

Medical image simulation object model

// Metadata

Name	Medical image simulation object model
Keywords	Medical image simulation object model
Creation date	June 20th, 2012
Has contributor	Germain Forestier, Bernard Gibaud
Used ontology engineering methodology	OntoSpec
Is of type	Domain ontology
Natural language	English
Has ontology language	OntoSpec
Has formality level	Semi informal
Has reference	
Resource locator	
Version	3.63
Number of concepts (classes)	94
Number of relations (properties)	34

Note: the document introduces first the relations defined in this ontology, then the concepts (i.e. the classes). Diagrams provide synthetic views of taxonomies. In those diagrams, links represent subsumption links (i.e. « is a » relationships), unless some other meaning is mentioned explicitly (in italics). Lines crossing two or more subsumption links depict a constraint of disjointness between the specialized classes.

// Relations

// Object properties

Has for physical parameter distribution

Properties

[EP/DR & RR] An OBJECT LAYER PART *has for physical parameter distribution* a MATHEMATICAL DISTRIBUTION OF PHYSICAL QUALITY.

Comment

This relation associates to an Object layer part the mathematical distribution of a specific Physical parameter characterizing the physical object referred to by this Object layer part.

Is a physical parameter distribution of

Properties

[EP/DR & RR] A MATHEMATICAL DISTRIBUTION OF PHYSICAL QUALITY *is a physical parameter distribution of* an OBJECT LAYER PART. [EP/IVL] *Is a physical parameter distribution of* mutually implies *has for physical parameter distribution*.

Has for physical parameter values layer

Properties

[EP/DR & RR] An OBJECT LAYER *has for physical parameter values layer* a VALUES LAYER.

Comment

This relation associates to an Object layer part a Values layer, that represents the values taken by the specific Physical quality referred to by this Values layer (T1 values in MRI).

Is a values layer of

Properties

[EP/DR & RR] A VALUES LAYER *is a values layer of* an OBJECT LAYER. [EP/IVL] *Is a values layer of* mutually implies *has for physical parameter values layer*.

Has for parameter

Properties

[EP/DR & RR] A MATHEMATICAL DISTRIBUTION *has for parameter* a MATHEMATICAL DISTRIBUTION PARAMETER. [EP/SL] *x has for parameter y* implies that *x has for proper part y during* a TIME INTERVAL.

Is a parameter of

Properties

[EP/DR & RR] A MATHEMATICAL DISTRIBUTION PARAMETER *is a parameter of* a MATHEMATICAL DISTRIBUTION. [EP/SL] *x is a parameter of y* implies that *x is a proper part of y during* a TIME INTERVAL. [EP/IVL] *Is a parameter of* mutually implies *has for parameter*.

Has for constant value

Properties

[EP/DR & RR] A MATHEMATICAL DISTRIBUTION *has for constant value* a CONSTANT VALUE. [EP/SL] *x has for constant value y* implies that *x has for parameter y*.

Is the constant value of

Properties

[EP/DR & RR] A CONSTANT VALUE *is the constant value of* a MATHEMATICAL DISTRIBUTION. [EP/SL] *x is the constant value of y* implies that *x is a parameter of y*. [EP/IVL] *Is the constant value of* mutually implies *has for constant value*.

Has for lower bound

Properties

[EP/DR & RR] A MATHEMATICAL DISTRIBUTION *has for lower bound* a LOWER BOUND. [EP/SL] *x has for lower bound y* implies that *x has for parameter y*.

Is the lower bound of

Properties

[EP/DR & RR] A LOWER BOUND *is the lower bound of* a MATHEMATICAL DISTRIBUTION. [EP/SL] *x is the lower bound of y* implies that *x is a parameter of y*. [EP/IVL] *Is the lower bound of* mutually implies *has for lower bound*.

Has for upper bound

Properties

[EP/DR & RR] A MATHEMATICAL DISTRIBUTION *has for upper bound* a UPPER BOUND. [EP/SL] *x has for upper bound y* implies that *x has for parameter y*.

Is the upper bound of

Properties

[EP/DR & RR] A UPPER BOUND *is the upper bound of* a MATHEMATICAL DISTRIBUTION. [EP/SL] *x is the upper bound of y* implies that *x is a parameter of y*. [EP/IVL] *Is the upper bound of mutually implies has for upper bound*.

Has for mean

Properties

[EP/DR & RR] A MATHEMATICAL DISTRIBUTION *has for mean* a MEAN. [EP/SL] *x has for mean y* implies that *x has for parameter y*.

Is the mean of

Properties

[EP/DR & RR] A MEAN *is the mean of* a MATHEMATICAL DISTRIBUTION. [EP/SL] *x is the mean of y* implies that *x is a parameter of y*. [EP/IVL] *Is the mean of mutually implies has for mean*.

Has for standard deviation

Properties

[EP/DR & RR] A MATHEMATICAL DISTRIBUTION *has for standard deviation* a STANDARD DEVIATION. [EP/SL] *x has for standard deviation y* implies that *x has for parameter y*.

Is the standard deviation of

Properties

[EP/DR & RR] A STANDARD DEVIATION *is the standard deviation of* a MATHEMATICAL DISTRIBUTION. [EP/SL] *x is the standard deviation of y* implies that *x is a parameter of y*. [EP/IVL] *Is the standard deviation of mutually implies has for standard deviation*.

Has for scale parameter

Properties

[EP/DR & RR] A MATHEMATICAL DISTRIBUTION *has for scale parameter* a SCALE PARAMETER. [EP/SL] *x has for scale parameter y* implies that *x has for parameter y*.

Is the scale parameter of

Properties

[EP/DR & RR] A SCALE PARAMETER *is the scale parameter of* a MATHEMATICAL DISTRIBUTION. [EP/SL] *x is the scale parameter of y* implies that *x is a parameter of y*. [EP/IVL] *Is the scale parameter of mutually implies has for scale parameter*.

Has for shape parameter

Properties

[EP/DR & RR] A MATHEMATICAL DISTRIBUTION *has for shape parameter* a SHAPE PARAMETER. [EP/SL] *x has for shape parameter y* implies that *x has for parameter y*.

Is the shape parameter of

Properties

[EP/DR & RR] A SHAPE PARAMETER *is the shape parameter of* a MATHEMATICAL DISTRIBUTION. [EP/SL] *x is the shape parameter of y* implies that *x is a parameter of y*. [EP/IVL] *Is the shape parameter of* mutually implies *has for shape parameter*.

Is defined in reference to

Properties

[EP/DR & RR] A QUALITY *is defined in reference to* a PARTICULAR. [EP/SL] *x is defined in reference to y* implies that *x depends constantly and specifically on y*.

// Data properties

Has for B0

Properties

[EP/DR & RR] A MAGNETIC PROPERTY *has for B0* a MAGNETIC FIELD INTENSITY (in Tesla), denoted by a DOUBLE.

Comment

This relation associates to a Magnetic property the value (in Tesla) of the applied B0 field.

Has for duration

Properties

[EP/DR & RR] An INSTANT *has for duration* a DURATION.

Has for starting date

Properties

[EP/DR & RR] A TIME POINT *has for starting date* a DATETIME.

