

An Ontology-Based Intelligent Information System for Urbanism and Civil Engineering

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Methodology for ontology development

◆ Combination of

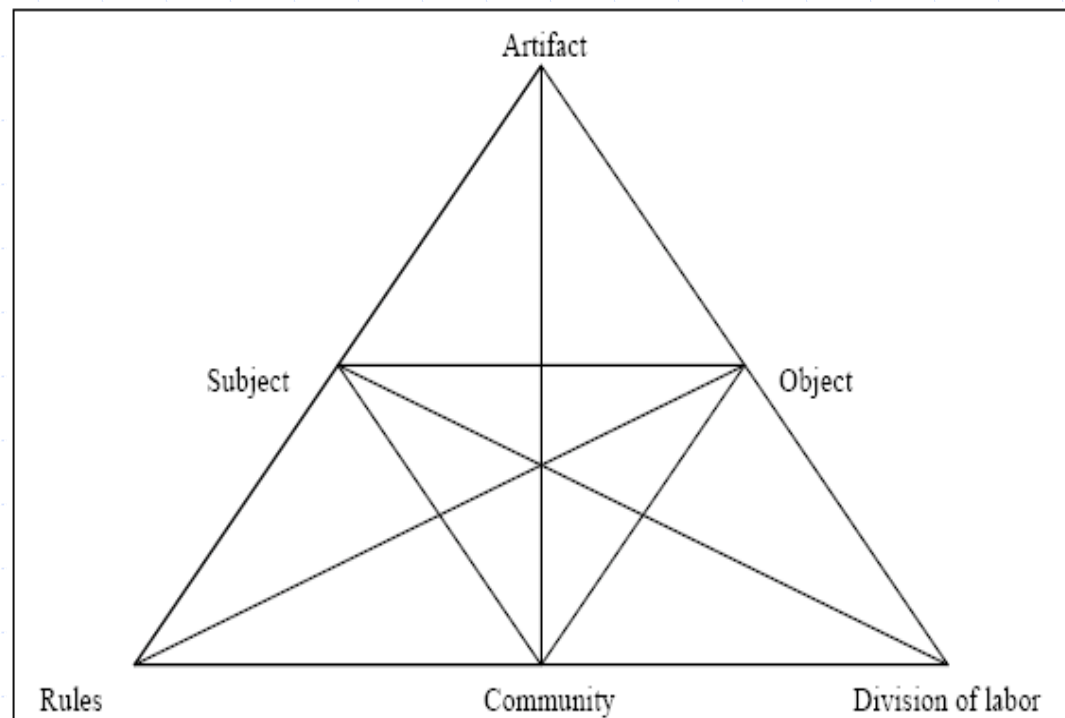
■ Pierce's categories

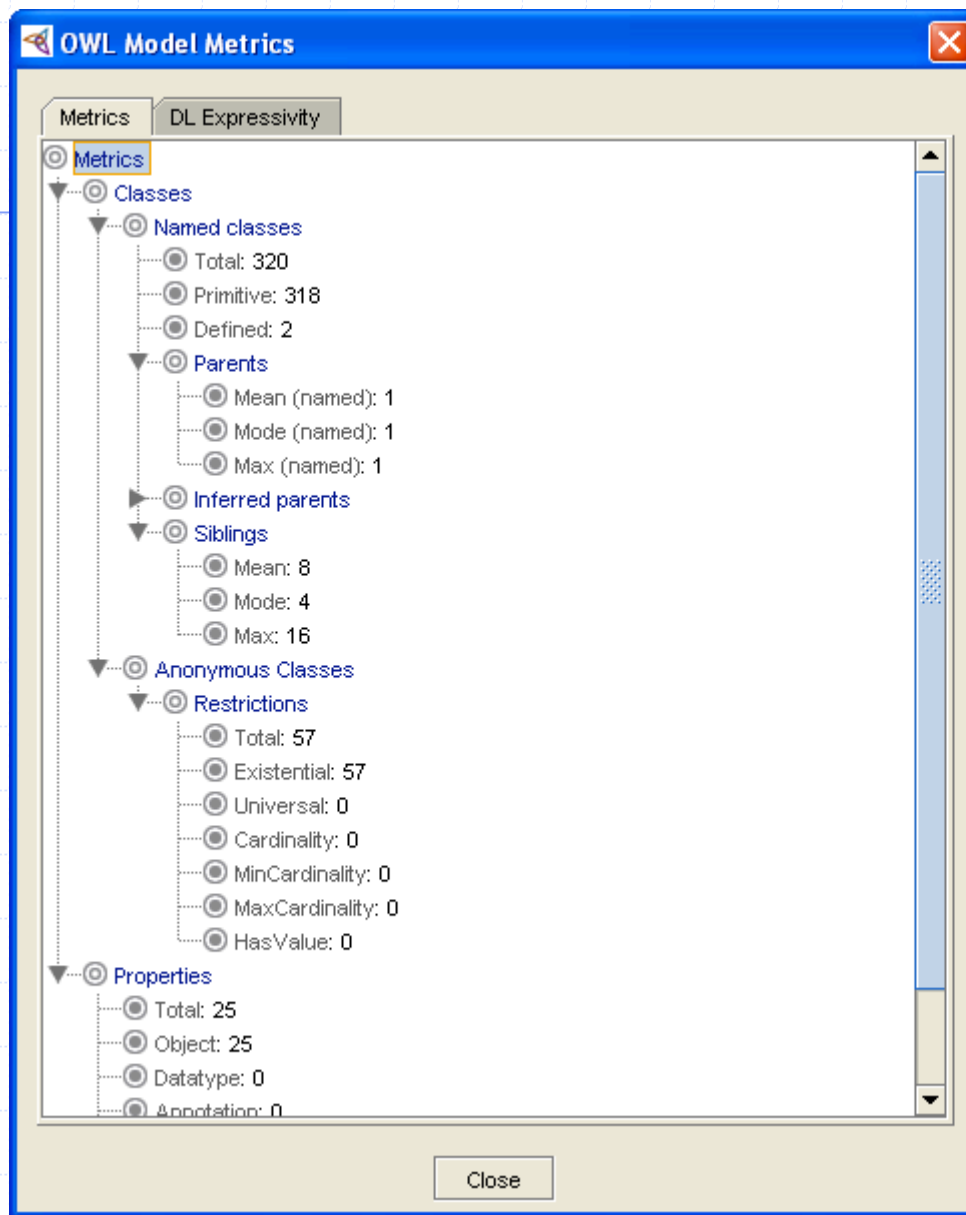
- ◆ Individuals
- ◆ Relations
- ◆ Triples

■ Engeström's theory of activity

■ Hewit's use of triangles in Engeström's diagram

The activity diagram of Engeström





1. Individuals

- ◆ Subjects
- ◆ Objects
- ◆ Communities
- ◆ General artifacts
- ◆ Social rules
- ◆ Division of labor



SUBCLASS EXPLORER

For Project: towntology_v1

Asserted Hierarchy

owl:Thing

- ▼ Artifact
 - Budget
 - ▼ Documents
 - ApprovalDocuments
 - AuthorizationRequest
 - CertificatUrbanism
 - ConstructionAuthorization
 - ConstructionContract
 - DesignContract
 - GeologicalReport
 - Project
 - PropertyTitle
 - SurveyDocumentation
 - TechnicalDesign
 - TechnicalExamination
 - WorkAcceptanceRecord
 - Property
 - Service
