



SPIRIT

www.geo-spirit.org

Semantic Web

- WP 6** Metadata extraction
- WP 3** Ontologies

Semantic Web



Tim Berners Lee



Was wäre, wenn der Computer den Inhalt einer Seite aus dem World Wide Web nicht nur anzeigen, sondern auch seine Bedeutung erfassen würde?

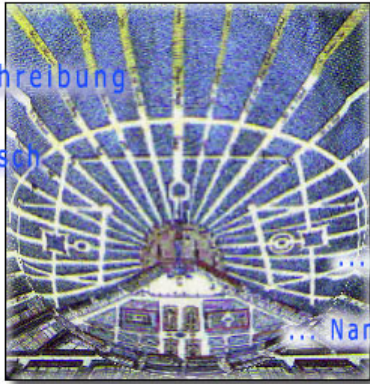
[Tim Berners-Lee, James Hendler, Ora Lassila]

Wie?



- Ergänzung des bereits bestehenden World Wide Web um Metadaten
- Wissensrepräsentation durch Ontologien

Datenformate



Projektbeschreibung

Datenaustausch

Links

... alphabetisch

... strukturell

... geographisch

... Standardisierung

... Namenskonventionen

Home

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<meta NAME="description" CONTENT="GIS-Datenaustauschformate, GIS- und IT-Literatur, Veranstaltungen, Systemeinfuehrung und -nutzung">
<meta NAME="author" CONTENT="Dr. Franz-Josef behr">
<meta NAME="publisher" CONTENT="gis-management.de">
<meta NAME="copyright" CONTENT="gis-management.de">
<meta NAME="page-topic" CONTENT="Dienstleistung, Forschung Technik,
Verwaltung, Wirtschaft, Wissenschaft">
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<meta NAME="audience" CONTENT="Anfänger, Experten">
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-Datenaustausch: EDBS, SQD, DXF, DFK, BGRUND, GEOTIFF ...
</title>
```

Ontologien



Name:
Britney

Beruf:
Sängerin

Maus

Maus

Maus

Maus

Maus



Mausmacher:
WDR

Kategorie:
Lach- und Sachgeschichten



Hersteller:
logitech

Haltbarkeit:
10 Jahre



gegründet:
1981 – Apples, Schweiz

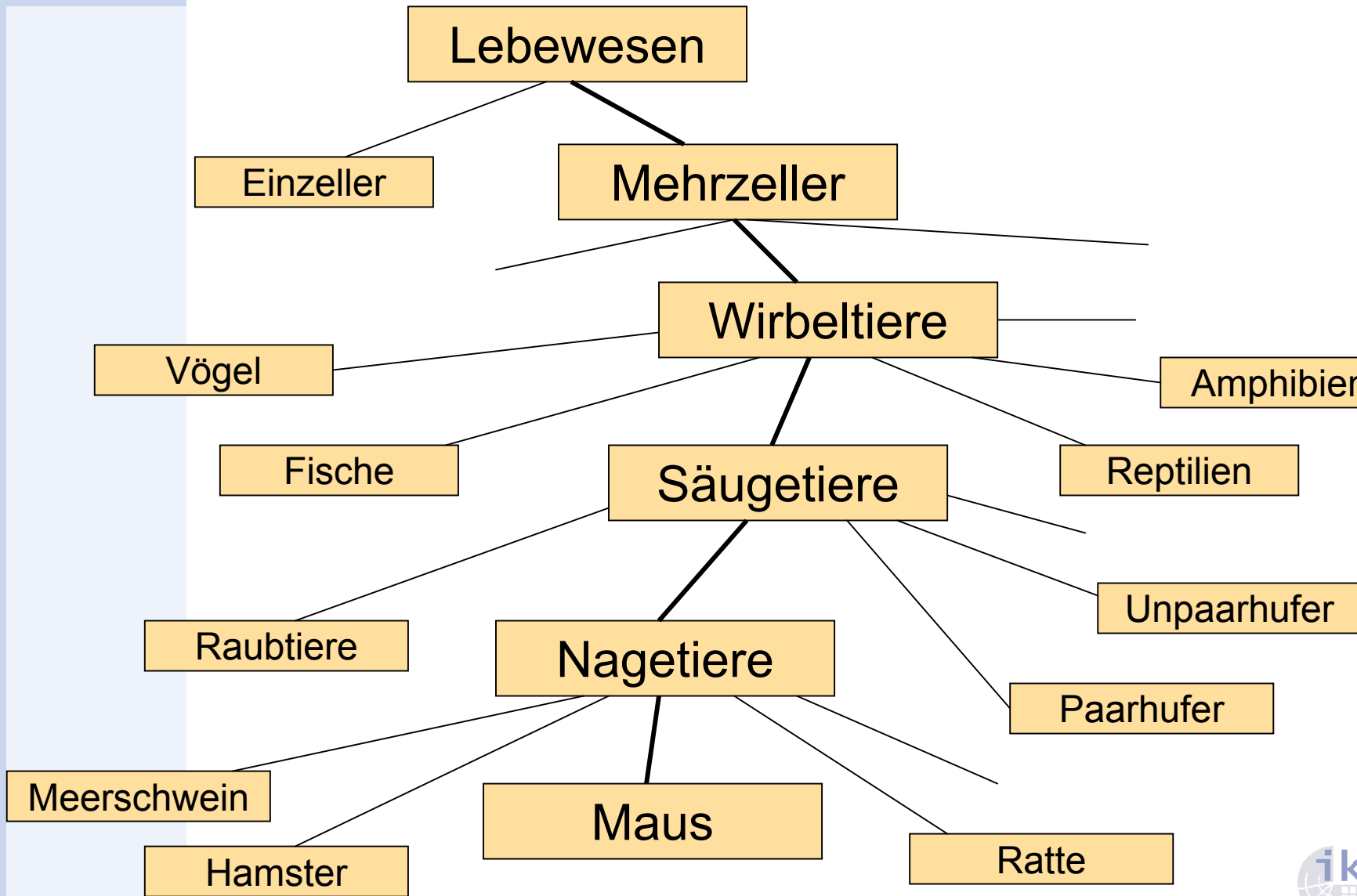
