



Some challenge problems for the Web Ontology Language

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Application context

- ✍ Annotation and search of digital collections of images
 - ape photographs (for magazine editors)
 - art-object photographs (for educated lay people)
- ✍ Image retrieval techniques employed:
 - (1) “content-based”image retrieval (texture, color)
 - (2) ontology-based image indexing and search
- ✍ Requirements & assumptions for (2)
 - Domain knowledge corpora exist
 - Search context is known
 - Manual indexing is feasible/practical

Annotating a photograph

MIA tool -- file:photos/ar5611-002.jpg

File ▾ Annotate ▾ Ontology ▾ View ▾ Help ▾ Photo_annotation ▾

Subject matter | Photo features | Medium features

Create: Passive agent Active agent

young scratching_the_head chimpanzee

Agent
chimpanzee

With

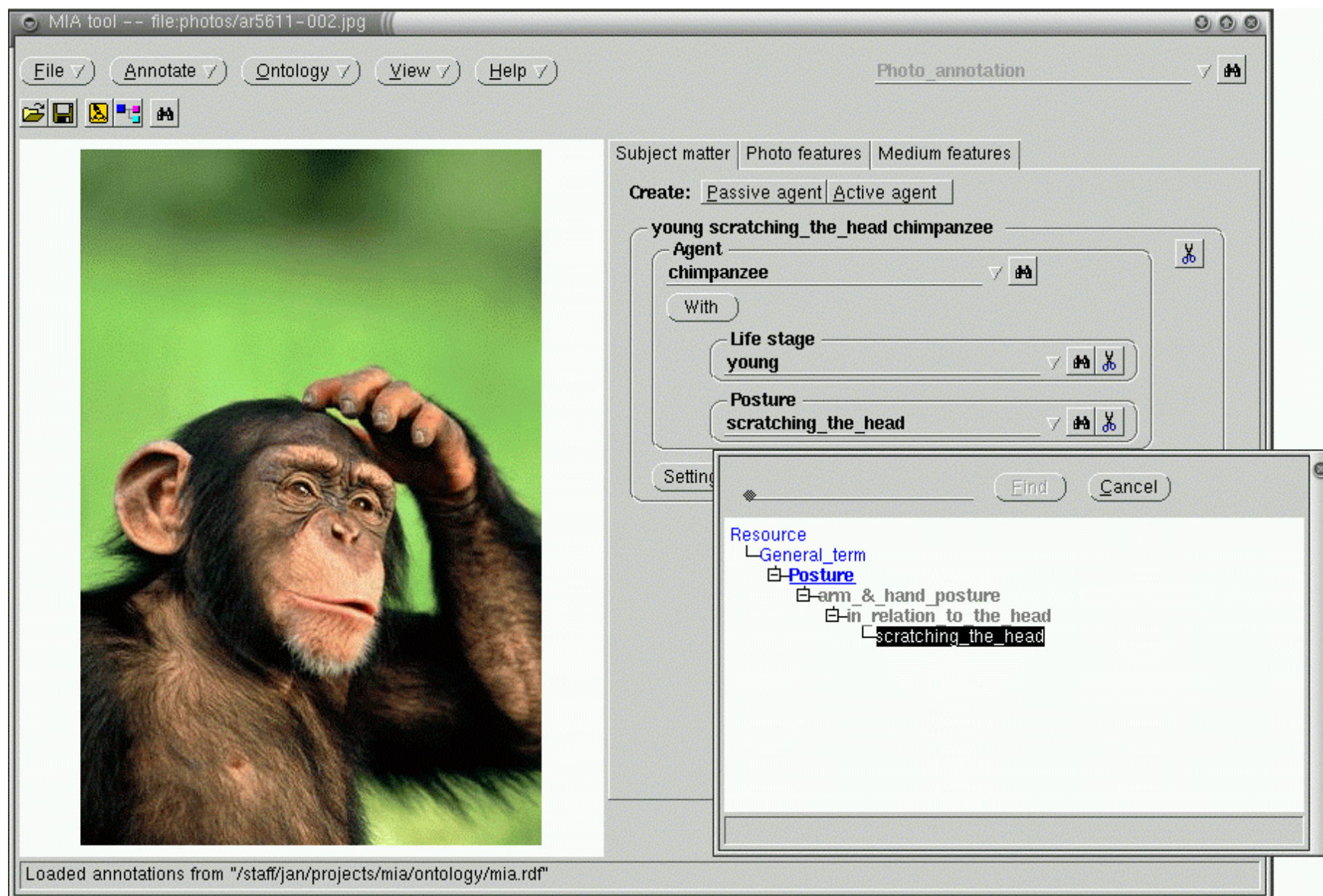
Life stage
young

Posture
scratching_the_head

Setting Find Cancel

Resource
└ General_term
└ Posture
└ arm_&_hand_posture
└ in relation to the head
└ scratching_the_head