 - ▼ Taxes
 - AprovalDocumentReleaseTaxe
 - AuthorizationTaxe
 - ConstructionTaxe
 - DesignTaxe
- ▶ Community
- ▶ DivisionOfLabor
- ▶ Object
- ▶ Rules

Metadata (Ontology1176527460.owl) | OWLClasses | Properties | Individuals | Forms

SUBCLASS EXPLORER

For Project: towntology_v1

Asserted Hierarchy

- DivisionOfLabor
- Object
- Rules
 - CivilCode
 - HG273_1994
 - HG525_1996
 - Lows
 - No.10_1995Low
 - No.350_2001Low
 - No.50_1991Low
 - Ordinul1430_2006
 - PlanulUrbanisticLocal
 - QualityNorms
- Subject
 - Architect
 - Contractor
 - DesignExpert
 - GeodeticEngineer
 - GeotechnicalEngineer
 - GouvernementQualityControl
 - InstrumentEngineer
 - Investor
 - LocalAuthority
 - Neighbors
 - TechnicalExpert
 - UtilityProvider
 - ElectricalProvider
 - PhoneCompany
 - WaterProvider

CLASS EDITOR

For Class: owl:Thing

| Property | Value |
|--------------|-------|
| rdfs:comment | |

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Metadata (Ontology1176527460.owl)
OWLClasses
Properties
Individuals
Forms