Hauptsitz:
Fremont, Kalifornien



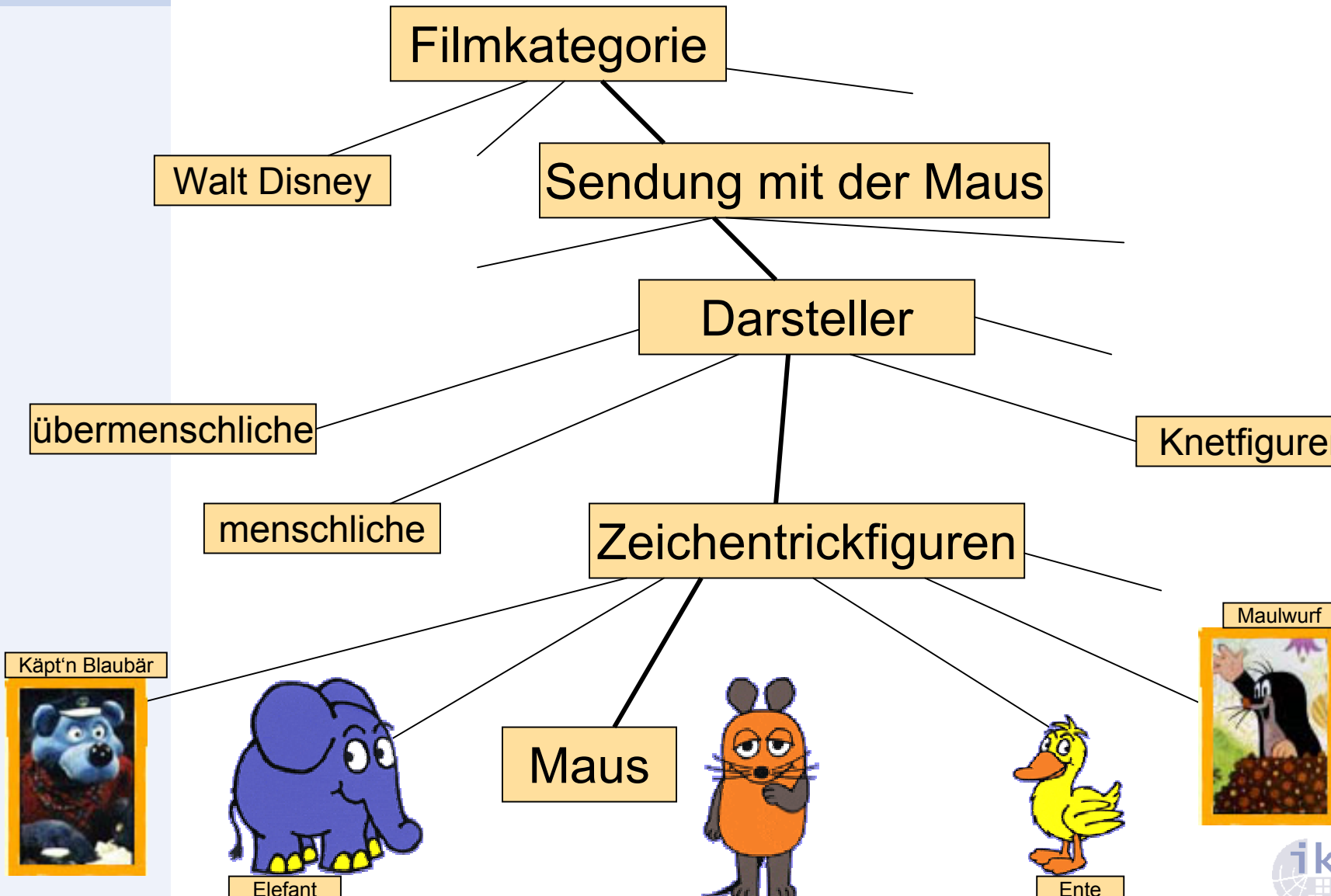
Halter:
Angelika Schn

Wohnort:
Laboratorium

Ontologie der Lebewesen



Ontologie der Trickfilmfiguren



Filmkategorie

Walt Disney

Sendung mit der Maus

Darsteller

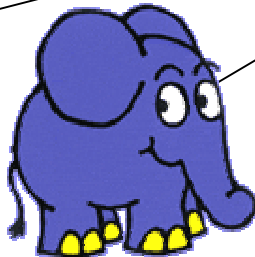
übermenschliche

Knetfiguren

menschliche

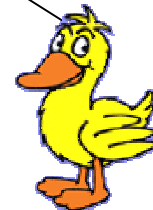
Zeichentrickfiguren

Käpt'n Blaubär



Elefant

Maus

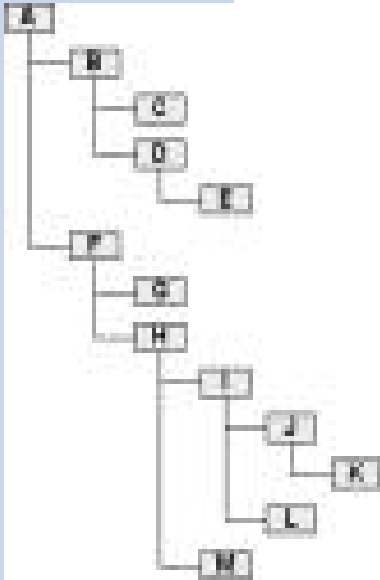


Ente

Maulwurf



Möglichkeiten der Speicherung



1. Generierung des Schemas der Ontologie und Vermerk auf jeder web-page, daß der Inhalt dieses Dokumentes der Semantik der Ontologie entspricht.
2. Generierung des Schemas der Ontologie und Anreicherung der Ontologie mit einzelnen Objekten
=> riesiger Lagerplatz

. Marking up the web page

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<USE-ONTOLOGY ID="cs-dept-ontology" VERSION="1.0" PREFIX="cs" URL=
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<CATEGORY NAME="cs.Professor" FOR="http://www.cs.umd.edu/users/hendler/">
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  <ARG POS=2 VALUE="http://www.cs.umd.edu/users/hendler/">
</RELATION>
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  <ARG POS=2 VALUE="Dr. James Hendler">
</RELATION>
<RELATION NAME="cs.doctoralDegreeFrom">
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  <ARG POS=2 VALUE="http://www.brown.edu">
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  <ARG POS=2 VALUE="http://www.cs.umd.edu/users/hendler/">
</RELATION>
</INSTANCE>
```

