

# **Providing Universal Accessibility using Connecting Ontologies**

**(Role of Impairment and UI Ontologies)**

**(Presented during Workshop in the Institute of Medical  
Informatics, Statistics & Documentation, MedUni Graz)**

**Muhammad Shuaib Karim**

Institute of Software Technology and Interactive Systems

Vienna University of Technology – Austria

<http://www.ifs.tuwien.ac.at/~skarim>

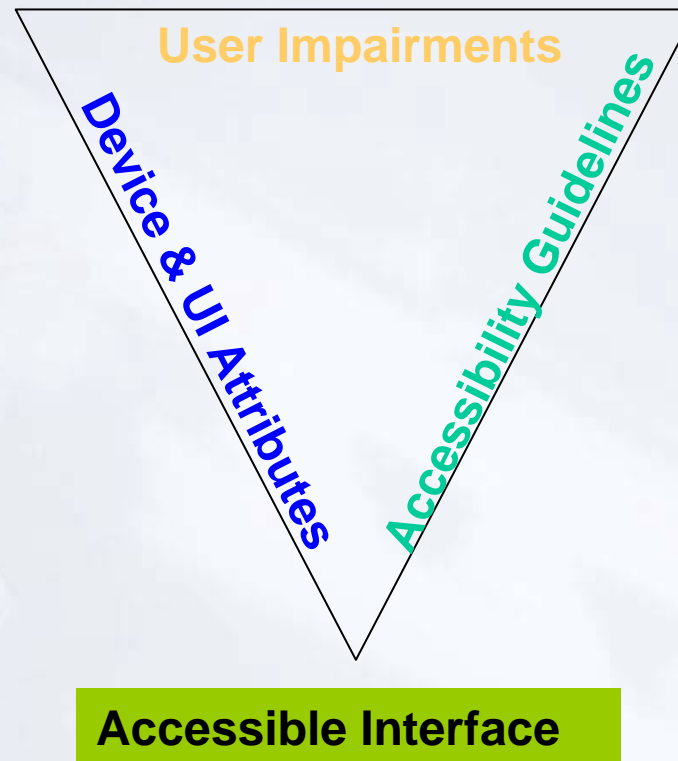
- Ability to store and annotate user's personal information items in our prototype [SemanticLIFE](#) leads to our next step – “making the system accessible for people with special needs”
- Possibility to provide a generic accessibility solution using ontological approach
- Explore accessibility provision other than at UI

- W3C WAI guidelines, 1.0
  - Content is accessible when it may be used by someone with a **disability**
- ANSI HFES 200 (draft)
  - The set of properties that allows a product, service or facility to be used by people with a wide range of capabilities, either directly or in conjunction with assistive technologies. Although 'accessibility' typically addresses users who have a disability, **the concept is not limited to disability issues.**
- ISO TS 16071
  - The usability of a product, service, environment or facility by people with the **widest range of capabilities**

There are different types of:

- **User impairments** such as blindness, hearing problems, motor problems, cognitive problems
- **Interface characteristics** such as text, sound, UI widgets and their behavior
- **Accessibility guidelines** for recommending UI according to impairments

# Essential accessibility components



# Renewed accessibility effort for each impairment type

- Providing alternate text for the pictures
- Avoiding certain color combinations for the color blind
- Avoiding complex table layout for the blind
- Difficulty in interaction by mouse/keyboard due to motor problems
- Difficulty in system behavior recall due to cognitive problems

- Voice feedback (beep, alarm) would no more work if hearing impairment is introduced or becomes more severe
- Response of tactile feedback will change with severity of motoric problems
- Cognitive problems may increase over time

A corresponding change of system behavior over time is required in these cases

# Multiple impairments at the same time

- Vision problem (hemianopsia – loss of one half of visual field) + motoric problems
- Color blind + cognitive problems (for example difficulty in comprehension)
- Cognitive problems + mobility impaired