Has for label in model

Properties

[EP/DR & RR] An OBJECT LAYER PART VOXEL *has for label in model* a LABEL, denoted by an INT .

Comment

This relation associates to an Object layer part voxel the specific label used to denote membership to this Object layer part voxel. All the voxels of an Object layer that share the same label value belong to the same Object layer part.

Has for model name

Properties

[EP/DR & RR] A MEDICAL IMAGE SIMULATION OBJECT MODEL *has for model name* a MODEL NAME, denoted by a STRING.

Comment

This relation associates a Model name to a MEDICAL IMAGE SIMULATION OBJECT MODEL

Has for last modification date

Properties

[EP/DR & RR] A MEDICAL IMAGE SIMULATION OBJECT MODEL *has for last modification date* a DATETIME.

Has for model description

Properties

[EP/DR & RR] A MEDICAL IMAGE SIMULATION OBJECT MODEL *has for model description* a MODEL DESCRIPTION, denoted by a STRING.

Has for model owner

Properties

[EP/DR & RR] A MEDICAL IMAGE SIMULATION OBJECT MODEL *has for model owner* a MODEL OWNER, denoted by a STRING.

Has for physical parameters lut file

Properties

[EP/DR & RR] An OBJECT LAYER *has for physical parameters lut file* a FILE NAME, denoted by a ANYURI.

Comment

This relation associates to an OBJECT LAYER a lut file, using its file name. This file contains the information about the Mathematical distribution of physical quality that characterize the objects referred to by the different Object layer parts that are part of this Object layer.

Has for priority

Properties

[EP/DR & RR] An OBJECT LAYER PART MESH *has for priority* a PRIORITY, denoted by an INT.

Comment

This relation associates a priority to an OBJECT LAYER PART MESH. It allows to control in which order the different OBJECT LAYER PART MESHES of a MEDICAL IMAGE SIMULATION OBJECT MODEL must be processed.

Is stored in file

Properties

[EP/DR & RR] A PROPOSITION *is stored in file* a FILE NAME, denoted by a ANYURI.

Comment

This relation associates to a Proposition a file, using its file name.

Has for scalar value

Properties

[EP/DR & RR] A PROPOSITION *has for scalar value* a SCALAR VALUE, denoted by a FLOAT.

Has for unit of measure label

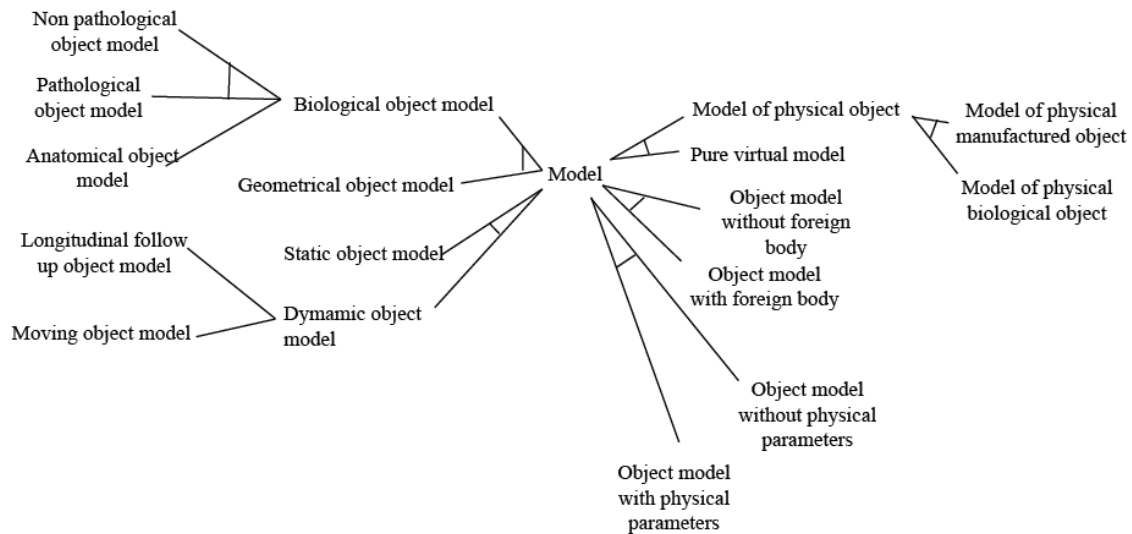
Properties

[EP/DR & RR] A PROPOSITION *has for unit of measure label* a UNIT OF MEASURE LABEL, denoted by a STRING.

Comment

This relation associates to a Proposition a unit of measure label used in this proposition. This allows, for example, to specify the unit of measure used in a Values layer, or the unit of measure of a Mathematical distribution parameter.

// Concepts



Medical image simulation object model, Model

Meta Properties

GEOMETRICAL PHANTOM OBJECT MODEL and BIOLOGICAL OBJECT MODEL *is a disjunctive sub-division of* MEDICAL IMAGE SIMULATION OBJECT MODEL. STATIC OBJECT MODEL and DYNAMIC OBJECT MODEL *is a disjunctive sub-division of* MEDICAL IMAGE SIMULATION OBJECT MODEL. OBJECT MODEL WITH EXTERNAL AGENT and OBJECT MODEL WITHOUT EXTERNAL AGENT *is a disjunctive sub-division of* MEDICAL IMAGE SIMULATION OBJECT MODEL. OBJECT MODEL WITH FOREIGN BODY and OBJECT MODEL WITHOUT FOREIGN BODY *is a disjunctive sub-division of* MEDICAL IMAGE SIMULATION OBJECT MODEL. OBJECT MODEL WITH PHYSICAL PARAMETERS and OBJECT MODEL WITHOUT PHYSICAL PARAMETERS *is a disjunctive sub-division of* MEDICAL IMAGE SIMULATION OBJECT MODEL. OBJECT MODEL OF PHYSICAL OBJECT and PURE VIRTUAL OBJECT MODEL *is a disjunctive sub-division of* MEDICAL IMAGE SIMULATION OBJECT MODEL.

Properties

[EP/SL] A MEDICAL IMAGE SIMULATION OBJECT MODEL *is a* DATASET.

Comment

[DEF] A Medical image simulation object model is a generic and virtual representation of a set of objects dedicated to image simulation. The represented objects can be different according to the different types of models. A Biological object model will represent biological objects which can, for example, depict their anatomy and/or physiology.

Geometrical phantom object model

Properties

[EP/NSMC] A GEOMETRICAL PHANTOM OBJECT MODEL *is a* MEDICAL IMAGE SIMULATION OBJECT MODEL which *has for proper part* some GEOMETRICAL PHANTOM OBJECT LAYER *during a* TIME INTERVAL.

Remark: This NSMC forbids having geometrical phantom object models defined using values layers only

Comment

[DEF] A Geometrical phantom object model is a model which represents a set of virtual geometrical objects like spheres or cubes. This kind of model is generally used for testing and/or calibration.

Biological object model**Meta Properties**

PATHOLOGICAL OBJECT MODEL and NON PATHOLOGICAL OBJECT MODEL *is a disjunctive sub-division of* BIOLOGICAL OBJECT MODEL.

Properties

[EP/SL] A BIOLOGICAL OBJECT MODEL *is a* MEDICAL IMAGE SIMULATION OBJECT MODEL.

