the concentration of radioactivity in the tissues at the time t of acquisition of the PET images (expressed in MBq/kg) and is measured directly by a PET scanner in a manner known per se;

[0008] Ainj is the dose of radiopharmaceutical (expressed in MBq) administered to the patient and measured at the moment of administration by means of a dose calibrator known per se;

Esporre i concetti necessari a capire il contesto, la terminologia, le definizioni, etc… in cui si inserisce il brevetto.

Deve essere esaustivo, l'esaminatore deve riuscire acapire il brevetto partendo da questa descrizione.

Description of the drawings

BRIEF DESCRIPTION OF THE DRAWINGS

[0028] Further features and advantages of the invention will be explained in more detail in the following detailed description of one embodiment thereof, given as a non-limiting example, referring to the appended drawings, in which:

[0029] FIG. 1 is a flowchart of a method for automatic recognition of anatomical structures in images obtained by a PET scanner and fo measurement of the mean and standard deviation of the SUV of a recognized anatomical structure;

[0030] FIG. 2 shows a patient's anatomic planes and principal axes;

[0031] FIGS. 3a, 3b and 3c are diagrams representing a 3D matrix of a patient's SUV, processed from PET images, in a sagittal, corona and axial section of the patient, respectively;

[0032] FIGS. 4a, 4b and 4c are diagrams representing the 3D matrix of FIGS. 3a, 3b, 3c of a patient's SUV, rotated and translated, in a sagittal, coronal and axial section of the patient, respectively;

[0033] FIGS. 5a, 5b and 5c are diagrams representing the Jacobian matrix of a patient's SUV, calculated from the 3D matrix of FIGS. 4a, and 4c, in a sagittal, coronal and axial section of the patient, respectively;

[0034] FIGS. 6a and 6b are projections of the matrix of a patient's SUV in the sagittal direction (on the coronal plane), respectively as me and standard deviation of the SUV values in the pixels aligned in sagittal directions;

[0035] FIG. 7 is a projection of the Jacobian matrix of a patient's SUV in the sagittal direction (on the coronal plane), as mean of the SUV values in the pixels aligned in sagittal directions;

[0036] FIGS. 8a, 8b and 8c are diagrams representing a sampling of the matrix of the SUV projected on the coronal plane using the me

Descrizione delle figure allegate al brevetto

Detailed description

DETAILED DESCRIPTION

[0041] Referring to the flowchart in FIG. 1, a method is described below for automatic recognition of anatomical structures in images obtained by a PET scanner and for measuring the mean SUV in the volume of the aforementioned anatomical structure thus recognized, in which the method is applied, purely as a non-limiting example, to a patient's liver.

[0042] In step 100, a 3D matrix of data, PIXELijk, representing the contents of the PET images, in which the data include for example the dimensions of each pixel, the thickness of the volume subtended at the pixel and the detected value of the SUV, at the space coordinates i,j,k identified with reference to a predetermined origin of the principal axes of the patient, i.e. of the longitudinal, sagittal and transverse axes, is acquired as a DICOM file (Digital Imaging and COmmunications in Medicine, the standard that defines the criteria for the communication, visualization, storing and printing of information of a biomedical type, for example radiological images).

[0043] FIG. 2 shows the anatomic planes and the principal axes of a patient, used in the following of the description. The sagittal plane is labelled ΠS, the frontal or coronal plane is labelled ΠF, and the transverse plane is labelled ΠT. The longitudinal axis (coordinate i) is labelled AL, the sagittal axis (coordinate j) is labelled AS, and the transverse axis (coordinate k) is labelled AT.

[0044] FIGS. 3a, 3b and 3c are diagrams representing a 3D matrix of a patient's SUV, processed from PET images, in a sagittal, coronal and axial section of the patient, respectively.

[0045] Advantageously, from the header of the same DICOM file, some tags indicative of the position and orientation of the patient's image are extracted for reconstructing the 3D matrix in SUVijk units in real space.

