

JOANNEUM



RESEARCH

# JOANNEUM RESEARCH

## Institute of Information Systems & Information Management

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Ontology visualisation

a TRADITION of INNOVATION



# Agenda

**■ Diploma Thesis**

**■ Demonstration of the application**



# Diploma Thesis

## ■ Working title

- ➔ Visual exploring, querying and debugging of RDF-Graphs and Ontologies based on RDF

## ■ Scientific areas

- ➔ Semantic Web
- ➔ Information visualisation



# Ontologies and RDF-Graphs

## ■ **Ontology**

- Data model
- Used to represent knowledge
- Machine understandable

## ■ **RDF**

- Uses XML Syntax
- Contains S-P-O Triples

## ■ **RDF-Graph**

- Model of RDF



# Current Situation

## ■ Issues

- Complexity of ontologies
- Tools use inadequate visualisation techniques

## ■ Good tool support for

- Authoring
- Editing

## ■ Neglected

- Exploring and
- Debugging of unknown ontologies

# Protégé (Jambalaya)

pizza.owl Protégé 3.2.1 (file: C:\Programme\Protege\_3.2.1\examples\pizza\pizza.owl.pprj, OWL / RDF Files)

File Edit Project OWL Code Tools Window Jambalaya Help

CLASS BROWSER  
For Project: pizza.owl  
Class Hierarchy  
owl:Thing  
● DomainConcept  
● Country (5)  
● IceCream  
▼ ● Pizza  
● CheesyPizza  
● InterestingPizza  
● MeatyPizza  
▶ ● NamedPizza  
● NonVegetarianPizza  
● RealItalianPizza  
● SpicyPizza  
● SpicyPizzaEquivalent