Comment

[DEF] A Biological object model is a model which represents a biological object and/or biological/physiological process.

Anatomical object model**Properties**

[EP/SL] An ANATOMICAL OBJECT MODEL *is a* BIOLOGICAL OBJECT MODEL.

[EP/NSMC] An ANATOMICAL OBJECT MODEL *is a* MEDICAL IMAGE SIMULATION OBJECT MODEL *which has for proper part* some ANATOMICAL OBJECT LAYER *during a* TIME INTERVAL.

Remark: This NSMC forbids having anatomical models defined using values layers only

Comment

[DEF] An Anatomical object model is a model which represents anatomical objects. An Anatomical object model is composed of at least one Anatomical object layer.

Object model without foreign body**Properties**

[EP/SL] An OBJECT MODEL WITHOUT FOREIGN BODY *is a* MEDICAL IMAGE SIMULATION OBJECT MODEL. [EP/ICL] No OBJECT MODEL WITHOUT FOREIGN BODY *has for proper part* some FOREIGN BODY OBJECT LAYER *during a* TIME INTERVAL

Comment

[DEF] An Object model without foreign body is a model which does not contain any foreign body.

Object model with foreign body**Properties**

[EP/NSMC] An OBJECT MODEL WITH FOREIGN BODY *is a* MEDICAL IMAGE SIMULATION OBJECT MODEL *which has for proper part* some FOREIGN BODY OBJECT LAYER *during a* TIME INTERVAL.

Remark: This NSMC forbids having object models with foreign bodies defined using values layers only

Comment

[DEF] An Object model with foreign body is a model which contains at least one foreign body.

Static object model

Properties

[EP/SL] A STATIC OBJECT MODEL *is a* MEDICAL IMAGE SIMULATION OBJECT MODEL.

Comment

[DEF] A Static object model is a model which represents objects which do not evolve through time.

Dynamic object model

Properties

[EP/SL] A DYNAMIC OBJECT MODEL *is a* MEDICAL IMAGE SIMULATION OBJECT MODEL.

Comment

[DEF] A Dynamic object model is a model which represents objects which evolve through time. This evolution can model a longitudinal follow up (e.g. follow up of a subject through several exams at T0, T+6 months, T+12 months, etc.) or some rapid physiological evolution (e.g. respiratory movement). Some Dynamic object models may reflect both evolution patterns.

Longitudinal follow up object model

Properties

[EP/SL] A LONGITUDINAL FOLLOW UP OBJECT MODEL *is a* DYNAMIC OBJECT MODEL.

Comment

[DEF] A Longitudinal follow up object model is a model which models the evolution of a subject through a relatively long period of time (T0, T0+6 months, T0+12 months, etc.).

Moving object model

Properties

[EP/SL] A MOVING OBJECT MODEL *is a* DYNAMIC OBJECT MODEL.

Comment

[DEF] A Moving object model is a model which contains the information of the evolution of the object through a short period of time (e.g. respiratory movement).

Object model with external agent

Properties

[EP/NSMC] An OBJECT MODEL WITH EXTERNAL AGENT *is a* MEDICAL IMAGE SIMULATION OBJECT MODEL which *has for proper part* some EXTERNAL AGENT OBJECT LAYER *during a* TIME INTERVAL or which *has for proper part* some EXTERNAL AGENT VALUES LAYER *during a* TIME INTERVAL.

Comment

[DEF] An Object model with external agent is a model which uses an external agent. External agents can be for example a contrast agent or a marker.

Object model without external agent

Properties

[EP/SL] An OBJECT MODEL WITHOUT EXTERNAL AGENT *is a* MEDICAL IMAGE SIMULATION OBJECT MODEL. [EP/ICL] No OBJECT MODEL WITHOUT EXTERNAL AGENT *has for proper part some* EXTERNAL AGENT OBJECT LAYER.

[EP/ICL] No OBJECT MODEL WITHOUT EXTERNAL AGENT *has for proper part some* EXTERNAL AGENT VALUES LAYER.

Comment

[DEF] An Object model without contrast agent is a model where no external agent is used.

Non pathological object model

Properties

[EP/SL] A NON PATHOLOGICAL OBJECT MODEL *is a* BIOLOGICAL OBJECT MODEL. [EP/ICL] No NON PATHOLOGICAL OBJECT MODEL *has for proper part some* PATHOLOGICAL OBJECT LAYER *during a* TIME INTERVAL.

Comment

[DEF] A Non pathological object model is a model whose related biological objects are not affected by any pathology.

Pathological object model

Properties

[EP/SL] A PATHOLOGICAL OBJECT MODEL *is a* BIOLOGICAL OBJECT MODEL
[EP/NSMC] A PATHOLOGICAL OBJECT MODEL *is a* MEDICAL IMAGE SIMULATION OBJECT MODEL *which has for proper part some* PATHOLOGICAL OBJECT LAYER *during a* TIME INTERVAL.

Remark: This NSMC forbids having pathological object models defined using values layers only

Comment

[DEF] A Pathological object model is a model whose at least one related biological object is affected by at least one pathology.

Pure virtual object model

Properties

[EP/SL] A PURE VIRTUAL OBJECT MODEL *is a* MEDICAL IMAGE SIMULATION OBJECT MODEL.

Comment

[DEF] A Pure virtual object model is a model which does not represent any physical object in the real world.

Object model of physical object

Meta Properties

OBJECT MODEL OF PHYSICAL MANUFACTURED OBJECT and OBJECT MODEL OF PHYSICAL BIOLOGICAL OBJECT *is a disjunctive sub-division of* OBJECT MODEL OF PHYSICAL OBJECT.

Properties

[EP/SL] An OBJECT MODEL OF PHYSICAL OBJECT *is a* MEDICAL IMAGE SIMULATION OBJECT MODEL

Comment

[DEF] An Object model of physical object is a model which represents a physical object in the real world. For example, a such model may have been derived from a PET and a CT dataset of a real patient, in which the distribution of the radiopharmaceutical and the tissues density maps were estimated from the PET and CT data, respectively.

Object model of physical manufactured object

Properties

[EP/SL] An OBJECT MODEL OF PHYSICAL MANUFACTURED OBJECT *is an* OBJECT MODEL OF PHYSICAL OBJECT. [EP/ER] An OBJECT MODEL OF PHYSICAL MANUFACTURED OBJECT *refers to* at least one MANUFACTURED OBJECT.

Comment

[DEF] An Object model of physical manufactured object is a model which represents a manufactured object in the real world.