2. Scheme and entities stored together

Professor

member

Dept. of Computer Science, University of Maryland
Institute for Advanced Computer Studies, UM
Institute for Systems Research, UM
Dept. of Electrical Engineering, UM
Semantic Web and Agents Research
Maryland Information and Network Dynamics Laboratory
Advanced Information Technology Laboratory
Parallel Understanding Systems Laboratory
Autonomous Mobile Robotics Laboratory

name

James A. Hendler

doctoralDegreeFrom

University of Maryland, Dept. of Computer Science
Brown University, Providence, Rhode Island

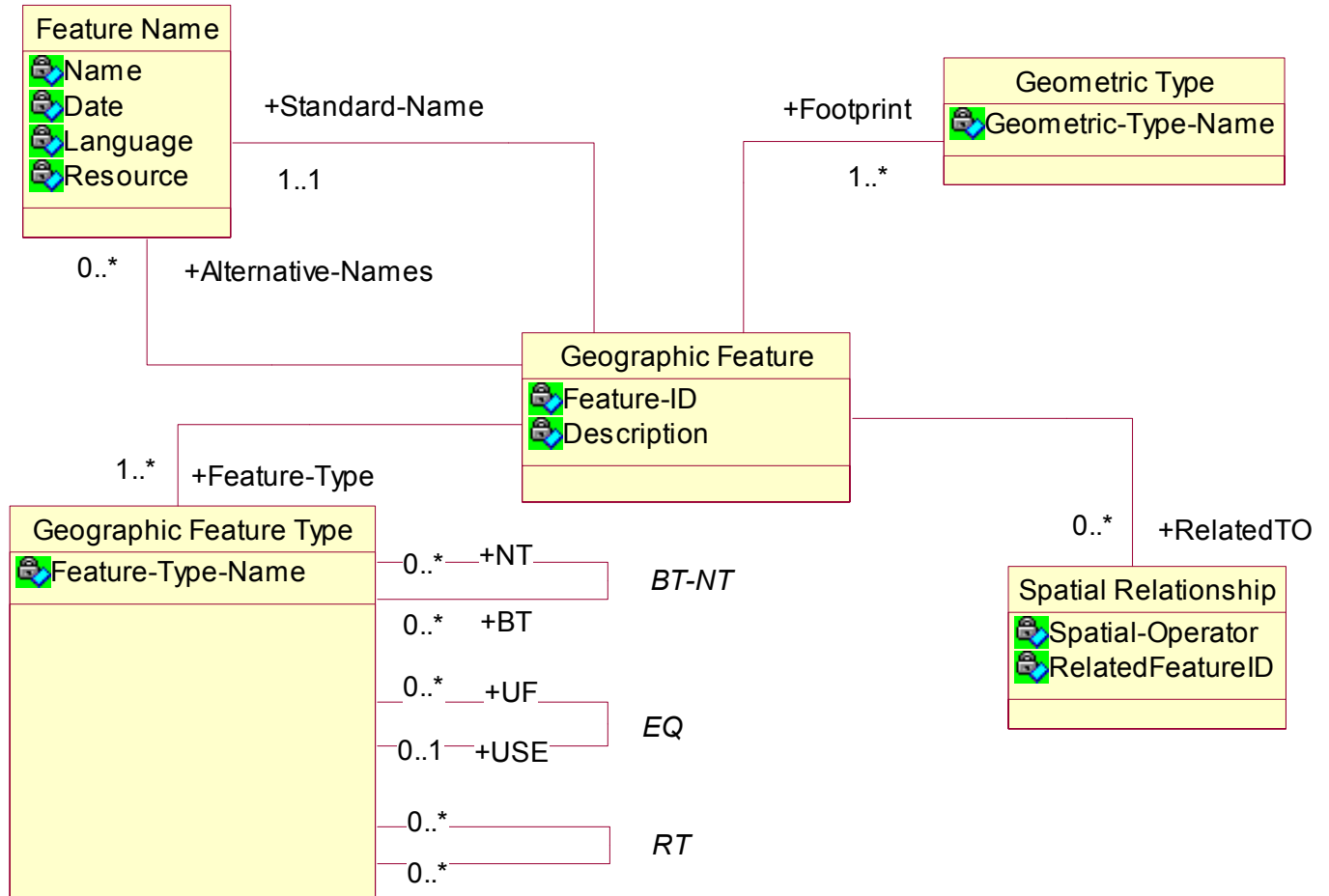
emailAddress

hendler@cs.umd.edu

head

Semantic Web and Agents Research
Maryland Information and Network Dynamics Laboratory
Advanced Information Technology Laboratory
Parallel Understanding Systems Laboratory
Autonomous Mobile Robotics Laboratory

Ontologie in SPIRIT



new search

GETTY VOCABULARY PROGRAM

Searched for: **Cambridge**

(Click icons (📄) below to view hierarchy for place; use checkboxes to view multiple place records.)

Found 79 places that match your search.

-  [Bristol](#)..... (inhabited place)
(N & C Am., USA, Connecticut, Hartford)[2016650]
New Cambridge
-  [Cambridge](#)..... (inhabited place)
(Europe, United Kingdom, England, Cambridgeshire)[7010874]
-  [Cambridge](#)..... (inhabited place)
(N & C Am., Canada, Ontario)[7013013]
Cambridge Mills
-  [Cambridge](#)..... (inhabited place)
(N & C Am., Jamaica, Cornwall, Saint James)[7018552]
-  [Cambridge](#)..... (inhabited place)
(N & C Am., USA, Alabama, Randolph)[2215678]
-  [Cambridge](#)..... (inhabited place)
(N & C Am., USA, Georgia, Columbia)[2215679]
-  [Cambridge](#)..... (inhabited place)
(N & C Am., USA, Idaho, Bannock)[2025463]
-  [Cambridge](#)..... (inhabited place)
(N & C Am., USA, Idaho, Washington)[2025462]
-  [Cambridge](#)..... (inhabited place)
(N & C Am., USA, Illinois, Henry)[2026640]
-  [Cambridge](#)..... (inhabited place)
(N & C Am., USA, Iowa, Story)[2034438]
-  [Cambridge](#)..... (inhabited place)
(N & C Am., USA, Kansas, Cowley)[2036142]
-  [Cambridge](#)..... (inhabited place)
(N & C Am., USA, Kentucky, Jefferson)[2038046]
-  [Cambridge](#)..... (inhabited place)
(N & C Am., USA, Maine, Somerset)[2044550]
-  [Cambridge](#)..... (inhabited place)
(N & C Am., USA, Maryland, Dorchester)[2046456]
-  [Cambridge](#)..... (inhabited place)
(N & C Am., USA, Massachusetts, Middlesex)[7013527]
Old Cambridge
-  [Cambridge](#)..... (inhabited place)
(N & C Am., USA, Massachusetts, Worcester)[2215680]
-  [Cambridge](#)..... (inhabited place)



new
arch

GETTY VOCABULARY PROGRAM

Place Records

0874]

Cambridge (inhabited place)

52 12 N Long: 000 07 E (represented in degrees minutes direction)

52.200 Long: 0.117 (represented in decimal degrees and fractions of degrees)

- Located on rivers Cam & Granta; site of prehistoric & Roman remains; oldest college is Peterhouse (founded 1284); was confirmed a university city by Pope John XXII 1384; named by Erasmus 1510; site of Holy Sepulchre Church, famed for its circular plan; Fitzwilliam Museum here.

hierarchical Position:

- [Europe](#)..... (continent)
- [United Kingdom](#)..... (nation)
- [England](#)..... (country)
- [Cambridgeshire](#)..... (county)