SUBCLASS EXPLORER

For Project: ● towntology_v1

Asserted Hierarchy

- Object
 - Buildings
 - ▶ AgriculturalBuildings
 - ▶ CommercialBuildings
 - ▶ DwellingsBuildings
 - ▶ GovernmentBuildings
 - ▶ IndustrialBuildings
 - ▶ MilitaryBuildings
 - ▶ ParkingAndStorageBuildings
 - ▶ PublicEntertainmentEducationHospitalBuildings
 - ▶ ReligiousBuildings
 - ▶ TransitStationsBuildings
 - CivilEngineeringWorks
 - PipelinesCommunicationAndElectricityLines
 - ▶ LocalPipelinesAndCables
 - ▼ LongDistancePipelines
 - ElectricityPipeline
 - OverlandElectricPowerDistributionLine
 - TransformerStation
 - UndergroundElectricPowerDistributionLine
 - ▶ OilAndGasPipeline
 - ▶ TelecommunicationPipeline
 - ▼ WaterPipeline
 - CatchmentStation
 - ConveyanceOfWaterPipeline
 - FilteringStation
 - HotWaterAndSteamPipeline
 - PumpingStaion

CLASS EDITOR

For Class: ● ElectricityPipeline

| Property | Value |
|--|-------|
| <div style="border: 1px solid #ccc; padding: 5px; margin-bottom: 5px;"> ▶ rdfs:comment </div> | |

U R + ⊗

- LongDistancePipelines

U + + ⊗ ⊗

- TelecommunicationPipeline
- WaterPipeline
- OilAndGasPipeline

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2. Relations

subject – object (owned buildings and cars)

subject – rules

subject – community

community – rules

community – object (e.g. buildings, cars, parks)

community – divisions of labor (e.g. roles)

community – artifacts (e.g. beliefs, documents like acts)

object – artifact (property acts, blueprints)

object – subject (owner)

object – rule (of use)



PROPERTY BROWSER

For Project: ● towntology_v1

Object Datatype Annotation All

Object properties

- finish ↔ is_finalised
- finances ↔ is_financed_by
- requires ↔ is_required
- controls ↔ is_verified_by
- owns ↔ is_owned
- builds ↔ is_bulid_by
- measures ↔ is_measured
- belongs_to ↔ has
- provides ↔ is_provided
- observes
- draws_out ↔ is_drawed_out_by
- releases ↔ is_released_by
- pays ↔ is_paid
- is_provided ↔ provides
- is_drawed_out_by ↔ draws_out
- is_required ↔ requires
- has ↔ belongs_to
- is_bulid_by ↔ builds
- is_finalised ↔ finish
- is_verified_by ↔ controls
- is_paid ↔ pays
- is_released_by ↔ releases
- is_financed_by ↔ finances
- is_owned ↔ owns
- is_measured ↔ measures

PROPERTY EDITOR

For Property: (insta



| Property | Value |
|--|---------|
| <input checked="" type="checkbox"/> rdfs:comment | |
| <input checked="" type="checkbox"/> rdfs:label | termina |

Domain

- Contractor
- ConstrucionObjective

Range

- Object

- Functions
- InverseFu
- Symmetri
- Transitive

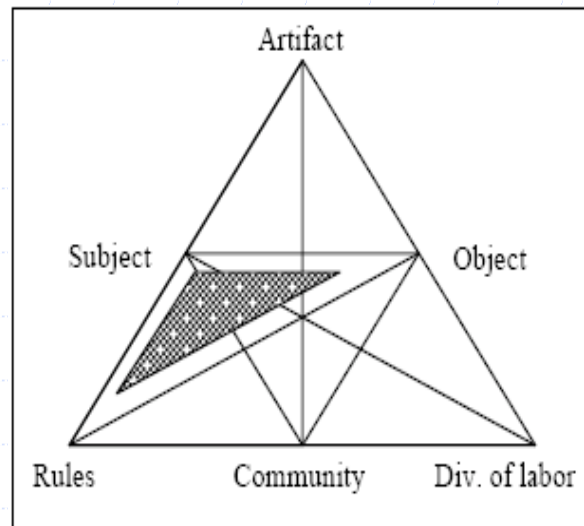
Inverse

- is_finalis

3. Triples

- ◆ May be triangles in the activity diagram
- ◆ Other mediating artifacts
- ◆ Will be used for
 - knowledge acquisition
 - Intelligent quering

Rules (laws) that apply to an individual in relation to an object



Example

- ◆ The rules that apply for an investor in a highway

Information Systems

- ◆ Provide information to users
 - information retrieval for a query in a collection of data
 - ◆ usually keyword-based
 - navigation (browsing)