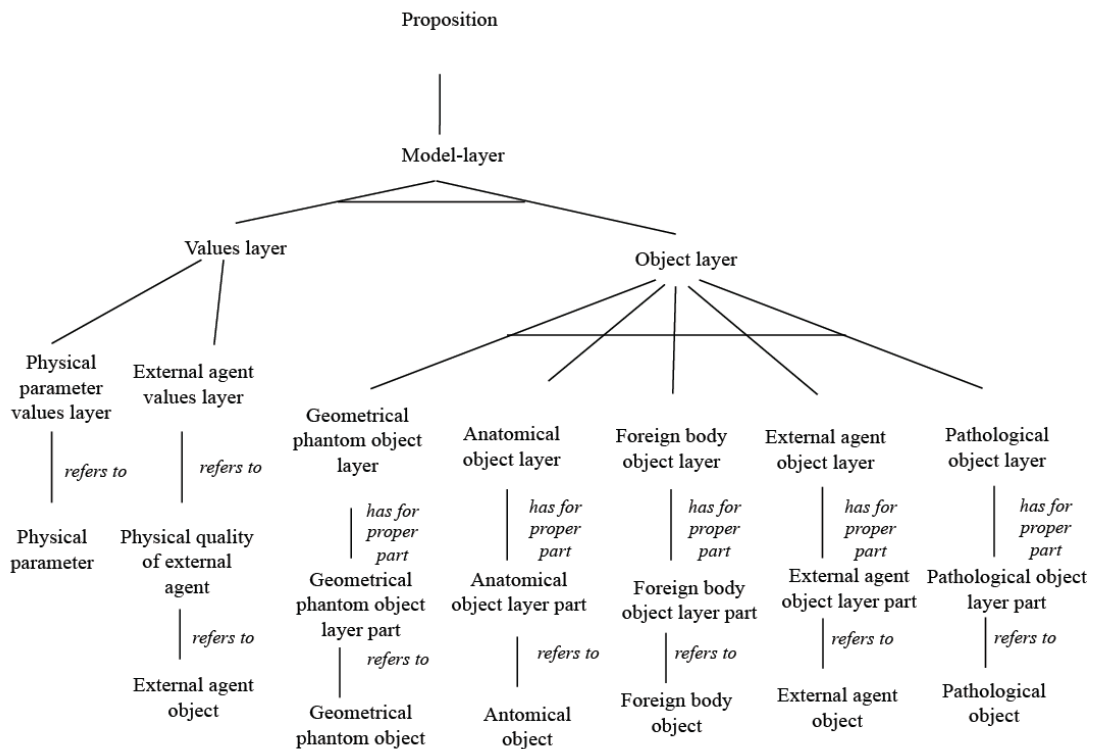
Object model of physical biological object

Properties

[EP/SL] An OBJECT MODEL OF PHYSICAL BIOLOGICAL OBJECT *is an* OBJECT MODEL OF PHYSICAL OBJECT.

Comment

[DEF] An Object model of physical biological object is a model which represents a physical biological object in the real world.



Model Layer

Properties

[EP/SL] A MODEL LAYER *is a* PROPOSITION. A MODEL LAYER *is a proper part of* exactly one MEDICAL IMAGE SIMULATION OBJECT MODEL *during a* TIME INTERVAL.

Comment

[DEF] A layer represents a specific part of a model, it is used to describe the different information about the composition of a model. In Dynamic object models, multiple Model layers are present to denote the temporal evolution of imaged structures; this is achieved by relating each Model layer to a Time point, or an Instant, or both.

Values layer

Properties

[EP/SL] A VALUES LAYER is a MODEL LAYER.

Comment

[DEF] A Values layer represents a part of a model as an exhaustive description of the values taken by a given Physical quality at each pixel/voxel of the model.

Object layer

Properties

[EP/SL] An OBJECT LAYER *is a* MODEL LAYER. [EP/ER] An OBJECT LAYER *has for proper part* some OBJECT LAYER PART *during a* TIME INTERVAL.

Comment

[DEF] An Object layer represents a part of a model focusing on a limited number of objects highlighted in Object layer parts, each referring to a different object. For example an Anatomical object layer allows associating to the pixels/voxels of this Object layer different anatomical objects; each of these objects is depicted by an Anatomical object layer part by means of a corresponding object label.

Physical parameter values layer

Properties

[EP/SL] A PHYSICAL PARAMETER VALUES LAYER *is a* VALUES LAYER. [EP/ER] A PHYSICAL PARAMETER VALUES LAYER *refers to* exactly one PHYSICAL PARAMETER.

Comment

[DEF] A Physical parameter values layer represents a part of a model as an exhaustive description of the values taken by a given Physical parameter at each pixel/voxel of the model.

External agent values layer

Properties

[EP/SL] An EXTERNAL AGENT VALUES LAYER *is a* VALUES LAYER. [EP/ER] A EXTERNAL AGENT VALUES LAYER *refers to* exactly one PHYSICAL QUALITY OF EXTERNAL AGENT

Comment

[DEF] An External agent values layer represents a part of a model as an exhaustive description of the values taken by a given Physical quality of an external agent at each pixel/voxel of the model.

Geometrical phantom object layer

Properties

[EP/SL] A GEOMETRICAL PHANTOM OBJECT LAYER *is an* OBJECT LAYER. [EP/ER] A GEOMETRICAL PHANTOM OBJECT LAYER *has for proper part* at least one GEOMETRICAL PHANTOM OBJECT LAYER PART *during a* TIME INTERVAL.

Comment

[DEF] A Geometrical phantom object layer is an object layer whose object layer parts refer to some Geometrical phantom objects. These Geometrical phantom objects are generally made of simple geometrical shapes (e.g. sphere, cube, etc.) and used for test and calibration.

Geometrical phantom object

Properties

[EP/SL] A GEOMETRICAL PHANTOM OBJECT *is a* PHYSICAL ENDURANT.

Comment

[DEF] Geometrical phantom objects are generally made of simple geometrical shapes (e.g. sphere, cube, etc.) and used for test and calibration.

Anatomical object layer

Properties

[EP/SL] An ANATOMICAL OBJECT LAYER *is an* OBJECT LAYER. [EP/ER] An ANATOMICAL OBJECT LAYER *has for proper part* at least one ANATOMICAL OBJECT LAYER PART *during a* TIME INTERVAL.

Comment

[DEF] An Anatomical object layer is a layer whose object layer parts refer to some Anatomical objects.

Anatomical object

Properties

[EP/SL] An ANATOMICAL OBJECT *is a* PHYSICAL ENDURANT.

Comment

[DEF & CIT] An Anatomical object is a physical object which is a part of a biological object's anatomy. "*Physical anatomical entity which has mass. Examples: hemoglobin molecule, mitochondrion, hepatocyte, erythrocyte, heart, head, blood, urine.*" Source: FMA definition of "*Material_anatomical_entity*".

Foreign body object layer

Properties

[EP/SL] A FOREIGN BODY OBJECT LAYER *is an* OBJECT LAYER. [EP/ER] A FOREIGN BODY OBJECT LAYER *has for proper part* at least one FOREIGN BODY OBJECT LAYER PART *during a* TIME INTERVAL.

Comment

[DEF] A Foreign body object layer is a layer whose object layer parts refer to some Foreign body object.

Foreign body object

Properties

[EP/SL] A FOREIGN BODY OBJECT *is a* PHYSICAL ENDURANT.

Comment

[DEF & CIT] "In physiology, a foreign body (Latin: corpus alienum) is any object originating outside the body." [[Wikipedia](#) (06/06/2012)]. Such an object may be introduced in the body on purpose (e.g. needle, catheters) or inadvertently.

External agent object layer

Properties

[EP/SL] An EXTERNAL AGENT OBJECT LAYER *is an* OBJECT LAYER. [EP/ER] An EXTERNAL AGENT OBJECT LAYER *has for proper part* at least one EXTERNAL AGENT OBJECT LAYER PART *during a* TIME INTERVAL.