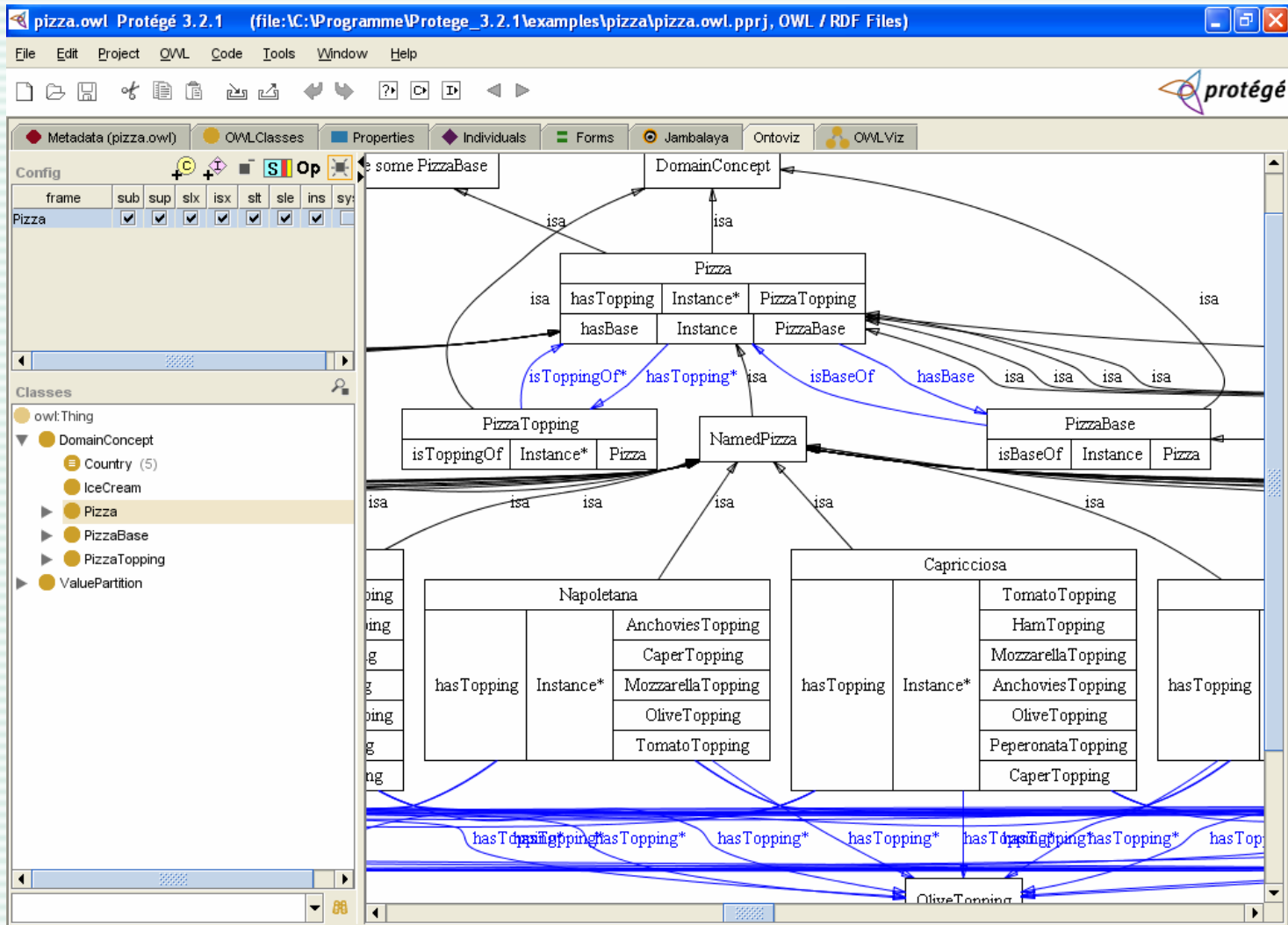
Quick Views

DomainConcept  
● Country ● IceCream ● Pizza  
● PizzaBase ● PizzaTopping

Instance Browser  
For Class: DomainConcept  
:NAME

Custom Views  
Hierarchy: has subclass and has instance Node Labels: Above Node (fixed) Arc Labels: Navigation: Magnify

# Protégé (OntoViz)





# IsaViz (1)

Prefix	URI	Display Prefix
protege	http://protege.stanford.edu/plugins/owl/protege#	<input checked="" type="checkbox"/>
dc	http://purl.org/dc/elements/1.1/	<input checked="" type="checkbox"/>
	http://www.cs.cmu.edu/ontology/elements/ontology/2006/07/18/ontology.owl#	<input checked="" type="checkbox"/>





# IsaViz (2)

IsaViz RDF Editor

File Edit Views Help

Selection/Creation

Zoom/(De)activation/Resize

Editing

Quick Search

Search

Attributes

Graph

http://www.co-ode.org/ontologies/pizza/2006/07/18/pizza.owl#American

Definitions

Prefix	URI	Display Prefix
protege	http://protege.stanford.edu/plugins/owl/protege#	<input checked="" type="checkbox"/>
dc	http://purl.org/dc/elements/1.1/	<input checked="" type="checkbox"/>
	http://www.co-ode.org/ontologies/pizza/2006/07/18/pizza.owl#	<input checked="" type="checkbox"/>

Add NS Binding Remove Selected



# IsaViz (3)

The screenshot displays the IsaViz RDF Editor interface. The main window, titled "Graph", shows a complex network of nodes and edges representing an ontology. Nodes include "Cobertura De Mozzarella" (yellow rectangle), "Pizza Com Queijo" (green oval), and "Any pizza that has at least 1 cheese top ..." (yellow rectangle). Edges are labeled with properties such as "owl:equivalentClass", "rdfs:label", and "rdfs:comment". The interface includes a menu bar (File, Edit, Views, Help), a toolbar with icons for selection, zoom, and editing, and a search bar. A "Definitions" panel at the bottom provides navigation options like "Namespaces", "Property Types", "Property Browser", "Stylesheets", and "Quick Input". The URL at the bottom of the graph window is <http://www.co-ode.org/ontologies/pizza/2006/07/18/pizza.owl#Capriciosa>.



# RDF Gravity

The screenshot displays the RDF Gravity (version 1.0) application window. The main area shows a dense network graph of concepts and their relationships. Nodes are represented by colored circles and rectangles, with lines indicating connections. The graph includes concepts like 'DomainConcept', 'VegetableTopping', 'Spiciness', and various pizza toppings such as 'ParmaHamTopping', 'HamTopping', 'TobascoPepp...', 'PrawnsTopping', 'FishTopping', 'SauceTopping', 'ParmesanTopping', 'FourCheeses...', 'GoatsCheese...', 'VegetarianP...', 'VegetarianT...', 'VegetarianPizza...', 'SpicyTopping', 'PepperTopping', 'SpicyPizza', 'Peperonata...', 'JalapenoPep...', 'GreenPepper...', 'RedOnionTopping', 'Cour', and 'HotGreenPep...'. Relationships are shown with arrows and labels like 'hasIngredient', 'isIngredientOf', 'hasBase', 'isTopping', 'isToppingOf', 'hasSpiciness', and 'is'. The interface includes a menu bar (File, Apply Filter, Graph View, Configure, HTTP, Help), a toolbar, and two filter panels on the right. The 'Global Filter' panel shows a list of properties with checkboxes. The 'One Time Filter' panel has buttons for 'Filter', 'Include Visible', 'Include', and 'C', and a list of properties with checkboxes. At the bottom right, there are buttons for 'Open RDF Graph', 'Scramble', and 'Clear Graph', along with a 'Zoom' slider.





