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Information technology — JPSearch —

Part 2:
Registration, identification and management of schema and ontology

AMENDMENT 1: JPEG Ontology for Image Description

Technologies de l'information — JPSearch —

Partie 2: Enregistrement, identification et gestion des schémas et de l'ontologie

AMENDEMENT 1: Ontologie JPEG pour la description d'image

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Foreword

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The committee responsible for this document is ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

Information technology — JPSearch —

Part 2:
Registration, identification and management of schema and ontology

AMENDMENT 1: JPEG Ontology for Image Description

Page 1, Normative references

Add the following references at the end of Clause 2:

Internationalized Resource Identifiers (IRI), January 2005, Internet RFC 3987, available at http://www.ietf.org/rfc/rfc3987.txt

W3C OWL Working Group, OWL 2 Web Ontology Language: Document Overview, W3C Recommendation 27 October 2009, available at http://www.w3.org/TR/2009/REC-owl2-overview-20091027/

Resource Description Framework (RDF): Concepts and Abstract Syntax, W3C Recommendation 10 February 2004, available at http://www.w3.org/TR/2004/REC-rdf-concepts-20040210

W3C XML Schema Definition Language (XSD) 1.1 Part 2: Datatypes, W3C Recommendation 5 April 2012, available at http://www.w3.org/TR/2012/REC-xmlschema11-2-20120405/

Add the following Clauses after 7.10.4:

8   JPEG Ontology for Image Description (JPOnto)

8.1   General

This Clause specifies the set of classes, properties, and restrictions that constitute the JPSearch Metadata Ontology (JPOnto). This ontology specification provides the foundation to implement applications in different domains that can represent, exchange, and integrate digital image information generated in different systems and under different contexts.

JPOnto users may only need to use parts of the entire ontology, depending on their needs and according to how much detail they want to include in their image information. For this, the JPOnto terms (classes and properties) are grouped into two sub-vocabularies to provide an incremental introduction to the ontology.

— **JPOnto-core**: A core vocabulary that acts as a central component to interconnect all the other sub-vocabularies.

— **JPOnto-visual**: A rich set of constructs for semantic visual content description, including, but not limited to, a uniform description of identities, features, aspect, relationships, actions and emotional information of people appearing in the images, as well as description of events, locations and objects.

8.2   JPOnto-core

8.2.1   Outline

A core vocabulary named JPOnto-core is the basic set of entities and properties which serves as a central component to interconnect all the other sub-vocabularies of the JPEG Ontology for Image Description (JPOnto). The following classes provide a basis for the rest of JPOnto-core.

— **jponto:Image**: Represents a digital image.

— **jponto:RegionOfInterest**: A certain region within a digital image.

— **jponto:Agent**: An agent (e.g. person, group, software or physical artifact).

The primary classes relate to one another and to themselves using the properties shown in Figure 1.
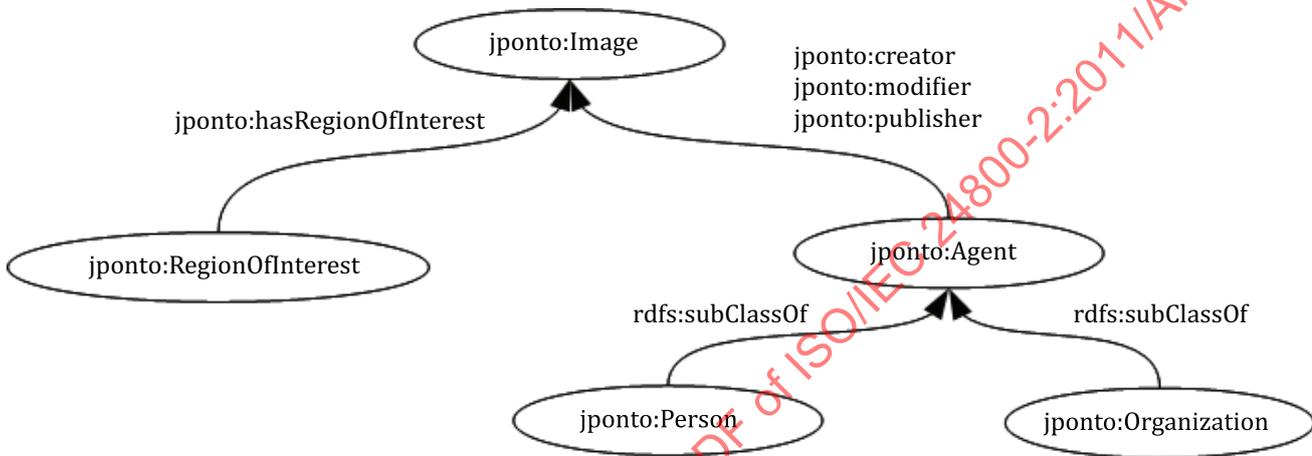
Figure 1 — Outline of JPOnto-core

8.2.2   Example

This example shows a complete description of an imaginary image. It has a unique ID, a title and a creator.

```
@base <http://example.org/> .
@prefix jponto: <http://www.jpeg.org/ns/jponto#> .
<#image1> a jponto:Image;
 jponto:title "An example image";
 jponto:keyword "London";
 jponto:keyword "JPEG";
 jponto:creator [
    jponto:givenName "John";
    jponto:familyName "Smith";
    jponto:mbox <mailto:jsmith@example.com> ];
 .
```

8.2.3 Semantics

8.2.3.1 JPOnto-core class definitions (in alphabetical order)

Class	jponto:Agent
Superclasses	—
IRI	http://www.jpeg.org/ns/jponto#Agent
Description	An agent (eg. person, group, software or physical artifact).
Described with properties:	
In range of	jponto:creator, jponto:modifier, jponto:publisher
Has subclasses	jponto:Organisation, jponto:Person
Syntax	:Agent a owl:Class; rdfs:comment "An agent (eg. person, group, software or physical artifact)."; .
Example	(see examples for subclasses)

Class	jponto:Image
Superclasses	—
IRI	http://www.jpeg.org/ns/jponto#Image
Description	Represents a digital image
Described with properties:	jponto:creationDate, jponto:creator, jponto:depicts, jponto:description, jponto:GPSaltitude, jponto:GPSlatitude, jponto:GPSlongitude, jponto:hasRegionOfInterest, jponto:height, jponto:modifiedDate, jponto:modifier, jponto:publisher, jponto:title, jponto:width
In range of	—
Has subclasses	—
Syntax	:Image a owl:Class; rdfs:comment " Represents a digital image "; .
Example	@base <http://example.org/> . @prefix jponto: <http://www.jpeg.org/ns/jponto#> . <#image1> a jponto:Image; jponto:title "An example image"; .

Class	jponto:Organisation
Superclasses	jponto:Agent
IRI	http://www.jpeg.org/ns/jponto#Organisation
Description	Organisation or moral agent.
Described with properties:	jponto:name
In range of	jponto:creator, jponto:modifier, jponto:publisher
Has subclasses	—

Syntax	:Organisation a owl:Class;
	
	  rdfs:comment "Organisation or moral agent";
	
	  rdfs:subClassOf :Agent ;
	
	.

Example	@base <http://example.org/> .
	
	@prefix jponto: <http://www.jpeg.org/ns/jponto#> .
	
	<#image1> a jponto:Image;
	
	  jponto:hasCreatorPublisher [
	
	  a jponto:Organisation;
	
	   jponto:name "Example Company";
	
	  ];
	
	.

Class	jponto:Person
Superclasses	
IRI	http://www.jpeg.org/ns/jponto#Person
Description	A physical person.
Described with properties:	jponto:familyName, jponto:givenName, jponto:mbox
In range of	jponto:creator, jponto:modifier, jponto:publisher, jponto:depicts
Has subclasses	—
Syntax	:Person a owl:Class; rdfs:comment "A physical person."; .

Example	@base <http://example.org/> .
	
	@prefix jponto: <http://www.jpeg.org/ns/jponto#> .
	
	<#image1> a jponto:Image;
	
	  jponto:hasCreator [
	
	    a jponto:Person;
	
	    foaf:givenName "John Smith";
	
	    foaf:mbox <mailto:jsmith@example.com>];
	
	.