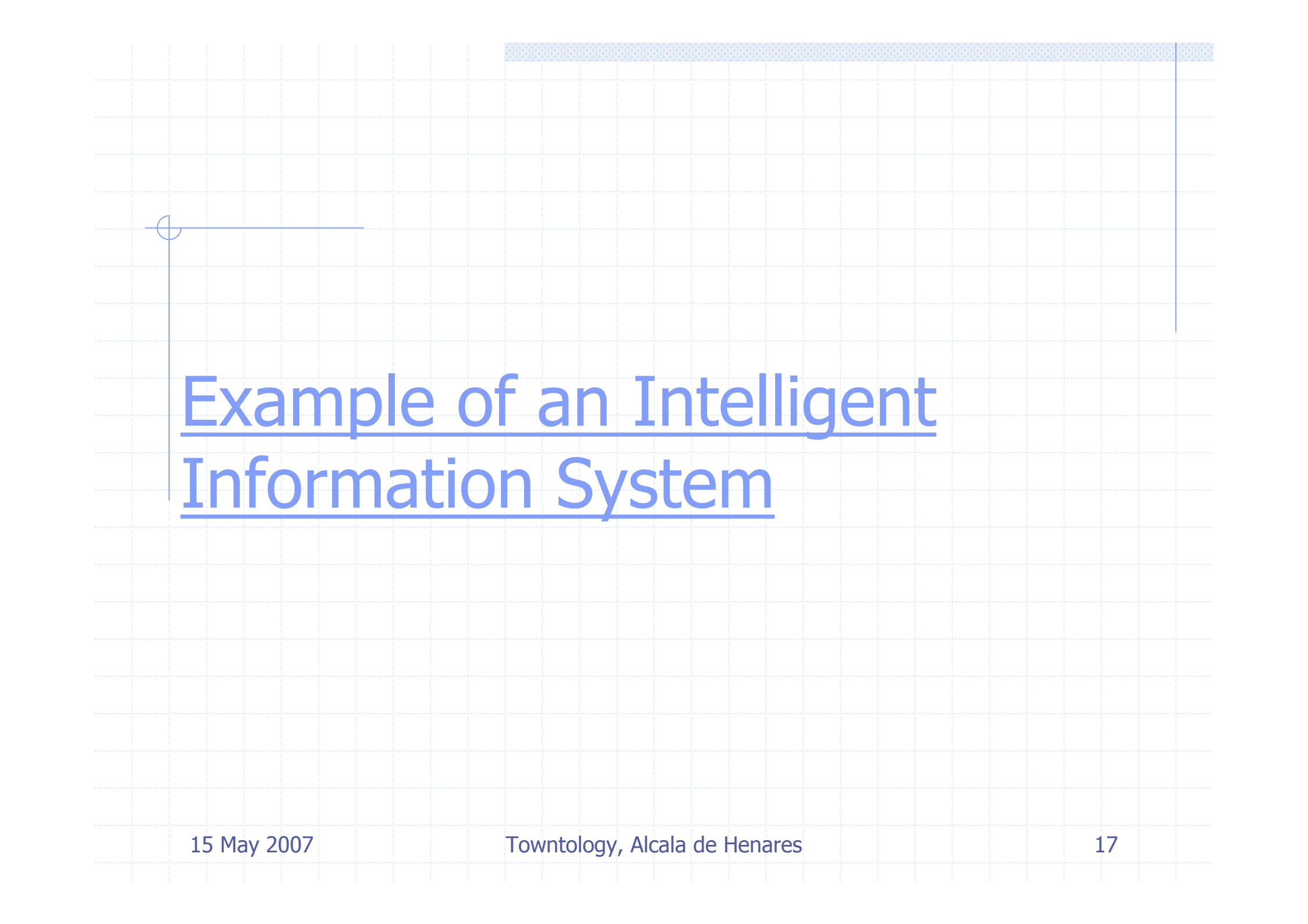
- ◆ Store data

Intelligent information systems

- ◆ Identify users' personal characteristics (personalize)
- ◆ Try to structure the dialog
- ◆ Meaning(vs. keyword)-based
 - knowledge-based
 - NLP
 - ontology
 - metadata

Personalization

- ◆ knowledge
- ◆ profile
- ◆ goals
- ◆ beliefs
- ◆ intentions
- ◆ perspective



Example of an Intelligent Information System

Further work

- ◆ Specific to the IIS:
 - Implement the knowledge acquisition and knowledge-processing modules
- ◆ General:
 - Develop the socio-cultural ontology
 - Develop software for conflict management in dialogs, based on ontologies and Toulmin's argumentation theory
 - Folksonomy integration support