Descrizione dettagliata (come non mai) facendo attenzione a non scendere nel particolare quando non necessario

Claims

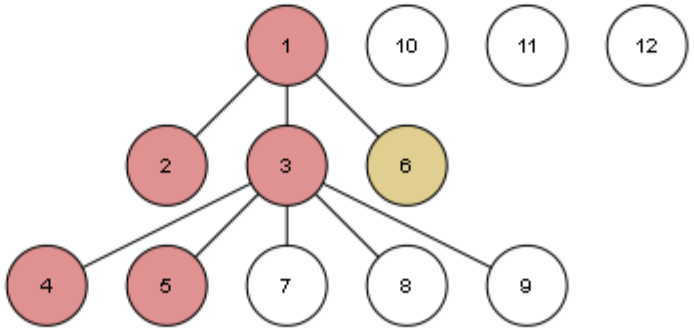
Original claims | **Claims tree**

The EPO does not accept any responsibility for the accuracy of data and information originating from other authorities than the EPO; in particular, the EPO does not guarantee that they are complete, up-to-date or fit for specific purposes.

---

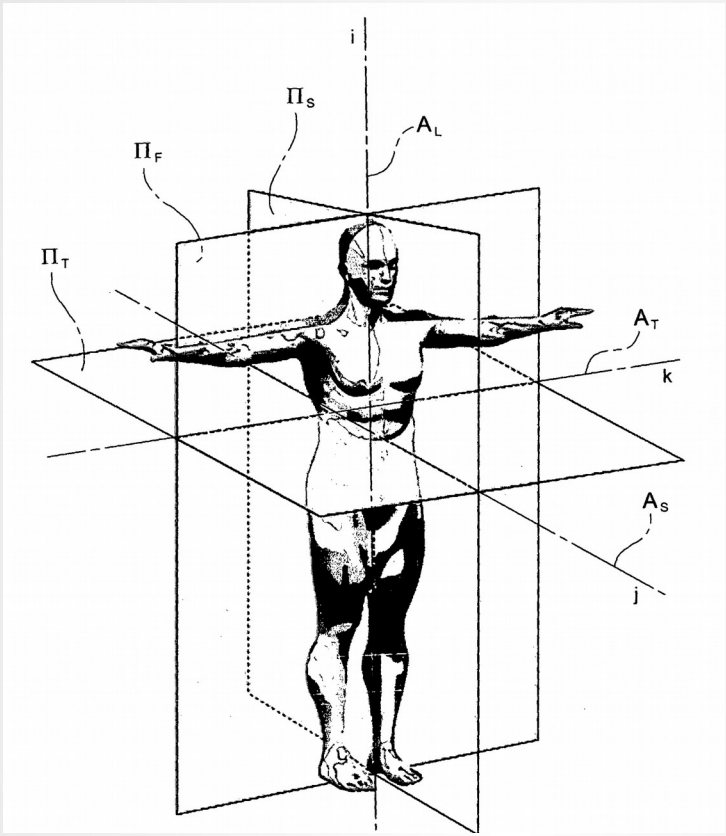
1. Method for the automatic recognition of anatomical structures in images obtained by positron emission tomography, characterized in that it comprises the following steps:
acquisition of a 3D matrix of data including standardized uptake values, SUVs, associated to a plurality of PET pixels in an anatomic volume of a patient;
calculation of the Jacobian matrix of said 3D matrix of standardized uptake values, SUVs, and determination of the isotropic variation of the standardized uptake values, SUVs, of each pixel with respect to adjacent pixels, in three predefined orthogonal reference spatial directions;
projection, along a predetermined anatomical direction of projection, of said 3D matrix of standardized uptake values, SUVs, or of said Jacobian matrix of the 3D matrix of standardized uptake values, SUVs, on an anatomical reference plane;
location of at least one two-dimensional minimum of said matrix of standardized uptake values, SUVs, or of said Jacobian matrix of the

Attenzione: non e' detto che tutti i claims debbano passare l'analisi ma e' necessario che quelli fondamentali ci siano



6. Method according to claim 3 any one of the preceding claims, wherein said projection is obtained by calculating the mean or the standard deviation of the values of said 3D matrix of standardized uptake values, SUVs, or of said Jacobian matrix of the 3D matrix of standardized uptake values, SUVs, along a projection direction.