Class	jponto:RegionOfInterest
Superclasses	jponto:Image
IRI	http://www.jpeg.org/ns/jponto#RegionOfInterest
Description	Represents a certain region within a digital image.
Described with properties:	jponto:boundingPolygon, jponto:depicts
In range of	jponto:hasRegionOfInterest
Has subclasses	—

Syntax	:RegionOfInterest a owl:Class;
	
	  rdfs:comment "Represents a certain region within a digital image.";
	
	  rdfs:subClassOf :Image;
	
	.

Example	@base <http://example.org/> . @prefix jponto: <http://www.jpeg.org/ns/jponto#> . <#image1> a jponto:Image; jponto:hasRegionOfInterest [jponto:boundingPolygon "0 0 100 100".]; .

8.2.3.2 JPOnto-core property definitions (in alphabetical order)

Property	jponto:boundingPolygon
IRI	http://www.jpeg.org/ns/jponto#boundingPolygon
Description	Specifies the coordinates of the edges of the polygon eclosing a region in the form "x1,y1, x2,y2, x3,y3, …".
Has super-properties:	—
Has domain	jponto:RegionOfInterest
Has range	xsd:string

Syntax	:boundingPolygon a owl:DatatypeProperty;
	
	  rdfs:comment "Specifies the coordinates of the edges of the polygon eclosing a region in the form "x1,y1, x2,y2, x3,y3, …";
	
	  rdfs:domain :Image ;
	
	  rdfs:range xsd:string ;
	
	.

Example	@base <http://example.org/> . @prefix jponto: <http://www.jpeg.org/ns/jponto#> . @prefix xsd: <http://www.w3.org/2001/XMLSchema#> . <#image1> a jponto:Image; jponto:creationDate "20 01-10-26T21:32:52"^^xsd:date; jponto:hasRegionOfInterest [jponto:boundingPolygon "0 0 100 100"; .

Property	jponto:creatonDate
IRI	http://www.jpeg.org/ns/jponto#creationDate
Description	Describes the date when the image is created.
Has super-properties:	—
Has domain	jponto:Image
Has range	xsd:dateTime
Syntax	:creationDate a owl:DatatypeProperty; rdfs:comment "Describes the date when the image is created."; rdfs:domain :Image ; rdfs:range xsd:dateTime; .
Example	@base <http://example.org/> . @prefix jponto: <http://www.jpeg.org/ns/jponto#> . @prefix xsd: <http://www.w3.org/2001/XMLSchema#> . <#image1> a jponto:Image; jponto:creationDate "20 01-10-26T21:32:52"^^xsd:date; .

Property	jponto:creator
IRI	http://www.jpeg.org/ns/jponto#creator
Description	Describes the creator of the image.
Has super - properties:	—
Has domain	jponto:Image
Has range	Jponto:Agent

Syntax	:creator a owl:ObjectProperty;
	
	  rdfs:comment " Describes the creator of the image.";
	
	  rdfs:domain :Image;
	
	  rdfs:range:Agent;
	
	.

Example	@base <http://example.org/> .
	
	@prefix jponto: <http://www.jpeg.org/ns/jponto#> .
	
	<#image1> a jponto:Image;
	
	  jponto:creator [
	
	  jponto:givenName "John Smith";
	
	    jponto:mbox <mailto:jsmith@example.com>];
	
	.

Property	jponto:description
IRI	http://www.jpeg.org/ns/jponto#description
Description	the content of the image in the form of text
Has super-properties:	—
Has domain	jponto:Image
Has range	xsd:string
Syntax	:description a owl:DatatypeProperty; rdfs:comment "Specifies the content of the image in the form of text."; rdfs:domain :Image ; rdfs:range xsd:string ; .
Example	@base <http://example.org/> . @prefix jponto: <http://www.jpeg.org/ns/jponto#> . <#image1> a jponto:Image; jponto:description "An example image taken during the MPEG meeting"; .

Property	jponto:familyName
IRI	http://www.jpeg.org/ns/jponto#familyName
Description	A name shared in common to identify the members of a family, as distinguished from each member's given name.
Has super-properties:	—
Has domain	jponto:Person
Has range	xsd:string

Syntax	:familyName a owl:DatatypeProperty;
	
	   rdfs:comment " Specifies the family name of a person.";
	
	   rdfs:domain :Person;
	
	   rdfs:range xsd:string;
	
	.

Example	@base <http://example.org/>.
	
	@prefix jponto: <http://www.jpeg.org/ns/jponto#>
	
	<#image1> a jponto:Image;
	
	  jponto:creator [
	
	    jponto:givenName "John";
	
	    jponto:familyName "Smith";
	
	    jponto:mbox <mailto:jsmith@example.com>];
	
	.

Property	jponto:givenName
IRI	http://www.jpeg.org/ns/jponto#givenName
Description	Specifies the given name of a person.
Has super-properties:	—
Has domain	jponto:Person
Has range	xsd:string

Syntax	:givenName a owl:DatatypeProperty;
	
	   rdfs:comment " Specifies the given name of a person.";
	
	   rdfs:domain :Person;
	
	   rdfs:range xsd:string;
	
	.

Example	@base <http://example.org/>.
	
	@prefix jponto: <http://www.jpeg.org/ns/jponto#>
	
	<#image1> a jponto:Image;
	
	   jponto:creator [
	
	   jponto:givenName "John";
	
	   jponto:familyName "Smith";
	
	   jponto:mbox <mailto:jsmith@example.com>];
	
	.

Property	jponto:GPSAltitude
IRI	http://www.jpeg.org/ns/jponto#creator
Description	Specifies the GPS altitude of the image, in decimal meters.
Has super-properties:	—
Has domain	jponto:Image
Has range	xsd:double
Syntax	:GPSAltitude a owl:DatatypeProperty; rdfs:comment "Describes the GPS altitude of the image "; rdfs:domain :Image ; rdfs:range xsd:double; .
Example	@base <http://example.org/> . @prefix jponto: <http://www.jpeg.org/ns/jponto#> . <#image1> a jponto:Image; jponto:GPSaltitude 1000.0; .

Property	jponto:GPSLatitude
IRI	http://www.jpeg.org/ns/jponto#GPSLatitude
Description	Specifies the GPS latitude of the image in decimal degrees.
Has super-properties:	—
Has domain	jponto:Image
Has range	xsd:double

Syntax	:GPSLatitude a owl:DatatypeProperty;
	
	    rdfs:comment "Describes the GPS latitude of the image.";
	
	    rdfs:domain :Image;
	
	    rdfs:range xsd:double;
	
	    .

Example	@base <http://example.org/> . @prefix jponto: <http://www.jpeg.org/ns/jponto#> . <#image1> a jponto:Image; jponto:GPSlatitude 34.0;

15

Property	jponto:GPSLongitude
IRI	http://www.jpeg.org/ns/jponto#GPSLongitude
Description	Specifies the GPS longitude of the image in decimal degrees.
Has super-properties:	—
Has domain	jponto:Image
Has range	xsd:double

Syntax	:GPSLongitude a owl:DatatypeProperty;
	
	   rdfs:comment "Describes the GPS longitude of the image ";
	
	   rdfs:domain :Image;
	
	   rdfs:range xsd:double;
	
	.

Example	@base <http://example.org/> . @prefix jponto: <http://www.jpeg.org/ns/jponto#> . <#image1> a jponto:Image; jponto:GPSlongitude 34.0; .

Property	jponto:hasRegionOfInterest
IRI	http://www.jpeg.org/ns/jponto#hasRegionOfInterest
Description	Describes a region of interest of the image.
Has super-properties:	—
Has domain	jponto:Image
Has range	jponto:RegionOfInterest
Syntax	:hasRegionOfInterest a owl:ObjectProperty; rdfs:comment "Describes a region of interest of the image."; rdfs:domain :Image; rdfs:range :RegionOfInterest; .
Example	@base <http://example.org/> . @prefix jponto: <http://www.jpeg.org/ns/jponto#> . @prefix xsd: <http://www.w3.org/2001/XMLSchema#> . <#image1> a jponto:Image; jponto:hasRegionOfInterest [jponto:boundingPolygon "0 0 100 100"; .