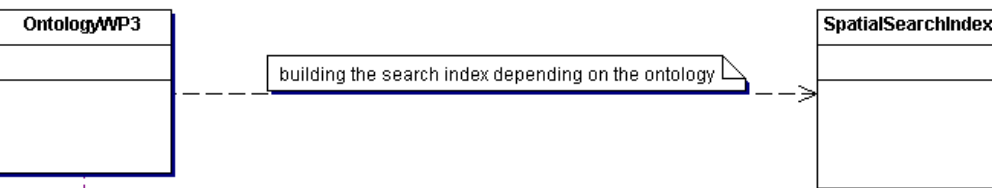
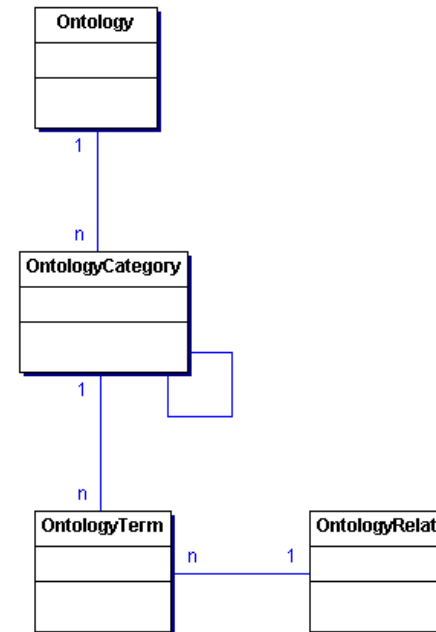
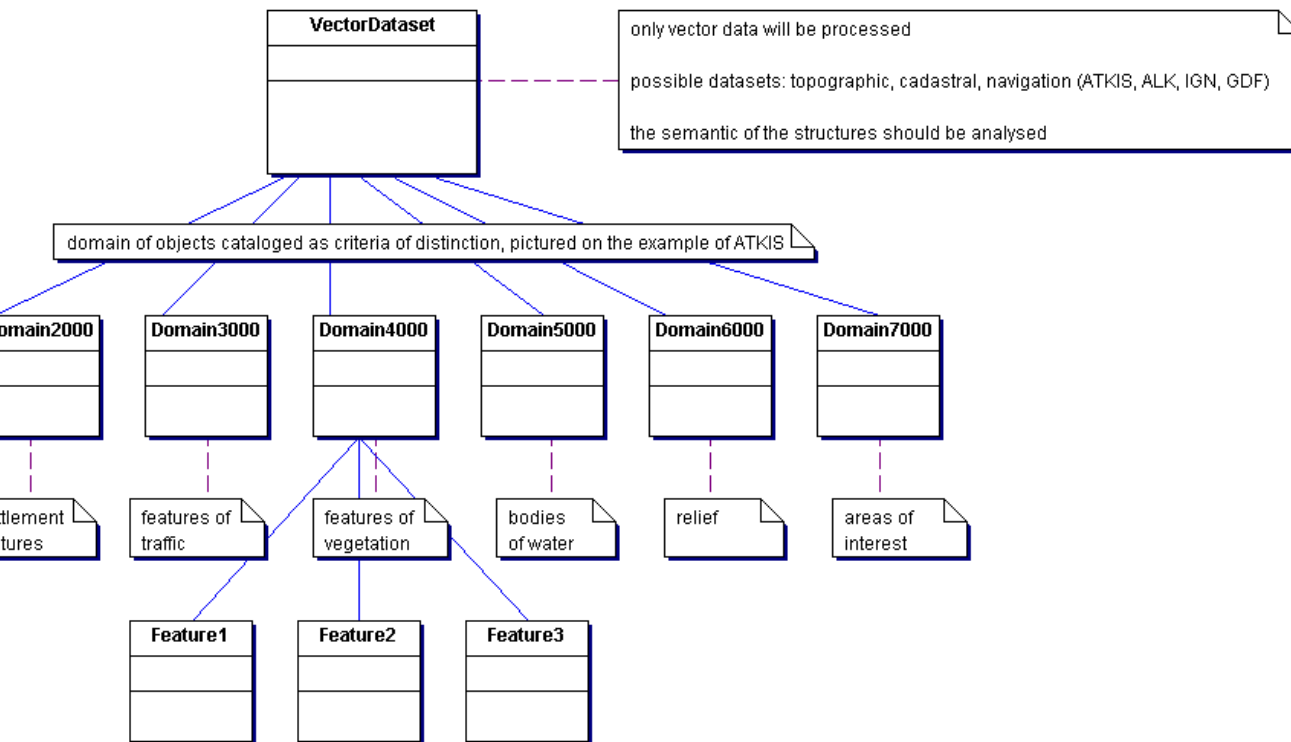
Names:

- Cambridge (C,V)
- Cantabrigia (H,V)
- Cantebrigge (H,V)
- Grantabridge (H,V)
- Grantebryege (H,V)
- Grantabryege (H,V)
- Grantebriidge (H,V)..... recorded in 1086
- Grentebriidge (H,V)..... recorded in 1086

Place Types:

- inhabited place (C)..... excavations at nearby by Castle Hill & Market Hill suggest pre-Roman occupation
- city (C)..... first chartered in 1207
- county seat (C)
- university center (C)..... since 13th cen.
- cultural center (C)





- interesting information inside the vector data will be stored in the scheme of the ontology (pre-processing)