Drawings



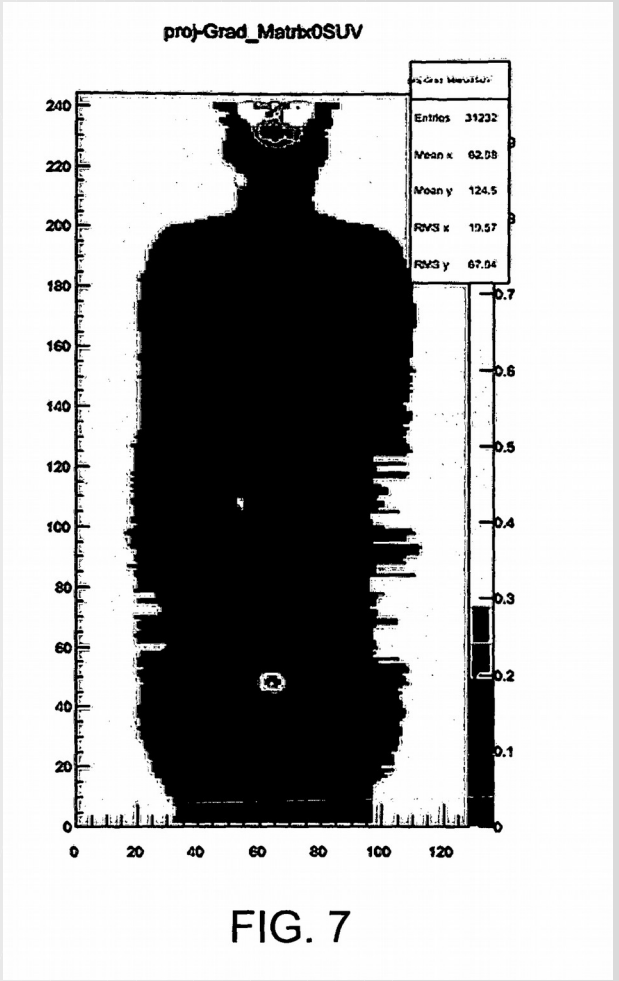


FIG. 7

I drawings sono fondamentali. le parole possono essere interpretate ma un disegno e' auto-esplicativo.

MINISTERO DELLO SVILUPPO ECONOMICO

DIREZIONE GENERALE LOTTA ALLA CONTRAFFAZIONE
UFFICIO ITALIANO BREVETTI E MARCHI

Sei in: dati / Espacenet [ricerche: Codice Data Provincia Testo Titolare Classe Ricerca avanzata]

Visualizza Scheda (Domanda: 102013902148327 (TO2013A000306) - Tipologia: Invenzioni)

Nell'area sottostante è visibile la scheda della domanda presa in esame.
N.B. Non tutte le schede riportano la medesima struttura poichè essa è strettamente correlata alla tipologia trattata.

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procedimento per il riconoscimento automatico di strutture anatomiche in immagini ottenute da tomografia ad emissione di positroni, sistema e programma di elaboratore per l'attuazione di detto procedimento