Property	jponto:height
IRI	http://www.jpeg.org/ns/jponto#title
Description	Specifies the number of pixel rows of the image.
Has super-properties:	—
Has domain	jponto:Image
Has range	xsd:integer

Syntax	:height a owl:DatatypeProperty;
	
	    rdfs:comment "Specifies the number of pixel rows of the image.";
	
	    rdfs:domain :Image;
	
	    rdfs:range xsd:integer;
	
	.

Example	@base <http://example.org/> . @prefix jponto: <http://www.jpeg.org/ns/jponto#> . <#image1> a jponto:Image; jponto:height 1024; .

Property	jponto:keyword
IRI	http://www.jpeg.org/ns/jponto#keyword
Description	Describes a keyword that characterize the image
Has super-properties:	—
Has domain	jponto:Image
Has range	xsd:string

Syntax	:keyword a owl:DatatypeProperty;
	
	    rdfs:comment "Describes a keyword that characterize the image ";
	
	    rdfs:domain :Image ;
	
	    rdfs:range xsd:string ;
	
	.

Example	@base <http://example.org/> . @prefix jponto: <http://www.jpeg.org/ns/jponto#> . <#image1> a jponto:Image; jponto:keyword "Seoul"; jponto:keyword "MPEG"; jponto:keyword "social event"; .

Property	jponto:mbox
IRI	http://www.jpeg.org/ns/jponto#mbox
Description	An email address as defined in RFC 5321
Has super-properties:	—
Has domain	jponto:Person
Has range	xsd:string

Syntax	:mbox a owl:DatatypeProperty;
	
	  rdfs:comment " Specifies the mbox of a person.";
	
	  rdfs:domain :Person;
	
	  rdfs:range xsd:string;
	
	.

Example	@base <http://example.org/> .
	
	@prefix jponto: <http://www.jpeg.org/ns/jponto#> .
	
	<#image1> a jponto:Image;
	
	  jponto:creator [
	
	    jponto:givenName "John";
	
	    jponto:familyName "Smith";
	
	    jponto:mbox <mailto:jsmith@example.com>];
	
	.

Property	jponto:modifiedDate
IRI	http://www.jpeg.org/ns/jponto#modifiedDate
Description	Describes the date when the image is modified.
Has super-properties:	—
Has domain	jponto:Image
Has range	xsd:dateTime
Syntax	:modifiedDate a owl:DatatypeProperty; rdfs:comment "Describes the date when the image is modified."; rdfs:domain :Image ; rdfs:range xsd:dateTime ; .
Example	@base <http://example.org/> . @prefix jponto: <http://www.jpeg.org/ns/jponto#> . @prefix xsd: <http://www.w3.org/2001/XMLSchema#> . <#image1> a jponto:Image; jponto:modifiedDate "2001- 10-26T21:32:52"^^xsd:date; .

Property	jponto:modifier
IRI	http://www.jpeg.org/ns/jponto#modifier
Description	Describes an agent who changed the image.
Has super-properties:	—
Has domain	jponto:Image
Has range	jponto:Agent

Syntax	:creator a owl:ObjectProperty;
	
	  rdfs:comment "Describes an agent who changed the image.";
	
	  rdfs:domain :Image;
	
	  rdfs:range :Agent;
	
	.

Example	@base <http://example.org/> .
	
	@prefix jponto: <http://www.jpeg.org/ns/jponto#> .
	
	<#image1> a jponto:Image;
	
	 jponto:modifier [
	
	   jponto:givenName "John Smith";
	
	   jponto:mbox <mailto:jsmith@example.com>];
	
	.

Property	jponto:publisher
IRI	http://www.jpeg.org/ns/jponto#publisher
Description	Describes information about the publishing people or organization of the image.
Has super-properties:	—
Has domain	jponto:Image
Has range	jponto:Agent

Syntax	:publisher a owl:ObjectProperty;
	
	    rdfs:comment " Describes the publisher of the image.";
	
	    rdfs:domain :Image;
	
	    rdfs:range :Agent;
	
	    .

Example	@base <http://example.org/> .
	
	@prefix jponto: <http://www.jpeg.org/ns/jponto#> .
	
	<#image1> a jponto:Image;
	
	 jponto:publisher [
	
	    jponto:givenName "John Smith";
	
	    jponto:mbox <mailto:jsmith@example.com>];
	
	    .

Property	jponto:title
IRI	http://www.jpeg.org/ns/jponto#title
Description	Specifies the title or name given to the image.
Has super-properties:	—
Has domain	jponto:Image
Has range	xsd:string

Syntax	:title a owl:DatatypeProperty;
	
	   rdfs:comment "Describes the title of the image ";
	
	   rdfs:domain :Image;
	
	   rdfs:range xsd:string;
	
	.

Example	@base <http://example.org/> . @prefix jponto: <http://www.jpeg.org/ns/jponto#> . <#image1> a jponto:Image; jponto:title "An example image"; .

Property	jponto:width
IRI	http://www.jpeg.org/ns/jponto#title
Description	Specifies the number of pixel columns of the image.
Has super-properties	—
Has domain	jponto:Image
Has range	xsd:integer
Syntax	:width a owl:DatatypeProperty; rdfs:comment "Specifies the number of pixel columns of the image."; rdfs:domain :Image; rdfs:range xsd:integer; .
Example	@base <http://example.org/> . @prefix jponto: <http://www.jpeg.org/ns/jponto#> <#image1> a jponto:Image; jponto:width 1024; .

8.2.4 Turtle representation of JPOnto-core

The following is the Turtle (Terse RDF Triple Language) representation of the JPOnto-core sub-vocabulary.

```
#Target namespace
@prefix : <http://www.jpeg.org/ns/jponto#> .

#Basic constructors by W3C (RDF, RDFS, OWL)
@prefix owl: <http://www.w3.org/2002/07/owl#> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .
@prefix jponto: <http://www.jpeg.org/ns/jponto#> .

#Datatype properties
@prefix xsd: <http://www.w3.org/2001/XMLSchema#> .

:Agent a owl:Class;
   rdfs:comment "An agent (eg. person, group, software or physical artifact).";
.
:Image a owl:Class;
   rdfs:comment " Represents a digital image ";
.

:Organisation a owl:Class;
   rdfs:comment "Organisation or moral agent";
   rdfs:subClassOf :Agent ;
.

:Person a owl:Class;
   rdfs:comment "A physical person.";


.
:RegionOfInterest a owl:Class;
   rdfs:comment "Represents a certain region within a digital image.";
   rdfs:subClassOf :Image;
.

:boundingPolygon a owl:DatatypeProperty;
   rdfs:comment "Specifies the coordinates of the edges of the polygon eclosing a region in the form "x1,y1,
x2,y2, x3,y3, ...";
   rdfs:domain :Image ;
   rdfs:range xsd:string ;
.

:creationDate a owl:DatatypeProperty;
   rdfs:comment "Describes the date when the image is created.";
   rdfs:domain :Image ;
   rdfs:range xsd:dateTime;
.
:creator a owl:ObjectProperty;
   rdfs:comment " Describes the author of the image.";
   rdfs:domain :Image;
   rdfs:range  :Agent;
.
```

```
:description a owl:DatatypeProperty;
   rdfs:comment "Specifies the content  of the image in the form of text.";
   rdfs:domain :Image ;
   rdfs:range xsd:string ;
.

:familyName a owl:DatatypeProperty;
   rdfs:comment " Specifies the family name of a person.";
   rdfs:domain :Person;
   rdfs:range xsd:string;
.
:givenName a owl:DatatypeProperty;
   rdfs:comment " Specifies the given name of a person.";
   rdfs:domain :Person;
   rdfs:range xsd:string;
.
:GPSAltitude a owl:DatatypeProperty;
   rdfs:comment "Describes the GPS altitude of the image ";
   rdfs:domain  :Image;
   rdfs:range xsd:double;
.
:GPSLatitude a owl:DatatypeProperty;
   rdfs:comment "Describes the GPS latitude of the image ";
   rdfs:domain :Image;
   rdfs:range xsd:double;
.
:GPSLongitude a owl:DatatypeProperty;
   rdfs:comment "Describes the GPS longitude of the image ";
   rdfs:domain  :Image;
   rdfs:range xsd:double;
.

:hasRegionOfInterest a owl:ObjectProperty;
   rdfs:comment "Describes a region of interest of the image.";
   rdfs:domain :Image;
   rdfs:range  :RegionOfInterest;
 .

:height a owl:DatatypeProperty;
   rdfs:comment "Specifies the height of the image.";
   rdfs:domain  :Image;
   rdfs:range xsd:integer;
.
:keyword a owl:DatatypeProperty;
   rdfs:comment "Describes a keyword that characterize the image ";
   rdfs:domain :Image ;
   rdfs:range xsd:string ;
.
:mbox a owl:DatatypeProperty;
   rdfs:comment " Specifies the mbox of a person.";
   rdfs:domain  :Person;
   rdfs:range xsd:string;
.
:modifiedDate a owl:DatatypeProperty;
   rdfs:comment "Describes the date when the image is modified.";
   rdfs:domain :Image ;
   rdfs:range xsd:dateTime ;
.
:creator a owl:ObjectProperty;
   rdfs:comment "Describes an agent who changed the image.";
```

```
    rdfs:domain  :Image;
    rdfs:range  :Agent;
  .
:publisher a owl:ObjectProperty;
    rdfs:comment " Describes the publisher of the image.";
    rdfs:domain  :Image;
    rdfs:range  :Agent;
  .
:title a owl:DatatypeProperty;
    rdfs:comment "Describes the title of the image ";
    rdfs:domain  :Image;
    rdfs:range xsd:string;
  .
:width a owl:DatatypeProperty;
    rdfs:comment "Describes the title of the image ";
    rdfs:domain  :Image;
    rdfs:range xsd:integer;
  .
```