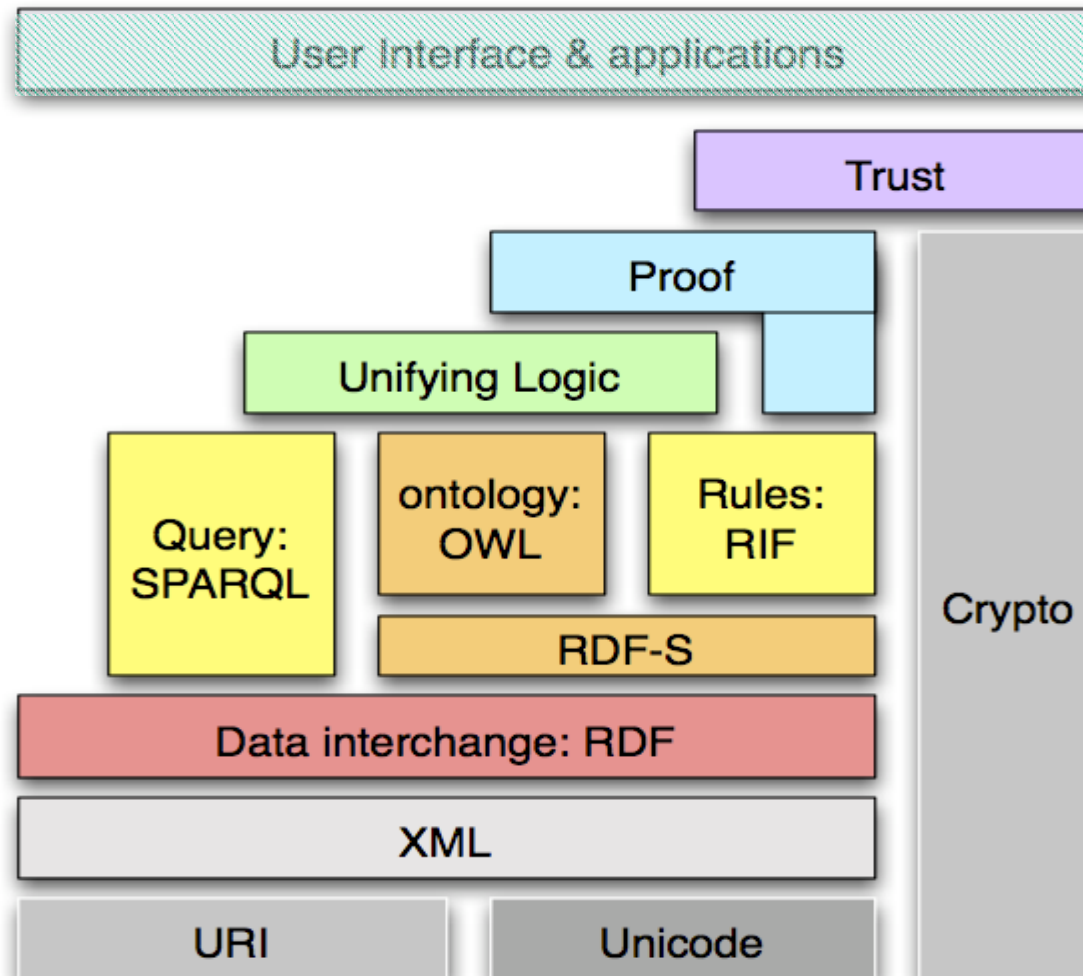
- WCAG make web content (Document Content, Structure, and Presentation) accessible for people with disabilities
  - Focus mainly on vision and motor impairments
  - Main contents are web pages

Other impairments, and information sources are not significantly addressed which are equally important in today's interactive environment