Comment

[DEF] An External agent object layer is an Object layer whose layer parts refer to some External agents.

External agent object

Properties

[EP/SL] An EXTERNAL AGENT OBJECT *is an* AMOUNT OF MATTER and a TECHNICAL ARTEFACT.

Comment

[DEF] An External agent object represents an external agent which can be for example a contrast agent or a marker (e.g. iodine or a radiopharmaceutical injected into the patient vasculature). It can be characterized by its concentration.

Pathological object layer

Properties

[EP/SL] A PATHOLOGICAL OBJECT LAYER *is an* OBJECT LAYER. [EP/ER] A PATHOLOGICAL OBJECT LAYER *has for proper part* at least one PATHOLOGICAL OBJECT LAYER PART *during a* TIME INTERVAL.

Comment

[DEF] A Pathological object layer is composed of one or more Pathological object layer parts.

Pathological object

Properties

[EP/SL] A PATHOLOGICAL OBJECT *is a* PHYSICAL ENDURANT.

Comment

[DEF] A Pathological object is an abnormal biological object: examples of such abnormalities are : atrophy, presence of a tumor, presence of hyper or hypo-metabolism.

Object layer part

Properties

[EP/SL] An OBJECT LAYER PART *is a* PROPOSITION. [EP/ER] An OBJECT LAYER PART *is a proper part of* exactly one OBJECT LAYER *during a* TIME INTERVAL.

Comment

[DEF] An object layer part is a part of an object layer which refers to a particular object.

Geometrical phantom object layer part

Properties

[EP/SL] A GEOMETRICAL PHANTOM OBJECT LAYER PART *is an* OBJECT LAYER PART. [EP/ER] A GEOMETRICAL PHANTOM OBJECT LAYER PART *refers to* exactly one GEOMETRICAL PHANTOM OBJECT.

Comment

[DEF] A Geometrical phantom object layer part is a part of a Geometrical phantom object layer which refers to a Geometrical phantom object.

Anatomical object layer part

Properties

[EP/SL] An ANATOMICAL OBJECT LAYER PART *is an* OBJECT LAYER PART. [EP/ER] An ANATOMICAL OBJECT LAYER PART *refers to* exactly one ANATOMICAL OBJECT.

Comment

[DEF] An Anatomical object layer part is a part of an Anatomical object layer which refers to an Anatomical object.

Foreign body object layer part

Properties

[EP/SL] FOREIGN BODY OBJECT LAYER PART *is an* OBJECT LAYER PART.

[EP/ER] A FOREIGN BODY OBJECT LAYER PART *refers to* exactly one FOREIGN BODY OBJECT.

Comment

[DEF] A Foreign body object layer part is a part of a Foreign body object layer which refers to a Foreign body object.

External agent object layer part

Properties

[EP/SL] An EXTERNAL AGENT OBJECT LAYER PART *is an* OBJECT LAYER PART.

[EP/ER] An EXTERNAL AGENT OBJECT LAYER PART *refers to* exactly one EXTERNAL AGENT OBJECT.

Comment

[DEF] An External agent object layer part is a part of a External agent object layer which refers to an External agent object.

Pathological object layer part

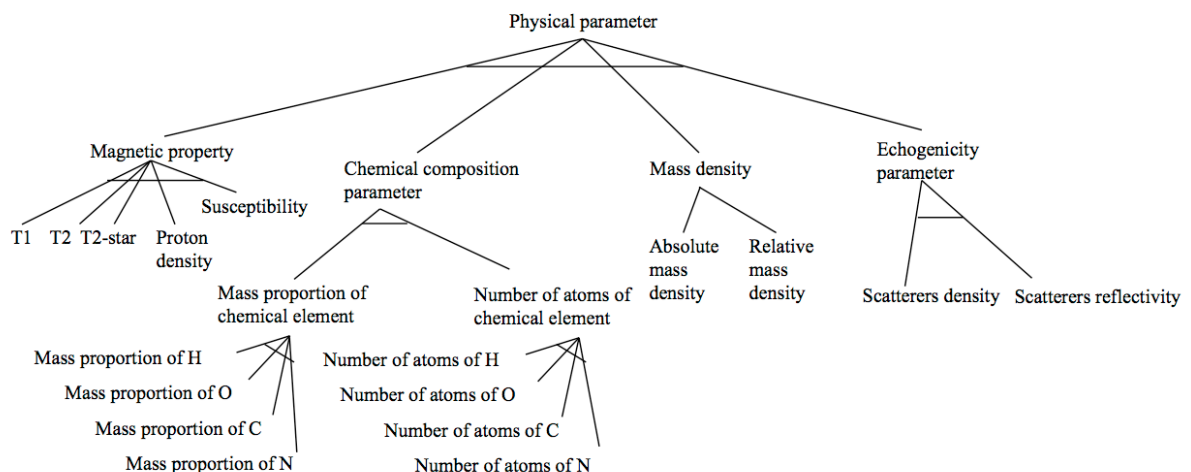
Properties

[EP/SL] A PATHOLOGICAL OBJECT LAYER PART *is an* OBJECT LAYER PART.

[EP/ER] A PATHOLOGICAL OBJECT LAYER PART *refers to* exactly one PATHOLOGICAL OBJECT.

Comment

[DEF] A Pathological object layer part is a part of a Pathological object layer which refers to a Pathological object.



Physical parameter

Properties

[EP/SL] A PHYSICAL PARAMETER *is a* PHYSICAL QUALITY.

Comment

[DEF] A Physical parameter denotes a physical characteristic of a physical object, qui peut faire l'objet d'une mesure, directe ou indirecte (e.g. T1, T2, etc. in MRI).

Magnetic property

Properties

[EP/SL] A MAGNETIC PROPERTY *is a* PHYSICAL PARAMETER.

Comment

[DEF] A Magnetic property is a physical characteristic of a physical object immersed in a magnetic field (e.g. T1, T2, etc. in MRI). Magnetic properties may depend on the intensity of the magnetic field.

T1, T1 relaxation time, longitudinal relaxation time, spin-lattice relaxation time

Properties

[EP/SL] T1 *is a* MAGNETIC PROPERTY.

Comment

[DEF] T1 is a magnetic property. [CIT] “The T1 relaxation time is the decay constant for the recovery of the z component of the nuclear spin magnetization, M_z , towards its thermal equilibrium, $M_{z,eq}$ ” [[Wikipedia](#) (06/06/2012)].

T2, T2 relaxation time, transverse relaxation time, spin-spin relaxation time

Properties

[EP/SL] T2 *is a* MAGNETIC PROPERTY.

Comment

[DEF] T1 is a magnetic property. [CIT] “The T2 relaxation time is the decay constant for the component of M perpendicular to B_0 , designated M_{xy} ” [[Wikipedia](#) (06/06/2012)].

Proton density, spin density

Properties

[EP/SL] PROTON DENSITY *is a* MAGNETIC PROPERTY.

Comment

[DEF] Proton density is a magnetic property denoting the amount of available spins (hydrogen nuclei in water).

Susceptibility, Magnetic susceptibility

Properties

[EP/SL] SUSCEPTIBILITY *is a* MAGNETIC PROPERTY.