8.3   JPOnto-visual

8.3.1   Outline

The JPOnto-Visual sub-vocabulary provides a core set of classes and properties facilitating the semantic description of the contents of the image. The **jponto:depicts** property is the core component of JPOnto-visual. The *jponto:depicts* property allows binding an image with the real-world objects and events that it represents. Defining the *RegionOfInterest* as a subclass of *Image*, allows to also use the *depicts* predicate to bind ROIs with real-world objects and events.
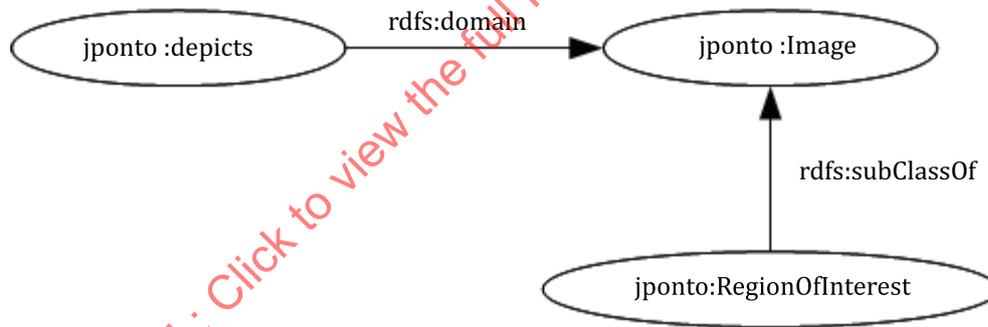

Figure 2 — The *jponto:depicts* property allows binding an image with the real-world objects and events that it represents

8.3.2   Example

This Clause provides three examples of semantic description of images.

8.3.2.1 Example 1

This example shows the semantic description of the contents of an imaginary image.

```
@base <http://example.org/> .
@prefix jponto: <http://www.jpeg.org/ns/jponto#> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .

<#image1> a jponto:Image;
 jponto:depicts <#person1>;
 jponto:depicts <#building1>;
.

<#person1> a jponto:Person;
 jponto:givenName "John smith";
 jponto:mbox <mailto:jsmith@example.com>
 jponto:hasAge jponto:Youngness;
 jponto:hasFeeling jponto:Happiness;
 jponto:hasGender jponto:Male;
.


<#building1> a jponto:Building;
 jponto:givenName "Namdaemun gate";
 jponto:wikipedia https://en. wikipedia.org/wiki/Sungnyemun;
.
```

8.3.2.2 Example 2

This example shows the semantic description of the content of an image showing a boy and his grandfather.

```
@base <http://example.org/> .
@prefix jponto: <http://www.jpeg.org/ns/jponto#> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .

<#image1> a jponto:Image;
 jponto:depicts <#person1>;
 jponto:depicts <#person2>;
.

<#person1> a jponto:Person;
 jponto:hasAge jponto:Youngness;
 jponto:hasFeeling jponto:Happiness;
 jponto:hasGender jponto:Male;
.

<#person2> a jponto:Person;
 jponto:hasAge jponto:Oldness;
 jponto:hasGender jponto:Male;
.

<#relationship1> a jponto:Parentage;
 jponto:involves <#person1>;
 jponto:involves <#person1>;
```

8.3.2.3 Example 3

This example shows the semantic description of the content of an image showing a man carrying a hat in his hand and talking with a woman.

```
@base <http://example.org/> .
@prefix jponto: <http://www.jpeg.org/ns/jponto#> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .

<#image1> a jponto:Image;
 jponto:depicts <#person1>;
 jponto:depicts <#person2>;
 jponto:depicts <#action1>;
 jponto:depicts <#action2>;
 .
<#person1> a jponto:Person;
 jponto:hasGender :Male;
 .
<#person2> a jponto:Person;
 jponto:hasGender jponto:Female;
 .
<#action1> a jponto:Carrying;
 jponto:subject <#person1>;
 jponto:object [
    rdf:type  jponto:Hat;
 ];
 .
<#action2> a jponto:Communication;
 jponto:subject <#person1>;
 jponto:subject <#person1>;
 .
```

8.3.3   Taxonomy of classes of JPOnto-visual

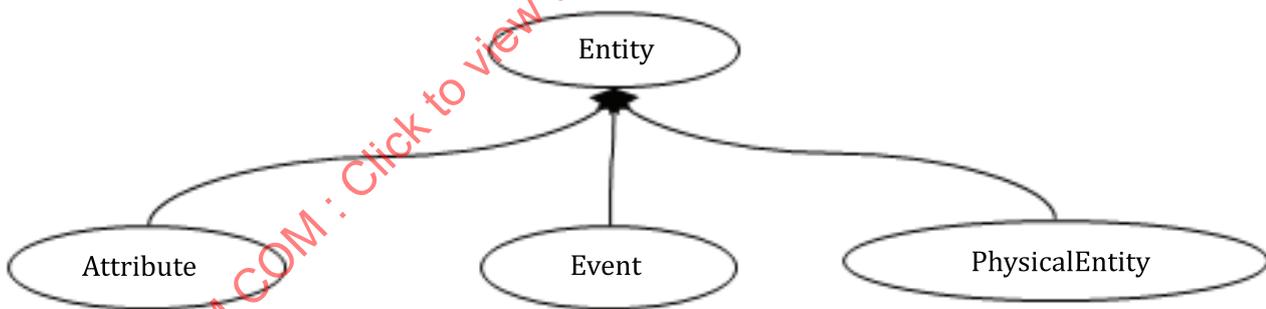The root classes of JPOnto-Visual (connected by rdfs:subClassOf edges) are shown in Figure 3.

Figure 3 — Root classes of JPOnto-visual (arrows represent *rdfs:subClassOf* relationships)

(informative) Design principle: Selection of classes and properties from WordNet

JPOnto-Visual does not attempt to model all possible entities depicted by the images, it just provides a taxonomy of root classes and properties, a small set of specific classes and properties and an extensibility mechanism. The classes and properties included in JPOnto-Visual, along with their definitions and rdfs:subClassOf/ rdfs:subPropertyOf relationships, have been selected from the WordNet lexical database for the English language.