# Aim (1)

- **Examine appropriate visualisation and user interface techniques**
- **For ontology developers**
  - ➔ Understand the content and
  - ➔ Find Errors in the ontology
- **Use cases**
  - ➔ Debugging ontologies
  - ➔ Determine the expressiveness of ontologies
  - ➔ Check Semantic Web content



## Aim (2)

### ■ Meet basic requirements

- Web accessible
- Native RDF rendering
- Data type handling
- Easy exploration of large ontologies
- Combination of text- and graphical visualisation
- Possibility for querying graphs

### ■ Do not

- Visualise the whole graph at once
- Develop a new graph visualisation algorithm



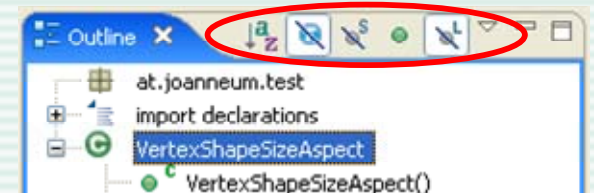
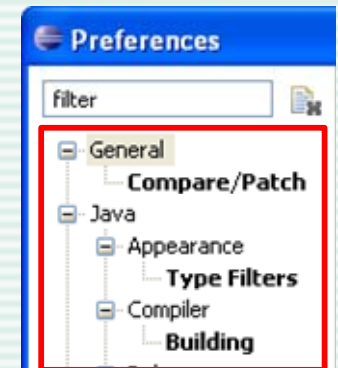
# Visualisation (1)

## Textual representation

- Trees
- Tables

## Functionalities

- Filtering
- Navigating

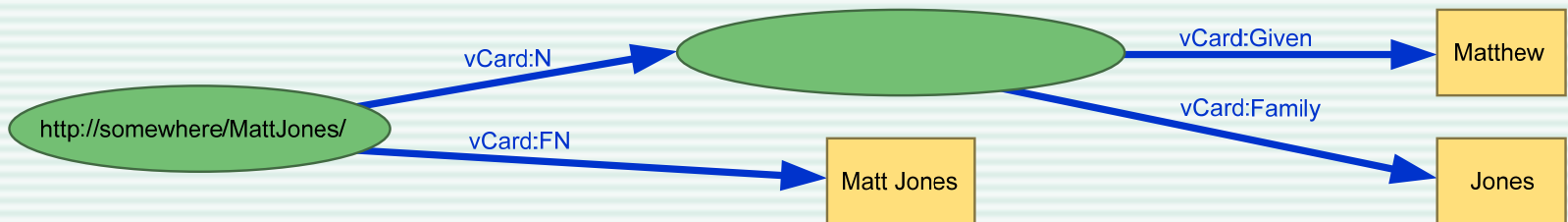


# Visualisation (2)

## Graphical representation

- Nodes
- Edges

## Native RDF rendering





# Debugging

- **To detect and remove errors**
- **Watch**
  - ➔ Values and
  - ➔ Data types of nodes
- **Watch nodes while querying**
- **Future features**
  - ➔ Online enhancement of values
  - ➔ Automatically detect errors



# Ontology Doctor (1)

Visualisation Application - Windows Internet Explorer

http://isv007:8080/vis-app/

Visualisation Application

## Ontology Doctor

ready

Upload Query Process

C:\Temp\doap\_Tomcat Durchsuchen... Submit

Triple view Tree view Options

Row 1 - 10 of 38 Rows

Select	Subject	Property	Object
<input type="checkbox"/>	bNode 0	url	http://www.jcp.org/en/jsr/detail?id=154
<input type="checkbox"/>	bNode 0	id	JSR 154
<input type="checkbox"/>	bNode 0	body	JCP
<input type="checkbox"/>	bNode 0	title	Java Servlets
<input type="checkbox"/>	bNode 0	type	Standard
<input type="checkbox"/>	http://tomcat.apache.org/	bug-database	bugzilla
<input checked="" type="checkbox"/>	http://tomcat.apache.org/	repository	bNode 1
<input type="checkbox"/>	http://tomcat.apache.org/	pmc	tomcat.apache.org
<input type="checkbox"/>	http://tomcat.apache.org/	category	network-server
<input type="checkbox"/>	http://tomcat.apache.org/	implements	bNode 2

Fertig

Lokales Intranet 100%



# Ontology Doctor (2)

Google Web Toolkit 

Jena



JUNG

Tomcat



Java