- the scheme gives at least the basic what to look for in the dataset

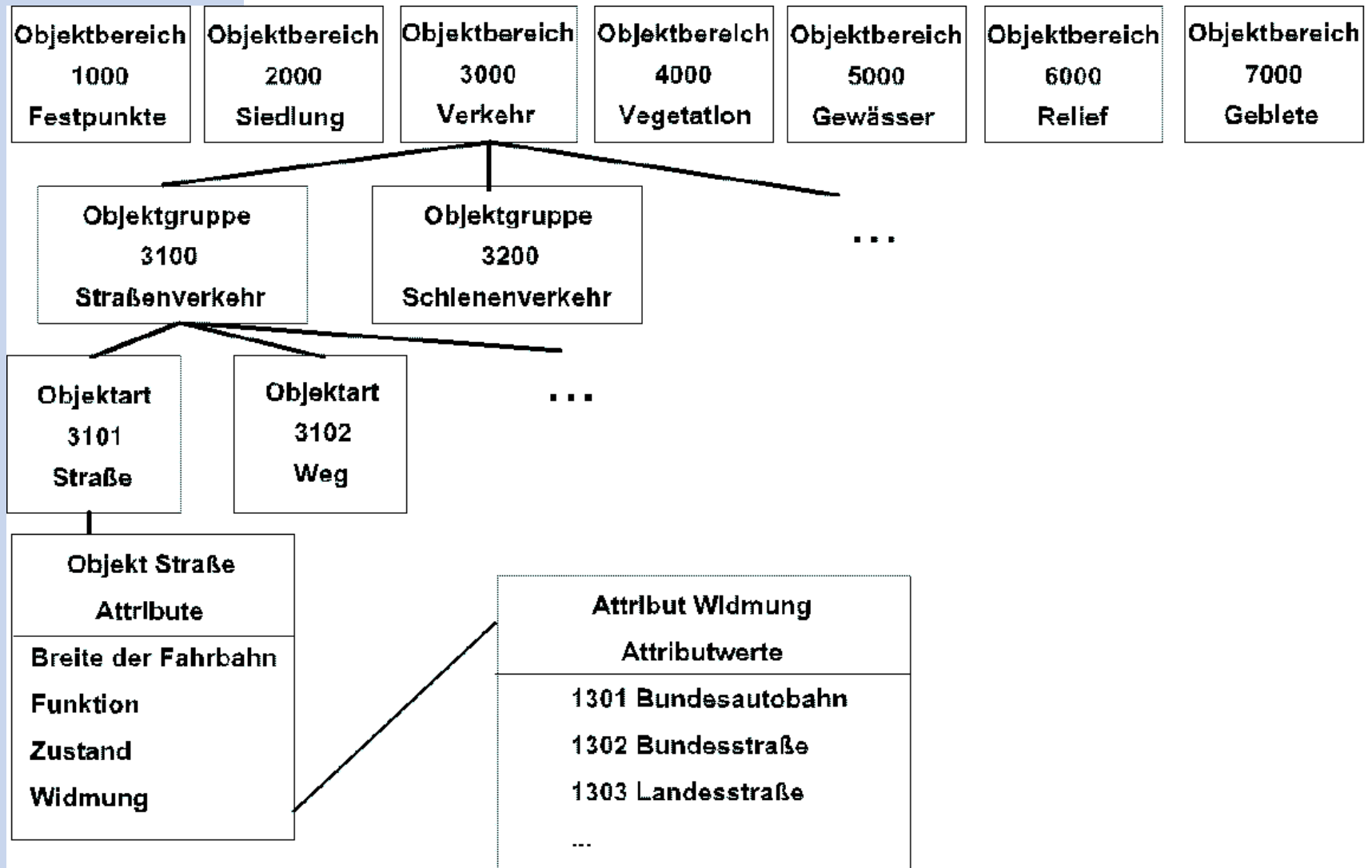
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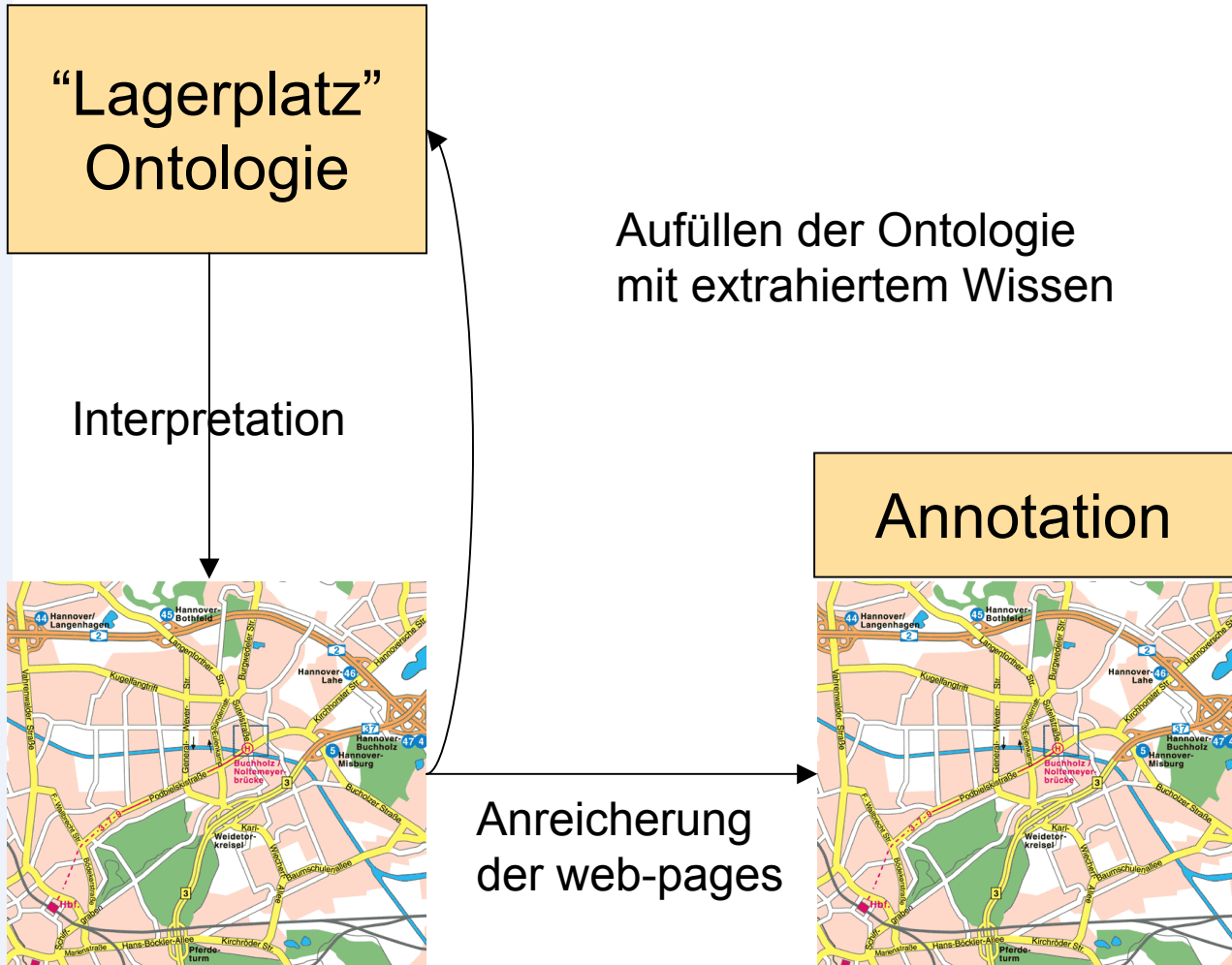
1. to extract typical geographic information (e.g. big cities in Japan are: Tokyo, Osaka, etc.)
2. to extract relationships and model expressions of relation