Comment

[DEF] Susceptibility is a magnetic property. [CIT] “Susceptibility is a dimensionless proportionality constant that indicates the degree of magnetization of a material in response to an applied magnetic field” [[Wikipedia](#) 06/06/2012].

T2-star, T2*

Properties

[EP/SL] T2-STAR *is a* MAGNETIC PROPERTY.

Comment

[DEF] T2-star is a magnetic property. [CIT] “In an idealized system, all nuclei in a given chemical environment, in a magnetic field, precess with the same frequency. However, in real systems, there are minor differences in chemical environment which can lead to a distribution of resonance frequencies around the ideal. Over time, this distribution can lead

to a dispersion of the tight distribution of magnetic spin vectors, and loss of signal ([Free Induction Decay](#)). In fact, for most magnetic resonance experiments, this "relaxation" dominates. This results in dephasing" [...] Unlike T_2 , T_2^* is influenced by magnetic field gradient irregularities. The T_2^* relaxation time is always shorter than the T_2 relaxation time and is typically milliseconds for water samples in imaging magnets. [[Wikipedia](#) 08/06/2012].

Chemical composition parameter

Properties

[EP/SL] CHEMICAL COMPOSITION PARAMETER *is a* PHYSICAL PARAMETER.

Comment

[DEF] A Chemical composition parameter is a physical parameter denoting of what chemicals a compound is made of.

Mass proportion of chemical element

Properties

[EP/SL] A MASS PROPORTION OF CHEMICAL ELEMENT *is a* CHEMICAL COMPOSITION PARAMETER. [EP/ER] A MASS PROPORTION OF CHEMICAL ELEMENT *is defined in reference to* exactly one ATOM.

Comment

[DEF] A Mass proportion of chemical element is a physical parameter denoting the relative quantity of mass that corresponds to a given chemical element.

Number of atoms of chemical element

Properties

[EP/SL] A NUMBER OF ATOMS OF CHEMICAL ELEMENT *is a* CHEMICAL COMPOSITION PARAMETER. [EP/ER] A NUMBER OF ATOMS OF CHEMICAL ELEMENT *is defined in reference to* exactly one ATOM.

Comment

[DEF] A Number of atoms of chemical element is a physical parameter denoting how many atoms of a given chemical element are part of a substance.

Number of atoms of H (Hydrogen)

Properties

[EP/NSMC] A NUMBER OF ATOMS OF H *is a* NUMBER OF ATOMS OF CHEMICAL ELEMENT which *is defined in reference to* some HYDROGEN ATOM. [EP/ER] A NUMBER OF ATOMS OF H *is defined in reference to* exactly one HYDROGEN ATOM.

Similar definition for elements : Na, K, Fe, Cl, Zn, Ca, S, P, Mg, C, N, O

Mass proportion of H (Hydrogen)

Properties

[EP/ NSMC] A MASS PROPORTION OF H *is a* MASS PROPORTION OF CHEMICAL ELEMENT which *is defined in reference to* some HYDROGEN ATOM. [EP/ER] A MASS PROPORTION OF H *is defined in reference to* exactly one HYDROGEN ATOM.

Similar definition for elements : Na, K, Fe, Cl, Zn, Ca, S, P, Mg, C, N, O

Mass density

Properties

[EP/SL] A MASS DENSITY *is a* PHYSICAL PARAMETER.

Comment

[DEF] A mass density is a physical parameter denoting the mass of a substance per unit volume.

Absolute mass density

Properties

[EP/SL] An ABSOLUTE MASS DENSITY *is a* MASS DENSITY.

Comment

[DEF] An absolute mass density is a mass density represented using units such as g/cm³, kg/m³, kg/L, g/mL, etc.

Relative mass density

Properties

[EP/SL] A RELATIVE MASS DENSITY *is a* MASS DENSITY.

Comment

[CIT] “Relative density, or specific gravity is the [ratio](#) of the [density](#) (mass of a unit volume) of a substance to the density of a given reference material. Specific gravity usually means relative density with respect to water. The term "relative density" is often preferred in modern scientific usage. ” [[Wikipedia](#) 06/06/2012]

Echogenicity parameter

Properties

[EP/SL] An ECHOGENICITY PARAMETER *is a* PHYSICAL PARAMETER.

Comment

[DEF] An echogenicity parameter is a physical parameter that modulates the backscattering of ultrasounds.

Scatterers density

Properties

[EP/SL] SCATTERERS DENSITY *is an* ECHOGENICITY PARAMETER.

Comment

[DEF] Scatterers density denotes the quantity of scatterers in a volume.

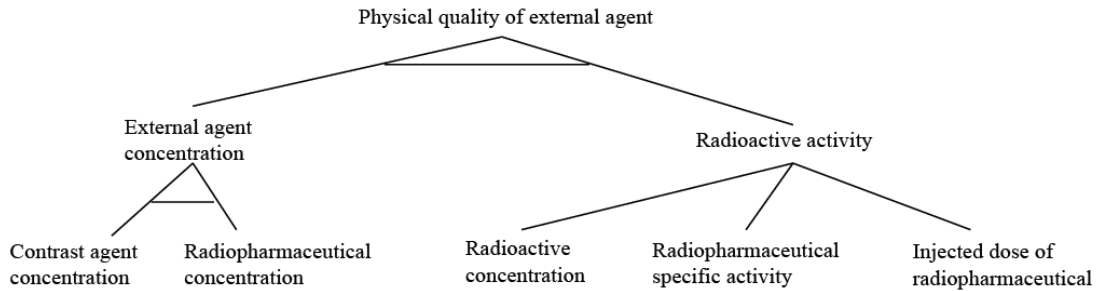
Scatterers reflectivity

Properties

[EP/SL] SCATTERERS REFLECTIVITY *is an* ECHOGENICITY PARAMETER.

Comment

[DEF] Scatterers reflectivity quantifies the ability of scatterers to backscatter the ultrasounds.



Physical quality of external agent

Properties

[EP/SL] A PHYSICAL QUALITY OF EXTERNAL AGENT *is a* PHYSICAL QUALITY.

[EP/ER] A PHYSICAL QUALITY OF EXTERNAL AGENT *is a quality of* exactly one EXTERNAL AGENT OBJECT.

Comment

[DEF] A Physical quality of external agent is a physical quality beared by an external agent, for example: its concentration.

External agent concentration

Properties

[EP/SL] An EXTERNAL AGENT CONCENTRATION *is a* PHYSICAL QUALITY OF EXTERNAL AGENT.

Comment

[DEF] An external agent concentration represents the quantity of external agent per unity of volume. It can be expressed in micromol per kilogram, for instance.

Contrast agent concentration

Properties

[EP/SL] A CONTRAST AGENT CONCENTRATION *is an* EXTERNAL AGENT CONCENTRATION.

Radiopharmaceutical concentration

Properties

[EP/SL] A RADIOPHARMACEUTICAL CONCENTRATION *is an* EXTERNAL AGENT CONCENTRATION

Comment

[DEF] A radiopharmaceutical concentration represents the quantity of radiopharmaceutical per unity of volume. It can be expressed in units such as mmol/L.