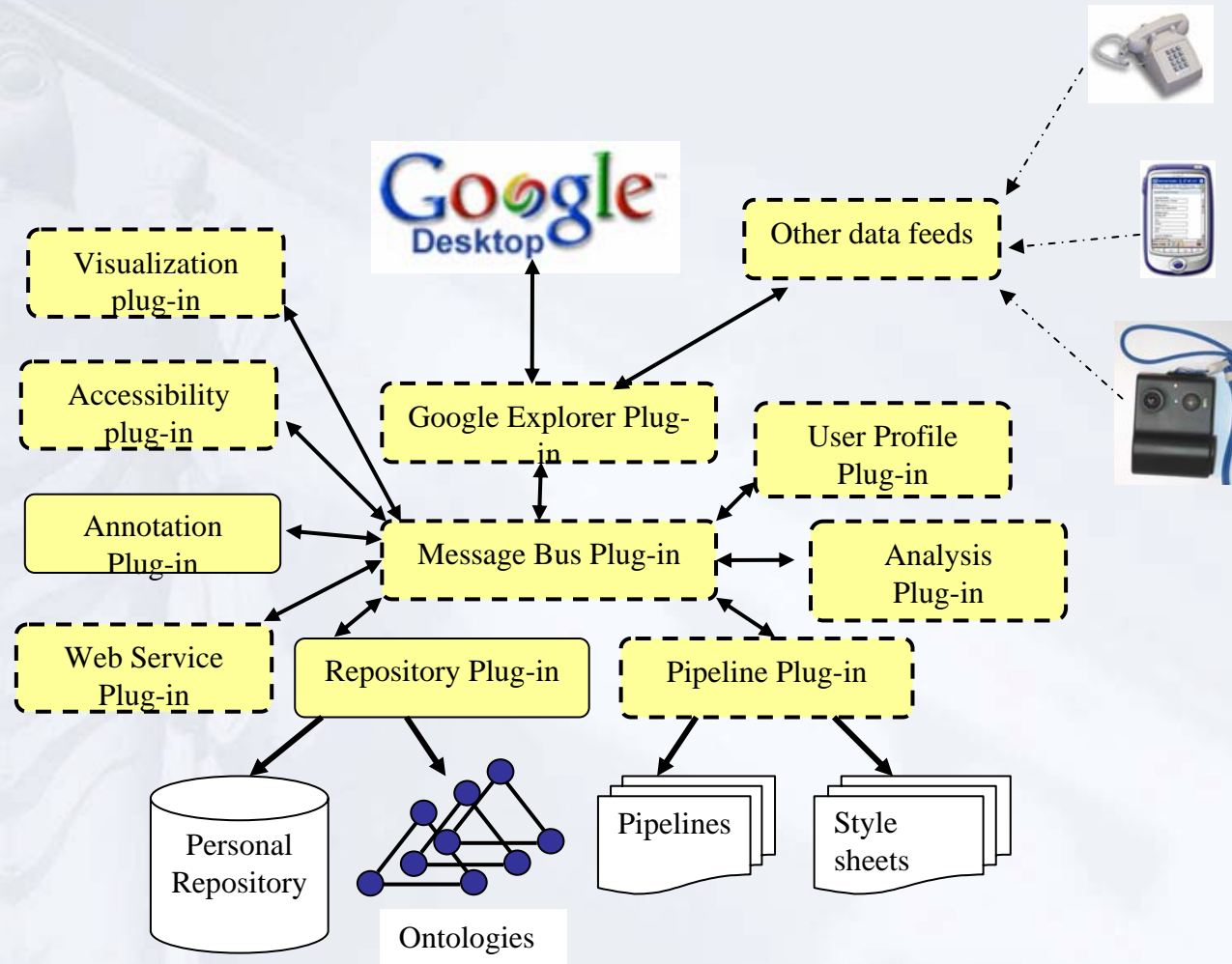
- Lack of Universal Accessibility in software
  - Accessibility is generally provided for only distinctive types of visual, hearing, motor & cognitive impairments
- Reasons:
  - Mostly the focus is specific type of user group
  - Considering many (or all possible) types of impairments, devices, tasks is considered to be out of budget, and also an unnecessary effort
  - The mutual benefits of UA are not recognized
  - **Lack of a holistic approach towards accessibility**

- Ability to integrate heterogeneous data sources
- Ability to formally describe the information
  - Formal data description is understandable; and thus processable and sharable by software agents
  - Automatic reasoning is possible
- Abundance of OS tools from modeling, storage, annotation, reasoning, & query to user interfaces