- building the search index by processing the information of the ontology and thus the enriched geo-data of WP6 too, because they are stored in the scheme of the ontology

- should the enriched geo-data (metadata) of the dataset be processed separately from the ontology?

ATKIS-Datenmodell – hierarchische Beziehungen





Extraction of information in SPIRIT context

- ▶ Extraction of geometric footprints, e.g.
 - Centroid of city
 - Extension of city
- ▶ Extraction of spatial relations, e.g.
 - City close to river
 - Ski resort in black forest
- ▶ Interpretation of spatial phenomena, e.g.
 - Big city
 - Recreational area

Interpretation of spatial data – example

- ▶ “Big city” – extract it from ATKIS data set
- ▶ City – Object class “settlement”
 - Object “Ortslage”
- ▶ Characteristics of a “big city”, e.g.
 - Size
 - Number of inhabitants
 - Has airport
 - Has public transportation network
 -
- ▶ Use spatial analysis for combining thematic and spatial criteria and assign a city as being a “big city”
 - E.g.: Big city, if
 - Has size > XX km²
 - Has airport in vicinity of 5 km

Vector
data set

settlement

houses
industrial areas
heat supply station
dumping ground
sports field
hospital

traffic

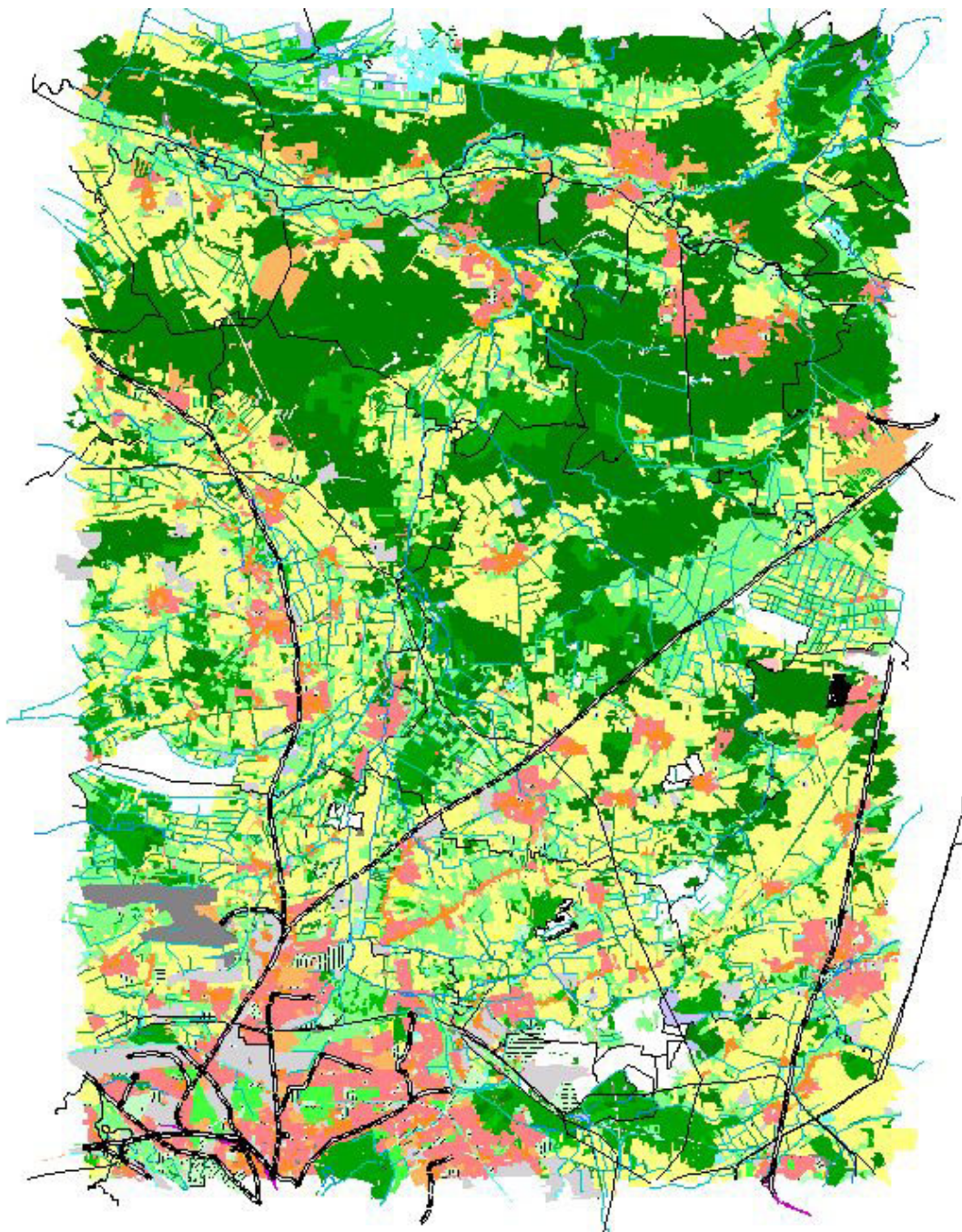
streets
places
railway station
airport
pipeline