8.3.3.1 Subclasses of *jponto:PhysicalEntity*

Subclasses of *jponto:PhysicalEntity* (connected by rdfs:subClassOf edges) are shown in Figure 4. A set of specific sublclasses are also defined (*jponto:Rain, jponto:Combustion, jponto:Face, jponto:Mountain, jponto:Water, jponto:Car*, etc.) but not shown in Figure 4.
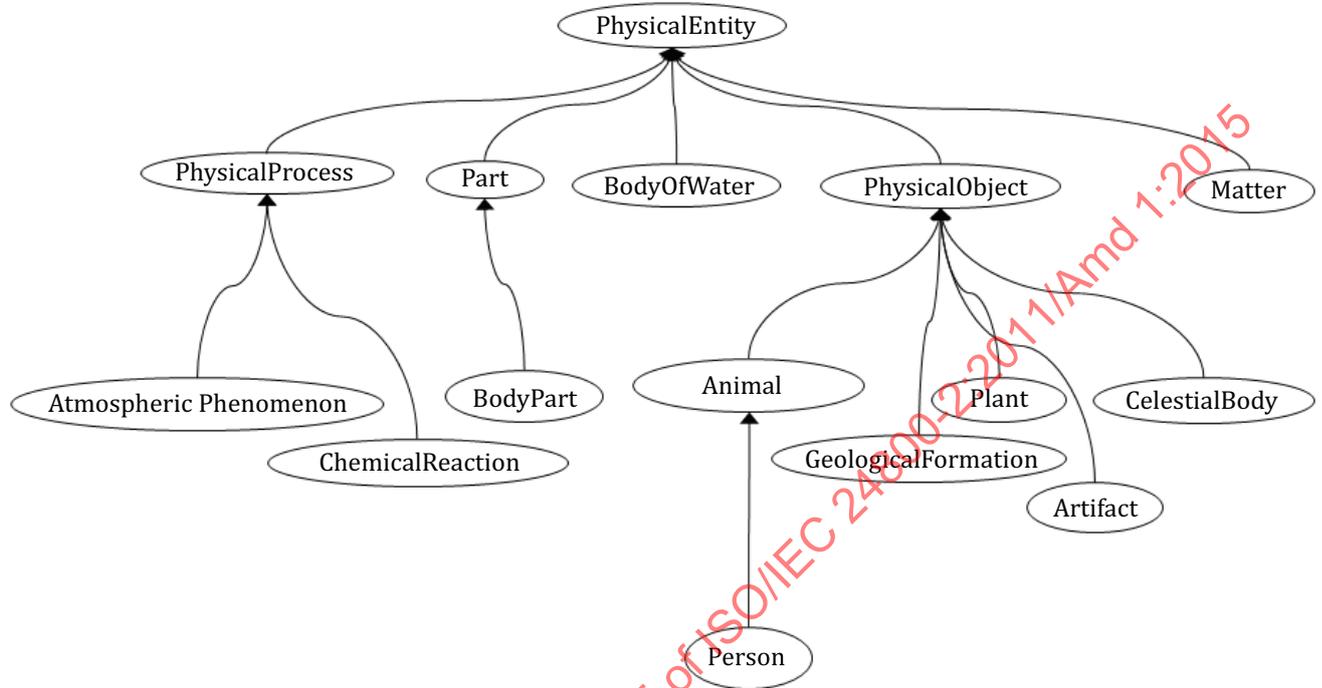

Figure 4 — Subclasses of *jponto:PhysicalEntity*

Table 1 shows all specific subclasses of *jponto:PhysicalEntity* defined within this part of ISO/IEC 24800.

Table 1 — Subclasses of *jponto:PhysicalEntity*

Subclasses of AtmosphericPhenomenon	Aurora, Cloud, Storm, Meteor, Sunset, Wind, Snow, Rain
Subclasses of ChemicalReaction	Fire
Subclasses of BodyPart	Head, Hand, Face, Lip, Shoulder, Thorax, Venter, Toe, Finger, Back
Subclasses of BodyOfWater	River, Lake, Sea, Ocean, Channel, Bay, Waterfall, Stream, Gulf
Subclasses of Animal	Person, Dog, Cat, Mouse
Subclasses of GeographicalFormation	Mountain, Hill, Ridge, Delta, Cave, Beach, Crater
Subclasses of Artifact	Car, Bicycle, House, Gun, Hat, Shoe, Ball
Subclasses of Plant	Oak, Pine, Grass, Flower
Subclasses of CelestialBody	Sun, Moon
Subclasses of Matter	Water, Plastic, Food, Crystal, Coal, Wood, Quartz, Dust, Foam, Paper, Earth

8.3.3.2 Subclasses of *jponto:Event*

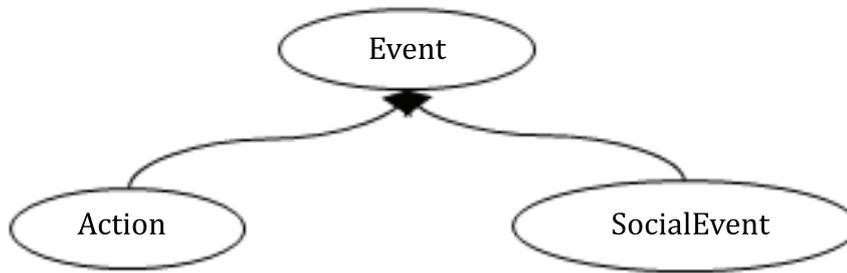Subclasses of *jponto:Event* (connected by rdfs:subClassOf edges) are shown in Figure 5.

Figure 5 — Subclasses of *jponto:Event*

Table 2 shows all specific subclasses of *jponto:Event* defined within this part of ISO/IEC 24800.

Table 2 — Subclasses of *jponto:Event*

Subclasses of Action	Playing, Wearing, Aggresion, Aggression, Touching, Carrying, Communication
Subclasses of SocialEvent	Wedding, BirthdayParty, Circus, Demonstration, Carnival, Play, Funeral

---

(informative) Design principle: Minimization of description choices

When multiple WordNet terms may be used to describe the same facts, only the ones with more descriptive power have been included. For instance, activities such as Work, Game, etc. have been discarded as they can be described with more detail with subclasses of jponto:Action.

8.3.3.3 Subclasses of *jponto:Attribute*

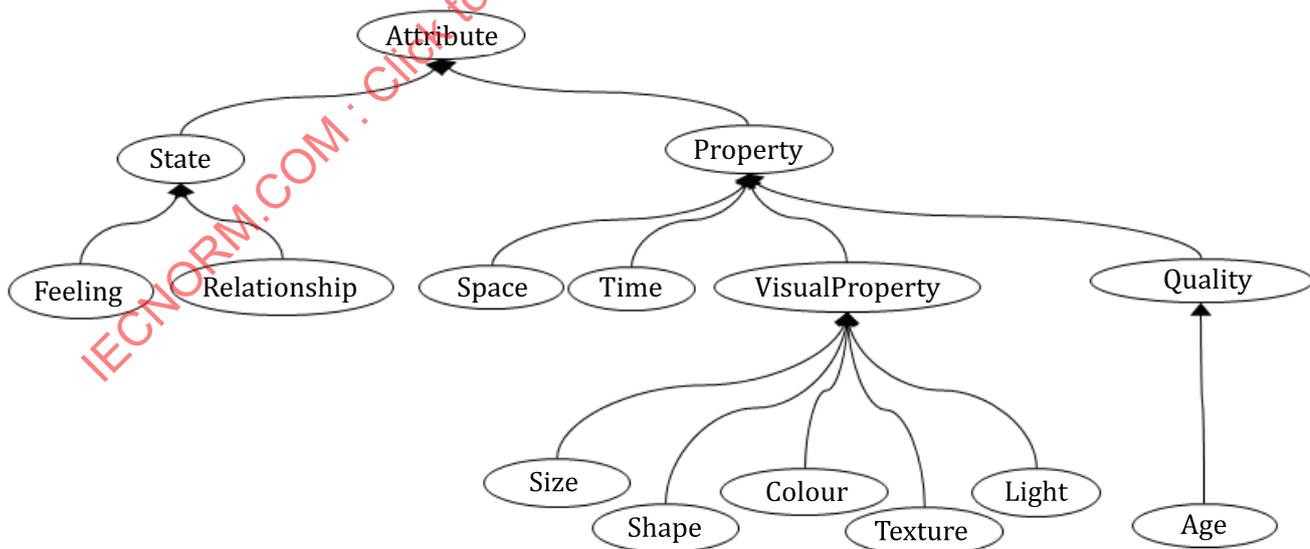Subclasses of *jponto:Attribute* (connected by rdfs:subClassOf edges) are shown in Figure 6.

Figure 6 — Subclasses of *jponto:Attribute*

Table 3 shows all specific subclasses of *jponto:Attribute* defined within this part of ISO/IEC 24800.