# Semantic Web – Architecture



# SemanticLIFE Architecture



## **Information Item** Information item on user's PC

Attributes {Description, Date, URI, Size}

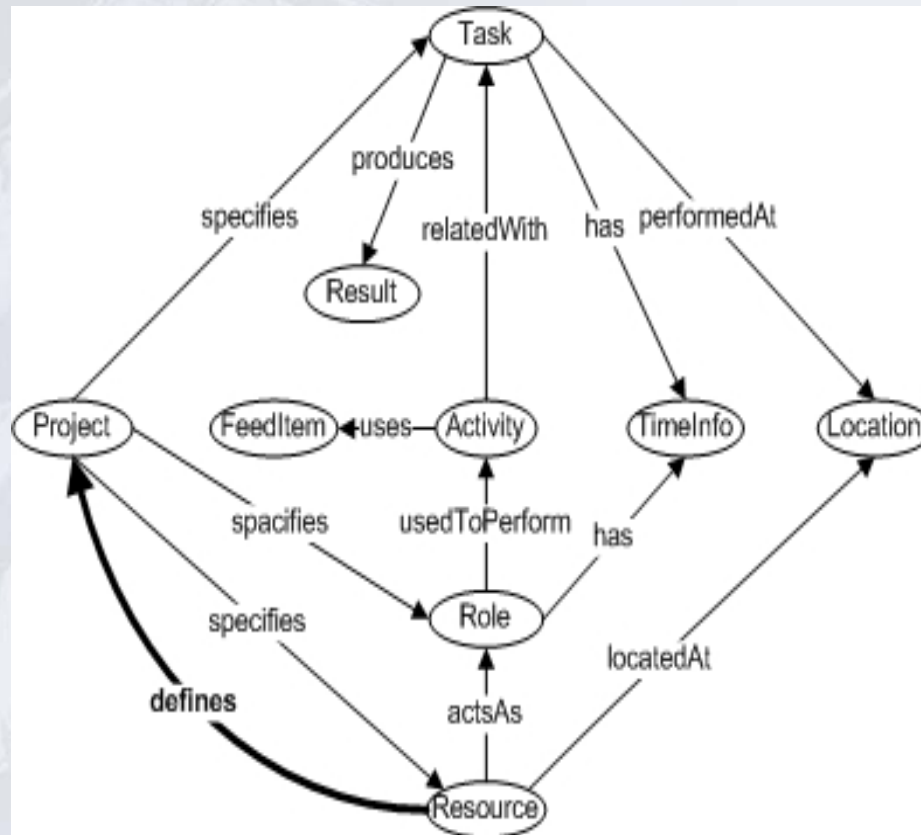
- **Email** Emails sent or received by the user  
Attributes {Subject, Sender, Receiver, Attachments, ...}
- **Chat** User's chat sessions  
Attributes {Participants, Start/End DateTimes, ...}
- **File** Any kind of file on user's computer  
Attributes {Name, Path, URL, ...}
- **Web Page** Pages browsed by the user  
Attributes {Title, URL, ..}
- **Contact** Items in user's address book  
Attributes {Name, Address, Tel, email, Contact Type (family, business, friends,...)}...
- **Calendar** Items from user's calendar  
Attributes {Title, Date, Location, Audience, ...}
- **Process Monitor** Processes running on user's PC  
Attributes {process id, user id, command, argument(s), Date Time, ...}

## **Life Event** User's lifetime events such as birth days of family members & friends, anniversaries, and other occurrences of user's interest