Loaded annotations from "/staff/jan/projects/mia/ontology/mia.rdf"



Knowledge sources for art objects

- ✍ Art and Architecture Thesaurus
 - 28,000 main terms
 - 120,000 terms in total
- ✍ Visual Resource Association (VRA) 3.0
 - Description template for art images
 - Refinement of Dublin Core
 - Controlled vocabulary for element values (AAT)
- ✍ (ICONCLASS, ULAN, TGN.....)

AAT description of chest of drawers



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Ontology browser

- Resource
 - aat_entity
 - Furnishings
 - furnishings
 - <furnishings by form or function>
 - furniture
 - <furniture by form or function>
 - screens (furniture)
 - seating furniture
 - <sleeping and reclining furniture>
 - <support furniture>
 - <storage and display furniture>
 - cases
 - cabinet
 - chest
 - chest of drawers**
 - cupboards
 - wardrobes (case furniture)
 - sideboards (furniture)
 - desk
 - exhibit cases
 - counters
 - arks
 - bookcase
 - corner shelves
 - dispensaries (furniture)
 - étagères
 - canterburies (storage furniture)
 - bookshelves
 - china shelves

drawer

Find

Class	chest of drawers
Meta Class	AATClass
Comment	Type of case furniture usually having four drawers but sometimes made with three, five, or more; generally supported on feet and sometimes resting directly on the floor. Use "commodes (chests of drawers)" for similar case pieces generally supported on short legs. Use "chests with drawers" for chests with one or more tiers of drawers below a deep storage space.
Class Properties	
synonym	chest of drawers
	bureaus
	dressers
	beuros
	bureaus (chests of drawers)
	buros
	chests, dressing
	drawers, chests of
	dressers (chests of drawers)
	dressing chests
Properties	
Name	Class Range

Found 1

Art object description template

- ✍ 25 properties: 17 from VRA, 8 from other sources (plus modifiers)
 - **type, style/period, culture, material, color**
- ✍ For annotation purposes divided into groups:
 - main category: **type**
 - production-related: **style/period, culture**
 - physical: **material, color**

Representation problem: object structure

- ✍ “chest of drawers” consists of parts, e.g. feet, drawers
- ✍ Parts can have their own properties, e.g. the fee style “bun feet”
- ✍ Again: need to represent prt-of structure

Different class types: the AAT color hierarchy

<color>

<chromatic color>

pink

vivid pink, strong pink,

<intermediate pink>

purplish pink

brilliant purplish pink,

yellowish pink, brownish pink

<neutral color>

Representation problem: abstract classes

- ✍ Some AAT terms are only there to “structure” the hierarchy
- ✍ How can we specify which colors in the color hierarchy are valid fillers of a “color” slot?
- ✍ Possible solution: distinguish between abstract and concrete classes
 - UML-type distinction
 - Abstract classes cannot be instantiated
 - Related issue: only “instances” of a color can be used as slot value?!

Representation problems: definitional knowledge

IF style/period = “Late Georgian”

THEN (*by definition*)

culture = “British” AND

date.created between 1760-1811

- ✍ No way to express inter-property/slot constraints
- ✍ We have to use a non-standard format

Representation problems: default knowledge

IF type = “chest of drawers” AND
style/period = “Late Georgian”
THEN (*this typically suggests*)
material.main = “mahogany”

- ✍ Most common form of domain knowledge
- ✍ Same story as for definitional knowledge, but a solution is probably more difficult

Representation issues

- ✍ "Ape" is an instance of "species"
 - one can define properties for species, such as "typical habitat"
- ✍ But: there is a hierarchy of ape types
- ✍ Need for instances as classes
 - no problem in RDF(S)

RDFS representation of description template

- ✍ First intuition: description template is aggregate structure
- ✍ Ambiguous semantics when translated to RDFS: no semantics for part-whole
- ✍ Alternative:
 - furniture class with 25 properties
 - “descriptor types” are defined as metaclasses of properties
- ✍ Representation requirement:
 - Aggregation?
 - Properties as instances of metaproperties?

Experiences with Web KR

Our sample wish list:

- aggregation
- abstract classes
- class as slot filler
- definitional rules (inter-slot constraints)
- default knowledge
- flexible class/instance and property/instance distinction

Web-ontology requirements should be based on realistic example problems

- Not just simple database schemata

Language decisions will (of course) be a trade off