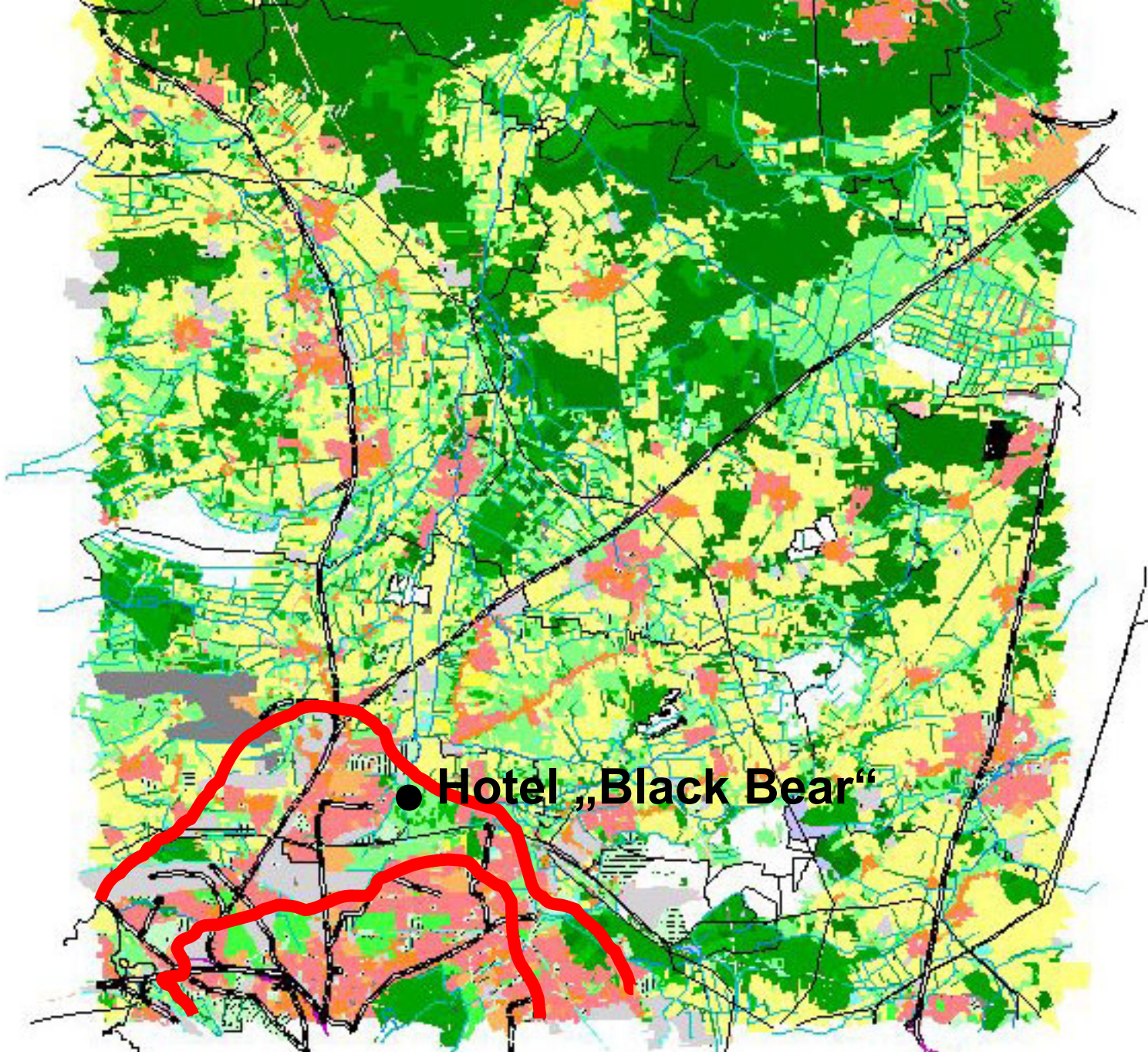
water

sea
harbour
canal
river
water reservoir

areas

administrative
districts
national park
biosphere
reserve
military area





● **Hotel „Black Bear“**

Next tasks

- ▶ Identification of basic spatial analysis/interpretation functions
 - Based on investigations from ontology WP
- ▶ Implementation of these functions in a generic way
- ▶ Extraction of information from spatial data sets based on given ontology
 - Use NMA-data sets as example
 - Automatically identify all SPIRIT-relevant information in a given data set

all over