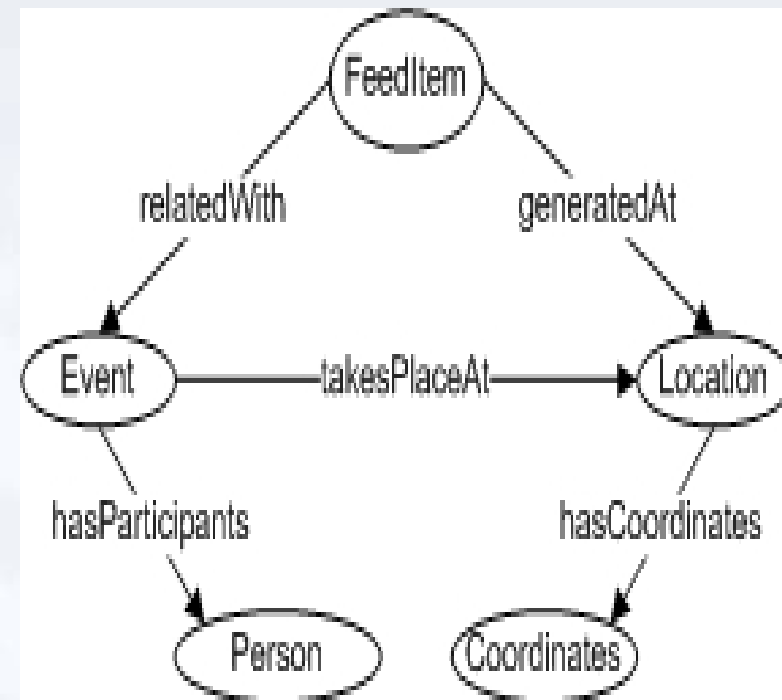
Attributes {Description}

- **Spatial Location** Geographical location of the place where event took place  
Attributes {Name, Coordinates}
- **Temporal Location** Event's starting and ending Date / Time  
Attributes {Start/End Times}
- **Disposition** Indicates the nature or mood of the event for the user  
Attributes {Description}

# Sample Domain Ontologies



Projects Ontology



Travel Ontology

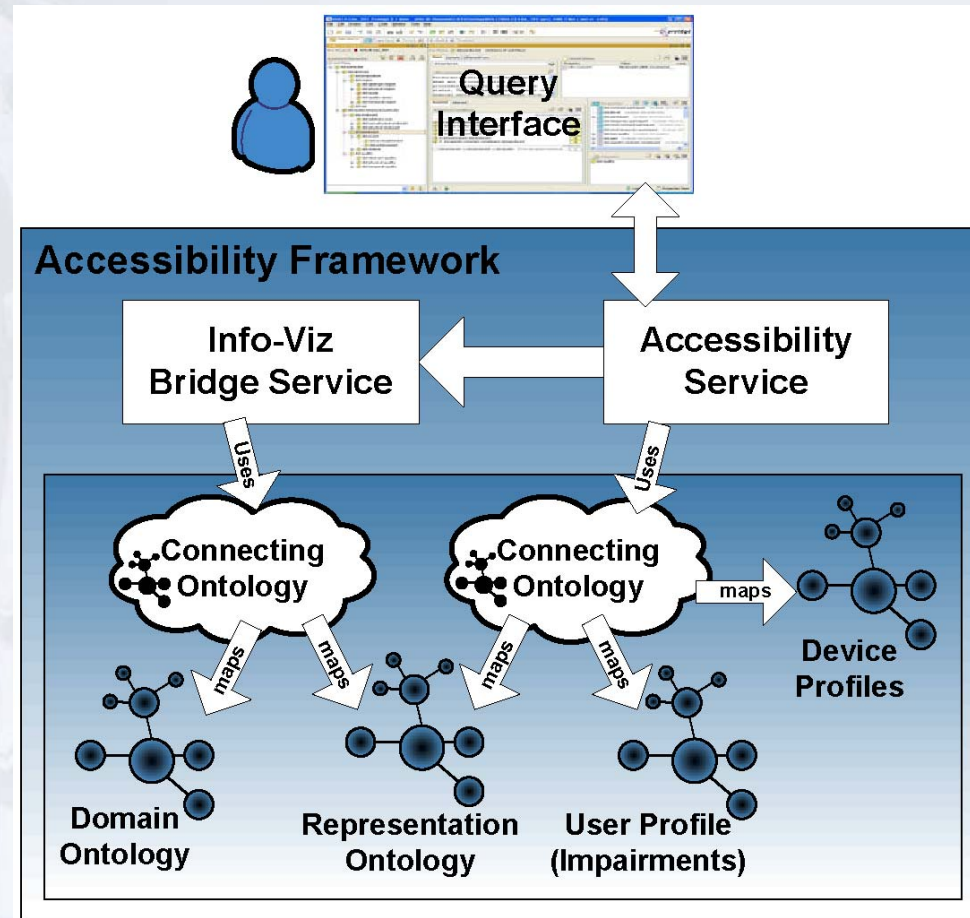
- Annotation of personal photos may increase the accessibility in general life
  - <photo>
    - <uri/>
    - <description/>
    - <location uri/>
    - <accessible facility>
      - <restroom/>
      - <lift/>
      - <ramp/>
      - <brail support/>
    - </accessible facility>
  - </photo>

Important contributing factors are:

- User Profile
- Interaction Device(s)
- UI Characteristics
- Task Characteristics

# Accessibility Framework

- A scalable framework using SemWeb Technology

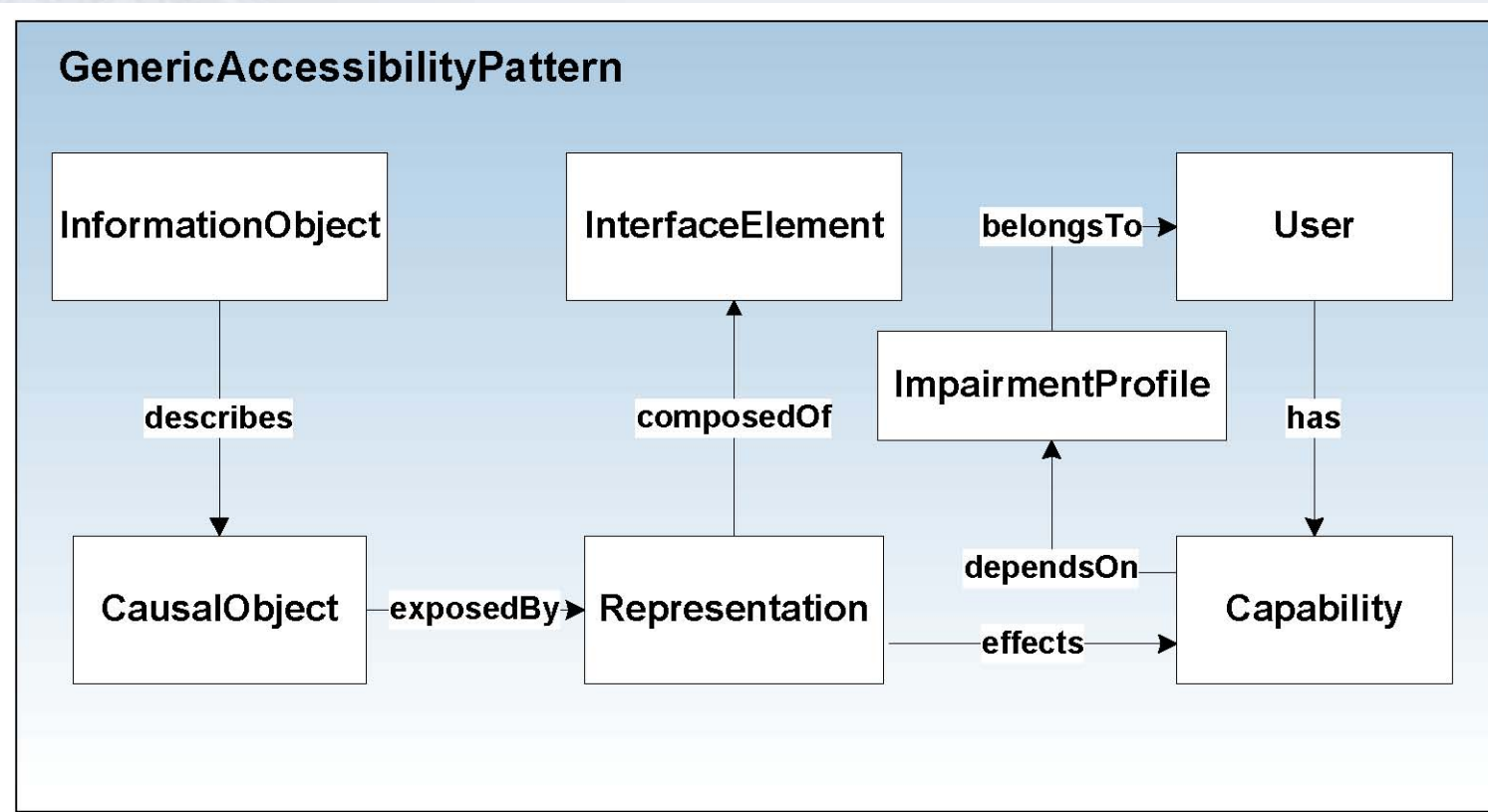


# Solution – Connecting Ontologies

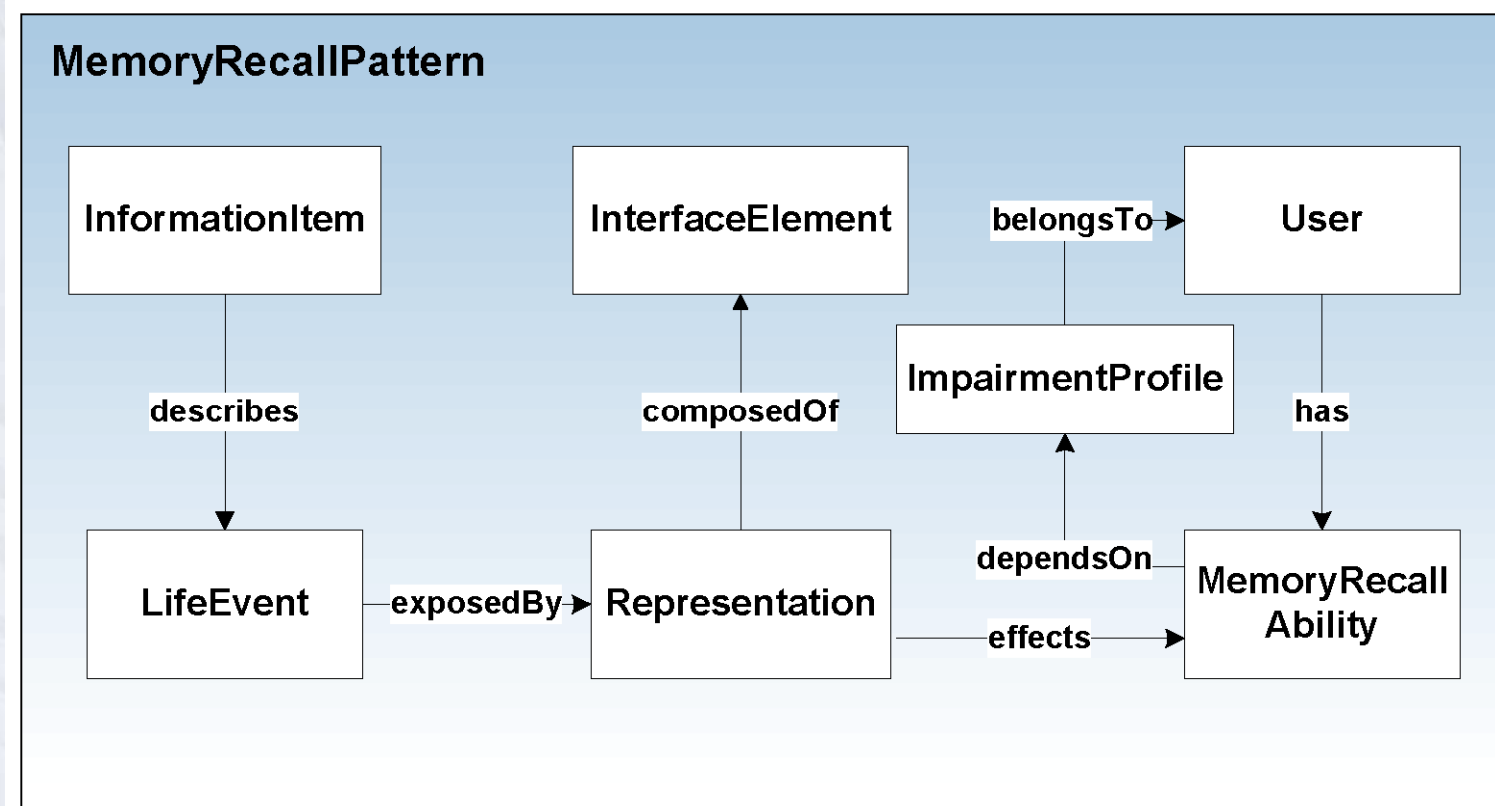


- Ontology of all the contributing factors (UI / Visualization, Impairments, Devices, Tasks) exist & evolve over time
- Connecting Ontologies are formed by making links between UI ontology and other ontologies
- Connecting Ontology is based upon the connecting rules managed by Info-Viz Bridge Service
- User profile exists (containing the impairments, capabilities and preferences for the particular user)
- Accessibility Service is used to provide accessible interface in terms of UI characteristics for a specific instance of user profile via Connecting Ontology. **It also creates the CSS at run time** according to user impairments. So no need to store many CSSs.