Radioactive activity

Properties

[EP/SL] A RADIOACTIVE ACTIVITY *is a* PHYSICAL QUALITY OF EXTERNAL AGENT.

Comment

[DEF] Radioactive activity quantifies the rate of radioactive decay of a radioactive material.

[CIT] “Radioactive decay is the process by which an [atomic nucleus](#) of an unstable atom loses energy by emitting ionizing particles” [[Wikipedia](#) 06/06/2012]. [CIT] “The [SI](#) unit of

radioactive activity is the [becquerel](#) (Bq) [...] One Bq is defined as one transformation (or decay or disintegration) per second [...] Another unit of radioactivity is the [curie](#), Ci, which was originally defined as the amount of radium emanation (radon-222) in equilibrium with one gram of pure [radium, isotope](#) Ra-226. At present it is equal, by definition, to the activity of any radionuclide decaying with a disintegration rate of 3.7×10^{10} Bq, so that 1 [curie](#) (Ci) = 3.7×10^{10} Bq” [[Wikipedia](#) 06/06/2012]. [CIT] “Curies are occasionally used to express a quantity of radioactive material rather than a decay rate, such as when one refers to 1 Ci of [cesium-137](#). This may be interpreted as the number of atoms that would produce 1 Ci of radiation. The rules of [radioactive decay](#) may be used to convert this to an actual number of atoms” [[Wikipedia](#) 06/06/2012].

Radiopharmaceutical specific activity, Specific activity

Properties

[EP/SL] A RADIOPHARMACEUTICAL SPECIFIC ACTIVITY *is a* RADIOACTIVE ACTIVITY .

Comment

[CIT] “The Specific activity (of a radioactive sample) is the number of decays per unit time per amount of substance of the sample at time set to zero ($t = 0$). "Amount of substance" can be the mass, volume or moles of the initial sample” [[Wikipedia](#) 06/06/2012]. [DIV] Indirectly, it is used to quantify the number of radionuclide atoms that are fixed by a quantity of pharmaceutical at a given time. It is usually expressed in units such as Ci/mol or TBq/mmol.

Injected dose of radiopharmaceutical

Properties

[EP/SL] An INJECTED DOSE OF RADIOPHARMACEUTICAL *is a* RADIOACTIVE ACTIVITY.

Comment

[DEF] An Injected dose of radiopharmaceutical quantifies the number of decays per unit time of the injected radiopharmaceutical. It is usually expressed in units such as mCi or MBq.

Radioactive concentration

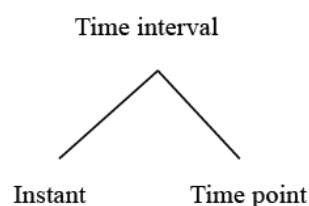
Properties

[EP/SL] A RADIOACTIVE CONCENTRATION *is a* RADIOACTIVE ACTIVITY.

Comment

[DEF] A radioactive concentration quantifies the amount of radioactive activity of a radionuclide in the tissues per unit volume. It can be expressed in units such as kBq/mL or MBq/kg. In nuclear medicine studies, the radioactive concentration can be measured from, e.g., PET images. It is used to compute the Standard Uptake Value, defined as:

$$\text{SUV}(t) = \text{radioactive concentration } (t) / (\text{injected dose } (t_0) \times \text{body weight})$$



Time point

Properties

[EP/SL] A TIME POINT *is a* TIME INTERVAL. [EP/ER] A TIME POINT *has for proper part* at least one INSTANT.

Comment

[DEF] A Time point is a time interval used to associate a time reference to some part of a Longitudinal follow-up object model (e.g. T0, T0 + 6 months, T0 +12 months).

Instant

Properties

[EP/SL] An INSTANT *is a* TIME INTERVAL. An INSTANT *is a proper part of* exactly one TIME POINT.

Comment

[DEF] An Instant is a time interval used to associate a time reference to some part of a Moving object model (e.g. t0, t0 + 10 ms, t0 + 20 ms, ... etc).

Mathematical distribution

Properties

[EP/SL] A MATHEMATICAL DISTRIBUTION *is an* INFORMATION. [EP/ER] A MATHEMATICAL DISTRIBUTION *refers to* exactly one PHYSICAL QUALITY. [EP/ER] A MATHEMATICAL DISTRIBUTION *has for proper part* some MATHEMATICAL DISTRIBUTION PARAMETER.

Comment

[DEF] A Mathematical distribution is an information representing the distribution of a specific Physical quality within a simulated tissue, e.g. the concentration of a radiopharmaceutical, the T1 relaxation time, etc.

Mathematical distribution of physical quality

Properties

[EP/SL] A MATHEMATICAL DISTRIBUTION OF PHYSICAL QUALITY *is a* MATHEMATICAL DISTRIBUTION. [EP/ER] A MATHEMATICAL DISTRIBUTION OF PHYSICAL QUALITY *refers to* exactly one PHYSICAL QUALITY.

Comment

[DEF] A Mathematical distribution of physical quality is an information representing the distribution of a specific Physical quality within a simulated tissue, e.g. the radioactive concentration of a radiopharmaceutical, the T1 relaxation time, etc.

Mathematical distribution parameter

Properties

[EP/SL] A MATHEMATICAL DISTRIBUTION PARAMETER *is an* INFORMATION. [EP/ER] A MATHEMATICAL DISTRIBUTION PARAMETER *is a proper part of* exactly one MATHEMATICAL DISTRIBUTION *during* a TIME INTERVAL.

Lower bound

Properties

[EP/SL] A LOWER BOUND *is a* MATHEMATICAL DISTRIBUTION PARAMETER.

Comment

[DEF] A Lower bound defines the minimum value of a Mathematical distribution.

Upper bound

Properties

[EP/SL] A UPPER BOUND *is a* MATHEMATICAL DISTRIBUTION PARAMETER.

Comment

[DEF] A Upper bound defines the maximum value of a Mathematical distribution.

Mean

Properties

[EP/SL] A MEAN *is a* MATHEMATICAL DISTRIBUTION PARAMETER.

Comment

[DEF] A Mean defines the mean value of a Mathematical distribution. [CIT] “In [statistics](#), mean has two related meanings: (1) the [arithmetic mean](#) (and is distinguished from the [geometric mean](#) or [harmonic mean](#)) ; (2) the [expected value](#) of a [random variable](#), which is also called the population mean.” [[Wikipedia](#) 06/06/2012]

Standard deviation

Properties

[EP/SL] A STANDARD DEVIATION *is a* MATHEMATICAL DISTRIBUTION PARAMETER.

Comment

[DEF] A Standard deviation defines the standard deviation of a Mathematical distribution. [CIT] “In [statistics](#) and [probability theory](#), standard deviation (represented by the symbol σ) shows how much variation or "[dispersion](#)" exists from the average ([mean](#), or expected value).” [[Wikipedia](#) 06/06/2012]

Constant value

Properties

[EP/SL] A CONSTANT VALUE *is a* MATHEMATICAL DISTRIBUTION PARAMETER.

Comment

[DEF] A Constant value defines the (constant) value taken by a constant mathematical distribution.

Scale parameter

Properties

[EP/SL] A SCALE PARAMETER *is a* MATHEMATICAL DISTRIBUTION PARAMETER.