Table 3 — Subclasses of *jponto:Attribute*

Subclasses of Feeling	Pain, Pleasure, Astonishment, Fear, Desire, Anger, Anger Sadness, Happiness, Dislike, Love
Subclasses of Relationship	Parentage, MaritalRelationship
Subclasses of Size	Big, Small, Huge
Subclasses of Shape	Round, Circle, Line, Square
Subclasses of Color	Red, Green, Blue, Pink, Olive, Black, White, Yellow, Grey, Orange, Purple, White
Subclasses of Texture	Smoothness, Roughness
Subclasses of Light	Night, Sunlight, Moonlight, Shadow, Darkness, Twilight, Incandescence
Subclasses of Age	Youngness, Oldness

8.3.4   Properties of JPOnto-visual

Figure 7 shows the generic properties of JPOnto-Visual (connected by rdfs:subPOf edges).
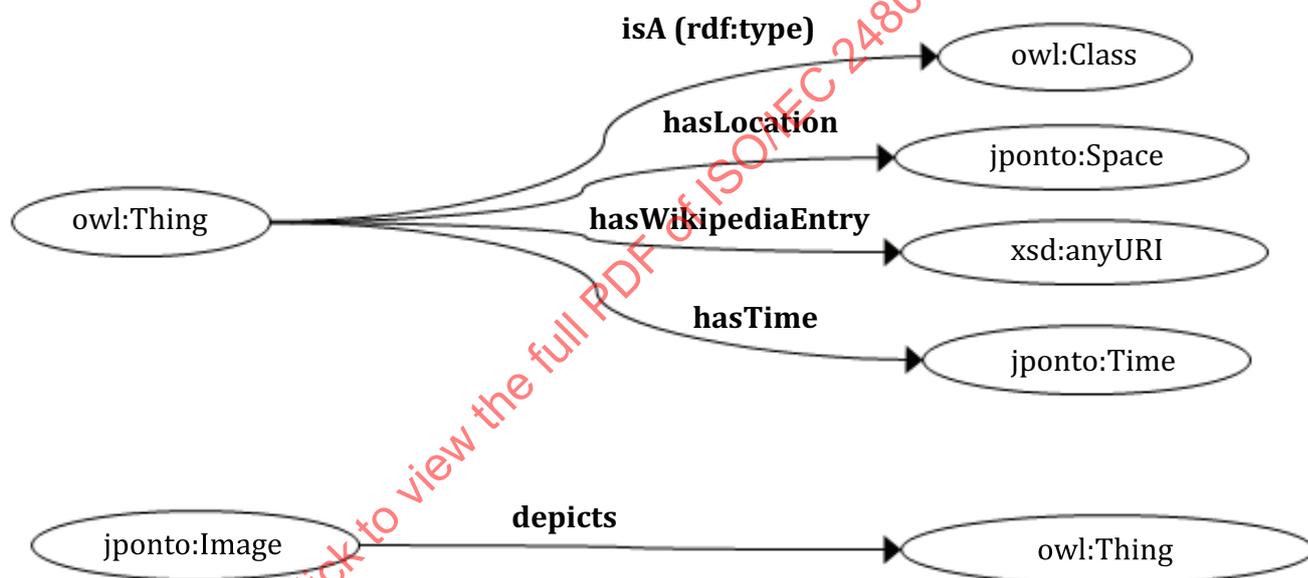
Figure 7 — Generic properties of JPOnto-visual (arrows show the domain and range of the property)

Specific properties of JPOnto-Visual (connected by rdfs:subPOf edges) are shown in Figure 8.
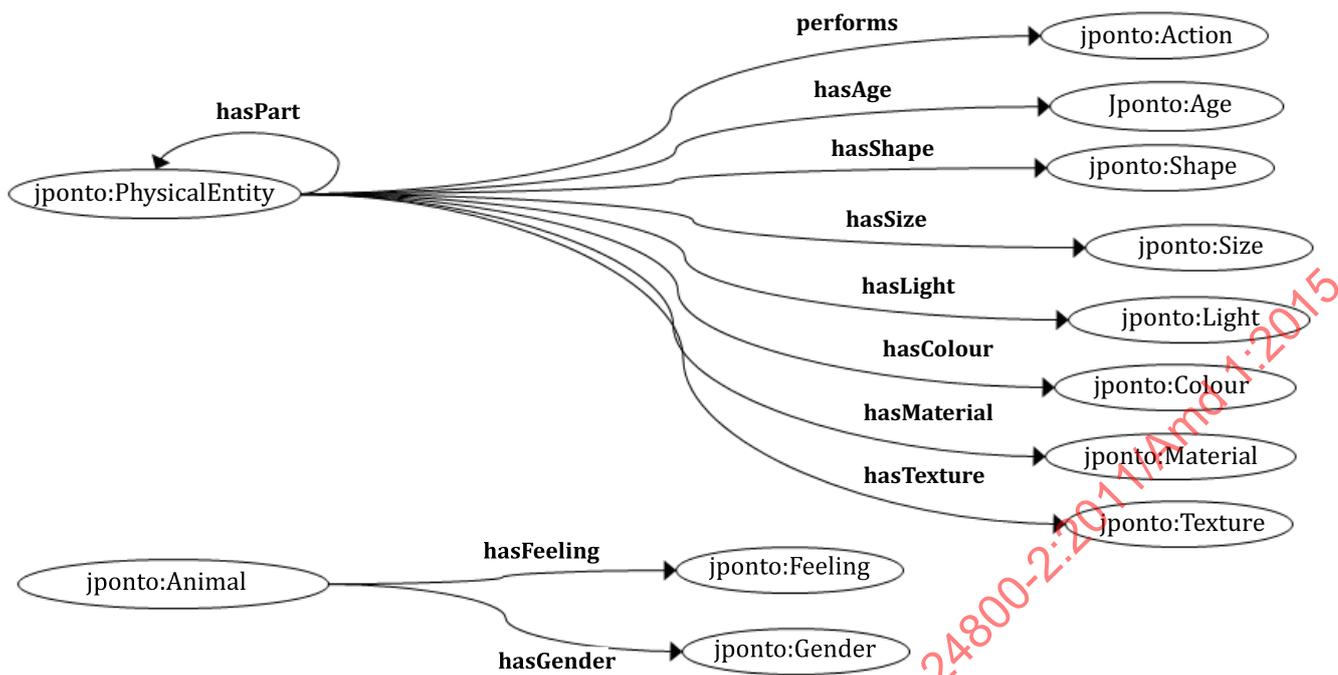
Figure 8 — Specific properties of JPOnto-visual (arrows show the domain and range of the property)

8.3.5   Semantics

8.3.5.1 JPOnto-visual class definitions (in alphabetical order)

Class	jponto:Action
Superclasses	jponto:Event
IRI	http://www.jpeg.org/ns/jponto#Action
Description	Something that people do or cause to happen.
Described with properties:	
In range of	jponto:performs
Has subclasses	
Syntax	:Action a owl:Class; rdfs:comment "Something that people do or cause to happen."; rdfs:subClassOf :Event; .

Class	jponto:Age
Superclasses	jponto:Quality
IRI	http://www.jpeg.org/ns/jponto#Age
Description	How long something has existed.
Described with properties:	
In range of	jponto:hasAge
Has subclasses	
Syntax	:Age a owl:Class; rdfs:comment "How long something has existed "; rdfs:subClassOf :Quality; .

Class	jponto:Animal
Superclasses	jponto:PhysicalObject
IRI	http://www.jpeg.org/ns/jponto#Animal
Description	A living organism characterized by voluntary movement.
Described with properties:	jponto:hasFeeling
In range of	
Has subclasses	
Syntax	:Animal a owl:Class ; rdfs:comment "A living organism characterized by voluntary movement."; rdfs:subClassOf:PhysicalObject; .

Class	jponto:Artifact
Superclasses	jponto:PhysicalObject
IRI	http://www.jpeg.org/ns/jponto#Artifact
Description	A man-made object taken as a whole.
Described with properties:	
In range of	
Has subclasses	
Syntax	:Artifact a owl:Class ; rdfs:comment "A man-made object taken as a whole."; rdfs:subClassOf:PhysicalObject; .