Titolare
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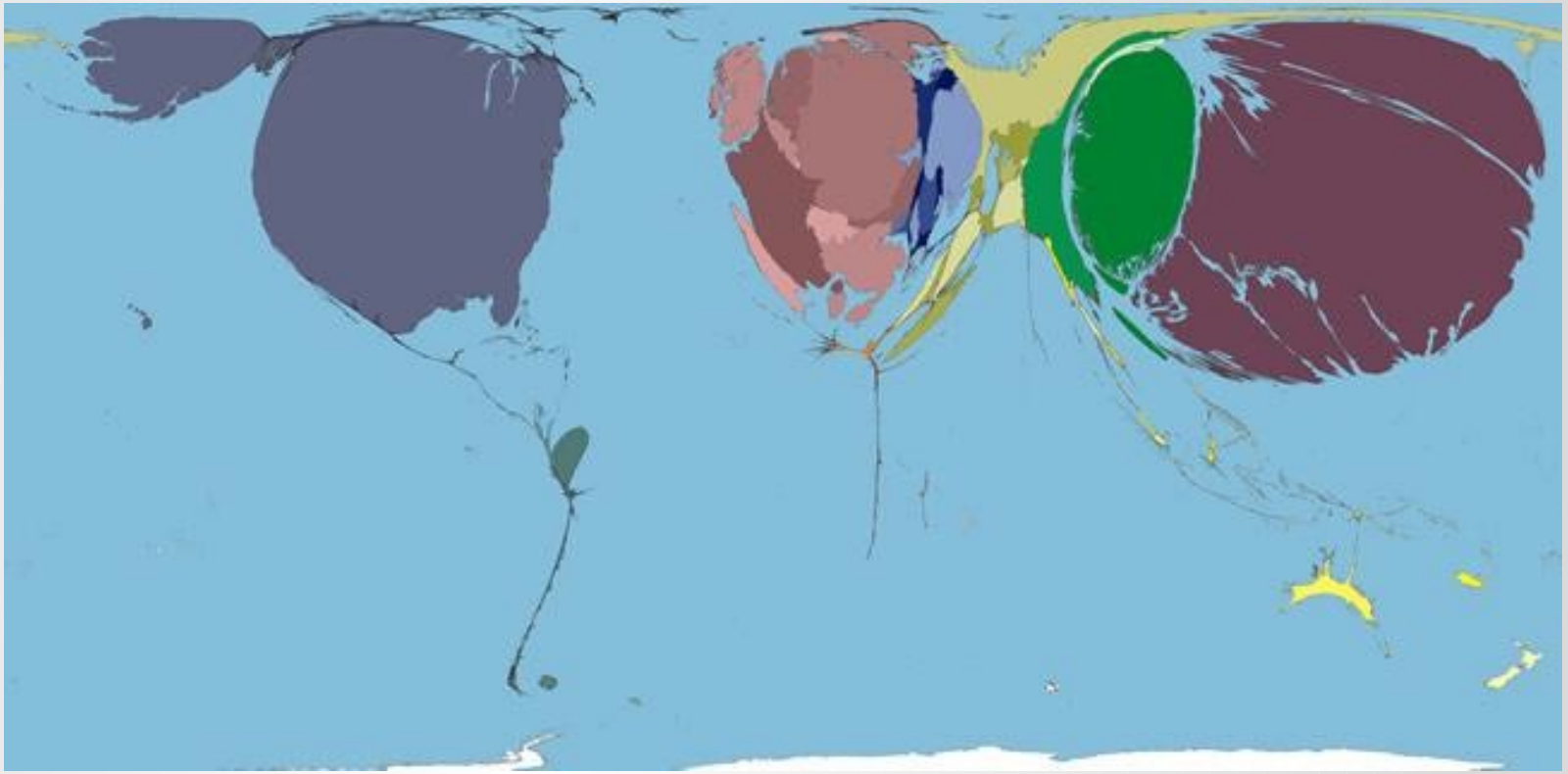
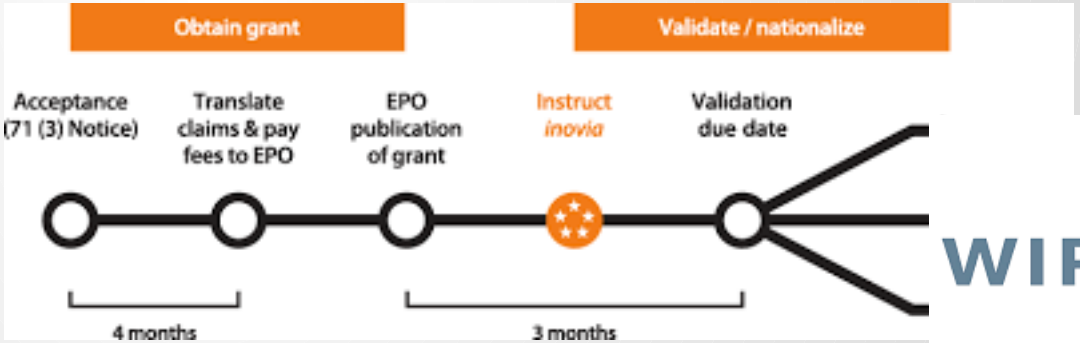
Grazie per l'attenzione

La scelta dei paesi





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METHOD FOR THE AUTOMATIC RECOGNITION OF ANATOMICAL STRUCTURES IN IMAGES OBTAINED BY POSITRON EMISSION TOMOGRAPHY, SYSTEM AND COMPUTER PROGRAM FOR PERFORMING SAID METHOD

Page bookmark	US2016055633 (A1) - METHOD FOR THE AUTOMATIC RECOGNITION OF ANATOMICAL STRUCTURES IN IMAGES OBTAINED BY POSITRON EMISSION TOMOGRAPHY, SYSTEM AND COMPUTER PROGRAM FOR PERFORMING SAID METHOD
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