Comment

[DEF] A Scale parameter denotes the statistical dispersion of a probability distribution.

Shape parameter

Properties

[EP/SL] A SHAPE PARAMETER *is a* MATHEMATICAL DISTRIBUTION PARAMETER.

Comment

[CIT] “A Shape parameter is any parameter of a probability distribution that is neither a [location parameter](#) nor a [scale parameter](#) (nor a function of either or both of these only, such as a [rate parameter](#)). Such a parameter must affect the shape of a distribution rather than

simply shifting it (as a location parameter does) or stretching/shrinking it (as a scale parameter does).” [[Wikipedia](#) 06/06/2012]

Uniform distribution

Properties

[EP/SL] A UNIFORM DISTRIBUTION *is a* MATHEMATICAL DISTRIBUTION OF PHYSICAL QUALITY. [EP/ER] A UNIFORM DISTRIBUTION *has for lower bound* exactly one LOWER BOUND. [EP/ER] A UNIFORM DISTRIBUTION *has for upper bound* exactly one UPPER BOUND.

Comment

[CIT] “In [probability theory](#) and [statistics](#), the continuous uniform distribution or rectangular distribution is a family of [probability distributions](#) such that for each member of the family, all [intervals](#) of the same length on the distribution's support are equally probable. The support is defined by the two parameters, a and b , which are its minimum and maximum values. The distribution is often abbreviated $U(a,b)$.” [[Wikipedia](#) 06/06/2012]

Gaussian distribution

Properties

[EP/SL] A GAUSSIAN DISTRIBUTION *is a* MATHEMATICAL DISTRIBUTION OF PHYSICAL QUALITY. [EP/ER] A GAUSSIAN DISTRIBUTION *has for mean* exactly one MEAN. [EP/ER] A GAUSSIAN DISTRIBUTION *has for standard deviation* exactly one STANDARD DEVIATION.

Comment

[CIT] “In [probability theory](#), the normal (or Gaussian) distribution is a [continuous probability distribution](#) that has a bell-shaped [probability density function](#), known as the [Gaussian function](#) or informally the bell curve [...] The parameter μ is the [mean](#) or [expectation](#) (location of the peak) and σ^2 is the [variance](#). σ is known as the [standard deviation](#).” [[Wikipedia](#) 06/06/2012]

Constant distribution

Properties

[EP/SL] A CONSTANT DISTRIBUTION *is a* MATHEMATICAL DISTRIBUTION OF PHYSICAL QUALITY. [EP/ER] A CONSTANT DISTRIBUTION *has for constant value* exactly one CONSTANT VALUE.

K distribution

Properties

[EP/SL] A K DISTRIBUTION *is a* MATHEMATICAL DISTRIBUTION OF PHYSICAL QUALITY. [EP/ER] A K DISTRIBUTION *has for scale parameter* exactly one SCALE PARAMETER. [EP/ER] A K DISTRIBUTION *has for shape parameter* exactly one SHAPE PARAMETER.

Comment

[CIT] “The K-distribution is a [probability distribution](#) that arises as the consequence of a statistical or probabilistic model used in [Synthetic Aperture Radar](#) (SAR) imagery. The K distribution is formed by [compounding](#) two separate [probability distributions](#), one representing the [radar cross-section](#), and the other representing speckle that is a characteristic of coherent imaging.” [[Wikipedia](#) 06/06/2012]. [REF] Redding, Nicholas J. (1999) Estimating the Parameters of the K Distribution in the Intensity Domain. Report DSTO-TR-0839, DSTO Electronics and Surveillance Laboratory, South Australia. p. 60

US simulation compatible model

Properties

[EP/SL] An US SIMULATION COMPATIBLE MODEL *is a* MEDICAL IMAGE SIMULATION OBJECT MODEL. [EP/ER] An US SIMULATION COMPATIBLE MODEL *allows to carry out* some US SIMULATION. [EP/ER] An US SIMULATION COMPATIBLE MODEL *bears* some US SIMULATION CAPACITY at a TIME INTERVAL.

US simulation capacity

Properties

[EP/SL] An US SIMULATION CAPACITY *is a* CAPACITY TO ENABLE ACTION. [EP/ER] An US SIMULATION CAPACITY *enables to fulfil* some ROLE_OF MODEL IN US SIMULATION.

Role of model in US simulation

Properties

[EP/SL] A ROLE_OF MODEL IN US SIMULATION *is a* DATA ROLE.

CT simulation compatible model

Properties

[EP/SL] A CT SIMULATION COMPATIBLE MODEL *is a* MEDICAL IMAGE SIMULATION OBJECT MODEL. [EP/ER] A CT SIMULATION COMPATIBLE MODEL *allows to carry out* some CT SIMULATION. [EP/ER] A CT SIMULATION COMPATIBLE MODEL *bears* some CT SIMULATION CAPACITY at a TIME INTERVAL.

CT simulation capacity

Properties

[EP/SL] A CT SIMULATION CAPACITY *is a* CAPACITY TO ENABLE ACTION. [EP/ER] A CT SIMULATION CAPACITY *enables to fulfil* some ROLE_OF MODEL IN CT SIMULATION.

Role of model in CT simulation

Properties

[EP/SL] A ROLE_OF MODEL IN CT SIMULATION *is a* DATA ROLE.

MR simulation compatible model

Properties

[EP/SL] An MR SIMULATION COMPATIBLE MODEL *is a* MEDICAL IMAGE SIMULATION OBJECT MODEL. [EP/ER] An MR SIMULATION COMPATIBLE MODEL *allows to carry out* some MR SIMULATION. [EP/ER] An MR SIMULATION COMPATIBLE MODEL *bears* some MR SIMULATION CAPACITY at a TIME INTERVAL.

MR simulation capacity

Properties

[EP/SL] An MR SIMULATION CAPACITY *is a* CAPACITY TO ENABLE ACTION.
[EP/ER] An MR SIMULATION CAPACITY *enables to fulfil* some ROLE_OF MODEL IN MR SIMULATION.

Role of model in MR simulation

Properties

[EP/SL] A ROLE_OF MODEL IN MR SIMULATION *is a* DATA ROLE.

PET simulation compatible model

Properties

[EP/SL] A PET SIMULATION COMPATIBLE MODEL *is a* MEDICAL IMAGE SIMULATION OBJECT MODEL. [EP/ER] A PET SIMULATION COMPATIBLE MODEL *allows to carry out* some PET SIMULATION. [EP/ER] A PET SIMULATION COMPATIBLE MODEL *bears* some PET SIMULATION CAPACITY at a TIME INTERVAL.

PET simulation capacity

Properties

[EP/SL] A PET SIMULATION CAPACITY *is a* CAPACITY TO ENABLE ACTION.
[EP/ER] A PET SIMULATION CAPACITY *enables to fulfil* some ROLE_OF MODEL IN PET SIMULATION.

Role of model in PET simulation

Properties

[EP/SL] A ROLE_OF MODEL IN PET SIMULATION *is a* DATA ROLE.

Data role

Properties

[EP/SL] A DATA ROLE *is a* CONCEPT. [EP/ER] A DATA ROLE *classifies* at every TIME INTERVAL only DATA.