Class	jponto:AtmosphericPhenomenon
Superclasses	jponto:PhysicalProcess
IRI	http://www.jpeg.org/ns/jponto#AtmosphericPhenomenon
Description	A physical phenomenon associated with the atmosphere.
Described with properties:	
In range of	
Has subclasses	
Syntax	:AtmosphericPhenomenon a owl:Class; rdfs:comment " A physical phenomenon associated with the atmosphere."; rdfs:subClassOf :PhysicalProcess; .

Class	**jponto:Attribute**
Superclasses	jponto:Entity
IRI	http://www.jpeg.org/ns/jponto#Attribute
Description	An abstraction belonging to or characteristic of an entity.
Described with properties:	
In range of	
Has subclasses	jponto:State, jponto:Property

Syntax	:Attribute a owl:Class;
	
	  rdfs:comment " An abstraction belonging to or characteristic of an entity.";
	
	  rdfs:subClassOf :Entity;
	
	  .

Example	(see examples for subclasses)

Class	jponto:BodyOfWater
Superclasses	jponto:PhysicalEntity
IRI	http://www.jpeg.org/ns/jponto#BodyOfWater
Description	The part of the earth's surface covered with water (such as a river or lake or ocean).
Described with properties:	
In range of	
Has subclasses	
Syntax	:BodyOfWater a owl:Class; rdfs:comment "The part of the eart h's surface covered with water (such as a river or lake or ocean)."; rdfs:subClassOf :PhysicalEntity; .

Class	jponto:BodyPart
Superclasses	jponto:Part
IRI	http://www.jpeg.org/ns/jponto#BodyPart
Description	Any part of an organism such as an organ or extremity.
Described with properties:	
In range of	
Has subclasses	
Syntax	:BodyPart a owl:Class; rdfs:comment "Any part of an organi sm such as an organ or extremity."; rdfs:subClassOf :Part; .

Class	jponto:CelestialBody
Superclasses	jponto:PhysicalObject
IRI	http://www.jpeg.org/ns/jponto#CelestialBody
Description	Natural objects visible in the sky.
Described with properties:	
In range of	
Has subclasses	

Syntax	:CelestialBody a owl:Class;
	
	    rdfs:comment " Natural objects visible in the sky.";
	
	    rdfs:subClassOf :PhysicalObject;
	
	    .

Class	jponto:ChemicalReaction
Superclasses	jponto:PhysicalProcess
IRI	http://www.jpeg.org/ns/jponto#ChemicalReaction
Description	A process in which one or more substances are changed into others.
Described with properties:	
In range of	
Has subclasses	

Syntax	:ChemicalReaction a owl:Class;
	
	    rdfs:comment "A process in which one or more substances are changed into others.";
	
	    rdfs:subClassOf :PhysicalProcess;
	
	.

Class	jponto:Color
Superclasses	jponto:VisualProperty
IRI	http://www.jpeg.org/ns/jponto#Color
Description	A visual attribute of things that results from the light they emit or transmit or reflect.
Described with properties:	
In range of	jponto:hasColor
Has subclasses	

Syntax	:Color a owl:Class;
	
	    rdfs:comment "Any A visual attribute of things that results from the light they emit or transmit or reflect.";
	
	    rdfs:subClassOf :VisualProperty;
	
	    .

Class	jponto:Entity
Superclasses	—
IRI	http://www.jpeg.org/ns/jponto#Entity
Description	That which is perceived or known or inferred to have its own distinct existence (living or nonliving).
Described with properties:	
In range of	
Has subclasses	jponto:Attribute, jponto:Event, jponto:PhysicalEntity

Syntax	:Entity a owl:Class;
	
	    rdfs:comment "That which is perceived or known or inferred to have its own distinct existence (living or nonliving).";
	
	    .

Class	jponto:Event
Superclasses	jponto:Entity
IRI	http://www.jpeg.org/ns/jponto#Event
Description	Something that happens at a given place and time.
Described with properties:	
In range of	
Has subclasses	jponto:PhysicalProcess, jponto: Part, jponto:BodyOfWater, jponto:PhysicalObject, Matter

Syntax	:Event a owl:Class;
	
	    rdfs:comment "Something that happens at a given place and time.";
	
	    rdfs:subClassOf :Entity;
	
	.

Class	jponto:Feeling
Superclasses	jponto:State
IRI	http://www.jpeg.org/ns/jponto#Feeling
Description	The experiencing of affective and emotional states.
Described with properties:	
In range of	jponto:hasFeeling
Has subclasses	

Syntax	:Feeling a owl:Class;
	
	   rdfs:comment "The experiencing of affective and emotional states.";
	
	   rdfs:subClassOf :State;
	
	.

Class	jponto:Gender
Superclasses	jponto:Attribute
IRI	http://www.jpeg.org/ns/jponto#Gender
Description	The state of being male or female.
Described with properties:	
In range of	jponto:hasGender
Has subclasses	

Syntax	:Gender a owl:Class;
	
	   rdfs:comment "The state of being male or female..";
	
	   rdfs:subClassOf :Attribute;
	
	.

Class	jponto:GeologicalFormation
Superclasses	jponto:PhysicalObject
IRI	http://www.jpeg.org/ns/jponto#GeologicalFormation
Description	The geological features of the earth.
Described with properties:	
In range of	
Has subclasses	
Syntax	:GeologicalFormation a owl:Class; rdfs:comment "The geological features of the earth."; rdfs:subClassOf :PhysicalObject; .

Class	jponto:Light
Superclasses	jponto:VisualProperty
IRI	http://www.jpeg.org/ns/jponto#Light
Description	The visual effect of illumination on objects or scenes as created in pictures.
Described with properties:	
In range of	jponto:hasLight
Has subclasses	
Syntax	:Light a owl:Class; rdfs:comment "The visual effect of illumination on objects or scenes as created in pictures."; rdfs:subClassOf :VisualProperty; .

Class	jponto:Matter
Superclasses	jponto:PhysicalEntity
IRI	http://www.jpeg.org/ns/jponto#Matter
Description	That which has mass and occupies space.
Described with properties:	
In range of	jponto:hasMaterial
Has subclasses	

Syntax	:Matter a owl:Class;
	
	  rdfs:comment " That which has mass and occupies space ";
	
	  rdfs:subClassOf :PhysicalEntity;
	
	  .

Class	jponto:Part
Superclasses	jponto:PhysicalEntity
IRI	http://www.jpeg.org/ns/jponto#Part
Description	Something determined in relation to something that includes it.
Described with properties:	
In range of	
Has subclasses	jponto:BodyPart

Syntax	:Part a owl:Class;
	
	  rdfs:comment " Something determined in relation to something that includes it.";
	
	  rdfs:subClassOf :PhysicalEntity;
	
	  .

Class	jponto:Person
Superclasses	jponto:Animal
IRI	http://www.jpeg.org/ns/jponto#Person
Description	Any living or extinct member of the family Hominidae characterized by superior intelligence, articulate speech, and erect carriage.
Described with properties:	
In range of	
Has subclasses	

Syntax	:Person a owl:Class;
	
	  rdfs:comment "Any living or ex tinct member of the family Hominidae characterized by superior intelligence, articulate speech, and erect carriage.";
	
	  rdfs:subClassOf :Animal;
	
	.

Class	jponto:PhysicalEntity
Superclasses	jponto:Entity
IRI	http://www.jpeg.org/ns/jponto#PhysicalEntity
Description	An entity that has physical existence.
Described with properties:	jponto:performs, jponto:hasAge, jponto:hasShape, jponto:hasSize, jponto:hasLight, jponto:hasColor, jponto:hasMaterial, jponto:hasTexture
In range of	
Has subclasses	jponto:PhysicalProcess, jponto: Part, jponto:BodyOfWater, jponto:PhysicalObject, Matter

Syntax	:Entity a owl:Class;
	
	   rdfs:comment " An entity that has physical existence.";
	
	   rdfs:subClassOf :Entity;
	
	   .

Class	jponto:PhysicalObject
Superclasses	jponto:PhysicalEntity
IRI	http://www.jpeg.org/ns/jponto#PhysicalObject
Description	A tangible and visible entity; an entity that can cast a shadow.
Described with properties:	
In range of	
Has subclasses	jponto:Animal, jponto:GeologicalFormation, jponto:Plant, jponto:Artifcat, jponto:CelestialBody

Syntax	:AnimatedThing a owl:Class;
	
	  rdfs:comment "A tangible and visible entity; an entity that can cast a shadow ";
	
	  rdfs:subClassOf :PhysicalEntity;
	
	.

Class	jponto:PhysicalProcess
Superclasses	jponto:PhysicalEntity
IRI	http://www.jpeg.org/ns/jponto#PhysicalProcess
Description	A sustained phenomenon or one marked by gradual changes through a series of states.
Described with properties:	
In range of	
Has subclasses	jponto:AtmosphericPhenomenon, jponto:ChemicalReaction

Syntax	:PhysicalProcess a owl:Class;
	
	  rdfs:comment "A sustained phenomenon or one marked by gradual changes through a series of states.";
	
	  rdfs:subClassOf :PhysicalEntity;
	
	  .

Class	jponto:Plant
Superclasses	jponto:PhysicalObject
IRI	http://www.jpeg.org/ns/jponto#Plant
Description	A living organism lacking the power of locomotion.
Described with properties:	
In range of	
Has subclasses	

Syntax	:Plant a owl:Class;
	
	  rdfs:comment " A living organism lacking the power of locomotion.";
	
	  rdfs:subClassOf :PhysicalObject;
	
	  .

Class	jponto:Property
Superclasses	jponto:Attribute
IRI	http://www.jpeg.org/ns/jponto#Property
Description	A construct whereby objects or individuals can be distinguished.
Described with properties:	
In range of	
Has subclasses	

Syntax	:Property a owl:Class;
	
	  rdfs:comment "A construct whereby objects or individuals can be distinguished.";
	
	  rdfs:subClassOf :Attribute;
	
	.

Class	jponto:Quality
Superclasses	jponto:Property
IRI	http://www.jpeg.org/ns/jponto#Quality
Description	An essential and distinguishing attribute of something or someone.
Described with properties:	
In range of	
Has subclasses	

Syntax	:Quality a owl:Class;
	
	  rdfs:comment "An essential and distinguishing attribute of something or someone.";
	
	  rdfs:subClassOf :Property;
	
	  .

Class	jponto:Relationship
Superclasses	jponto:State
IRI	http://www.jpeg.org/ns/jponto#Relationship
Description	A relation between people.
Described with properties:	
In range of	
Has subclasses	

Syntax	:Relationship a owl:Class;
	
	  rdfs:comment "A relation between people.";
	
	  rdfs:subClassOf :State;
	
	  .

Class	jponto:Shape
Superclasses	jponto:VisualProperty
IRI	http://www.jpeg.org/ns/jponto#Shape
Description	Any spatial attributes (especially as defined by outline).
Described with properties:	
In range of	jponto:hasShape
Has subclasses	

Syntax	:Shape a owl:Class;
	
	  rdfs:comment "Any spatial attribut es (especially as defined by outline).";
	
	  rdfs:subClassOf :VisualProperty;
	
	  .

Class	jponto:Size
Superclasses	jponto:VisualProperty
IRI	http://www.jpeg.org/ns/jponto#Size
Description	The physical magnitude of something (how big it is).
Described with properties:	
In range of	jponto:hasSize
Has subclasses	

Syntax	:Size a owl:Class;
	
	  rdfs:comment "The physical magnitude of something (how big it is).";
	
	  rdfs:subClassOf :VisualProperty;
	
	  .

Class	jponto:SocialEvent
Superclasses	jponto:Event
IRI	http://www.jpeg.org/ns/jponto#SocialEvent
Description	An event characteristic of persons forming groups.
Described with properties:	
In range of	
Has subclasses	
Syntax	:SocialEvent a owl:Class; rdfs:comment "An event characteristic of persons forming groups."; rdfs:subClassOf :Event; .

Class	jponto:Space
Superclasses	jponto:Property
IRI	http://www.jpeg.org/ns/jponto#Space
Description	A determination of the place where something is.
Described with properties:	
In range of	jponto:hasLocation
Has subclasses	
Syntax	:Space a owl:Class; rdfs:comment "A determination of the place where something is."; rdfs:subClassOf :Property; .

Class	jponto:State
Superclasses	jponto:Attribute
IRI	http://www.jpeg.org/ns/jponto# State
Description	The way something is with respect to its main attributes.
Described with properties:	
In range of	
Has subclasses	

Syntax	:State a owl:Class;
	
	  rdfs:comment "The way something is with respect to its main attributes.";
	
	  rdfs:subClassOf :Attribute;
	
	.

Class	jponto:Texture
Superclasses	jponto:VisualProperty
IRI	http://www.jpeg.org/ns/jponto#Texture
Description	The characteristic appearance of a surface having a tactile quality.
Described with properties:	
In range of	jponto:hasTexture
Has subclasses	

Syntax	:Texture a owl:Class;
	
	  rdfs:comment "The characteristic appearance of a surface having a tactile quality).";
	
	  rdfs:subClassOf :VisualProperty;
	
	.

Class	**jponto:Time**
Superclasses	jponto:Property
IRI	http://www.jpeg.org/ns/jponto#Space
Description	The fourth coordinate that is required (along with three spatial dimensions) to specify a physical event.
Described with properties:	
In range of	jponto:hasTime
Has subclasses	

Syntax	:Time a owl:Class;
	
	    rdfs:comment "The fourth coordinate that is required (along with three spatial dimensions) to specify a physical event.";
	
	    rdfs:subClassOf :Property;
	
	    .

Class	**jponto:VisualProperty**
Superclasses	jponto:Property
IRI	http://www.jpeg.org/ns/jponto#VisualProperty
Description	The visual percept of a region.
Described with properties:	
In range of	
Has subclasses	

Syntax	:VisualProperty a owl:Class;
	
	    rdfs:comment "The visual percept of a region.";
	
	    rdfs:subClassOf :Property;
	
	    .

8.3.5.2 JPOnto-visual property definitions (in alphabetical order)

Property	jponto:depicts
IRI	http://www.jpeg.org/ns/jponto#depicts
Description	Describes the real world people, things or phenomena depicted in the image.
Has super-properties:	—
Has domain	jponto:Image, jponto:RegionOfInterest
Has range	—

Syntax	:depicts a owl:ObjectProperty;
	
	  rdfs:comment "Describes the real world people, things or phenomena depicted in the image.";
	
	  rdfs:domain :Image;
	
	.

Property	jponto:hasAge
IRI	http://www.jpeg.org/ns/jponto#hasAge
Description	How long something has existed.
Has super-properties:	—
Has domain	jponto:PhysicalEntity
Has range	jponto:Age

Syntax	:hasAge a owl:ObjectProperty;
	
	  rdfs:comment "How long something has existed.";
	
	  rdfs:domain :PhysicalEntity;
	  rdfs:range :Age;
	
	.

Property	jponto:hasColor
IRI	http://www.jpeg.org/ns/jponto#hasColor
Description	A visual attribute of things that results from the light they emit or transmit or reflect.
Has super-properties:	—
Has domain	jponto:PhysicalEntity
Has range	jponto:Color
Syntax	:hasColor a owl:ObjectProperty; rdfs:comment "A visual attribute of things that results from the light they emit or transmit or reflect."; rdfs:domain :PhysicalEntity; rdfs:range :Color; .

Property	jponto:hasFeeling
IRI	http://www.jpeg.org/ns/jponto#hasFeeling
Description	To have a physical or emotional sensation of (something).
Has super-properties:	—
Has domain	jponto:Animal
Has range	jponto:Feeling
Syntax	:hasFeeling a owl:ObjectProperty; rdfs:comment "To have a physical or emotional sensation of (something)."; rdfs:domain :Animal; rdfs:domain :Feeling; .

Property	jponto:hasGender
IRI	http://www.jpeg.org/ns/jponto#hasGender
Description	The state of being male or female.
Has super-properties:	—
Has domain	jponto:Animal
Has range	jponto:Gender

Syntax	:hasGender a owl:ObjectProperty;
	
	    rdfs:comment "To have a physical or emotional sensation of (something).";
	
	    rdfs:domain :Animal;
	
	    rdfs:domain :Gender;
	
	    .