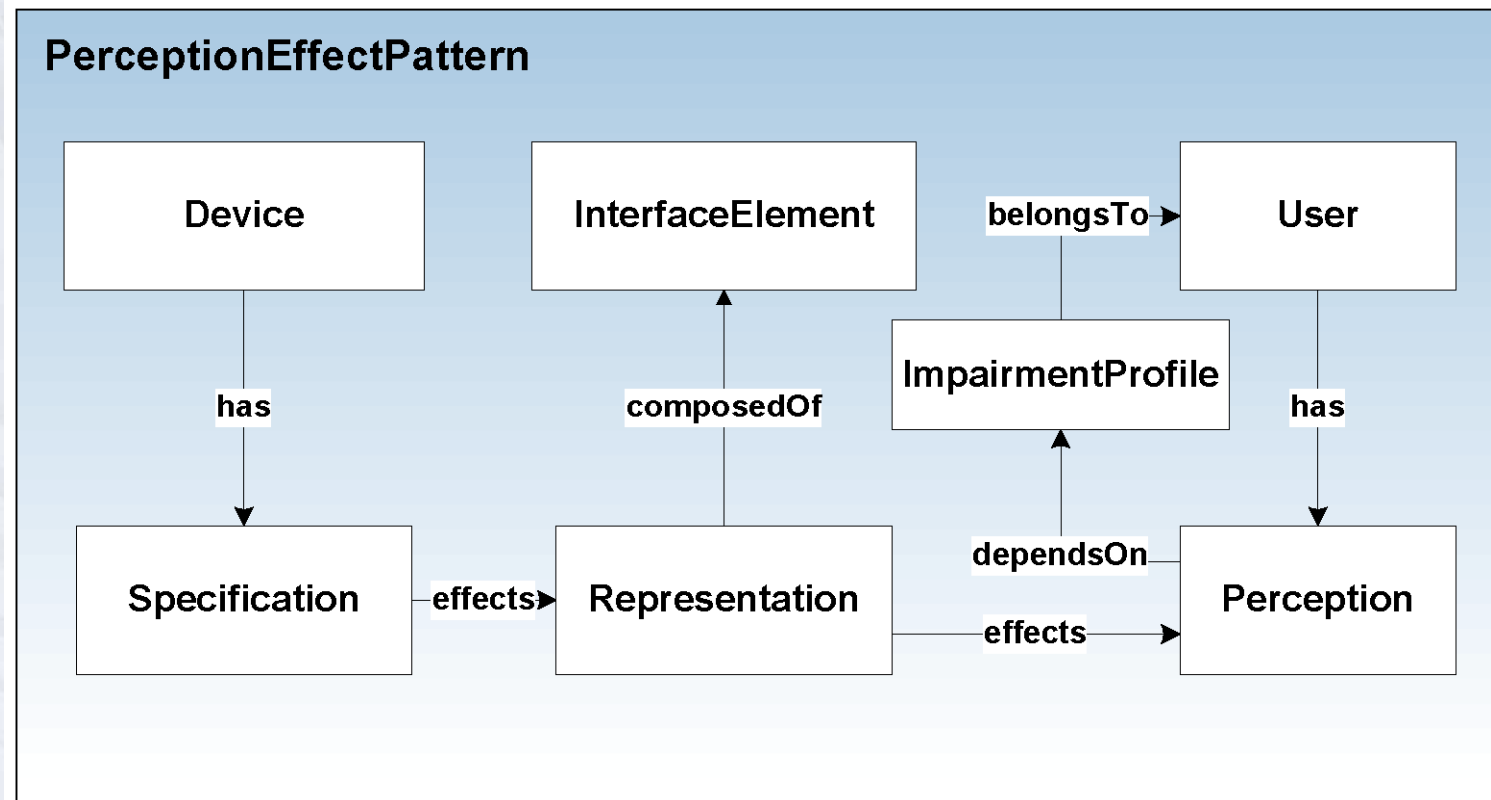
# Generic Accessibility Pattern



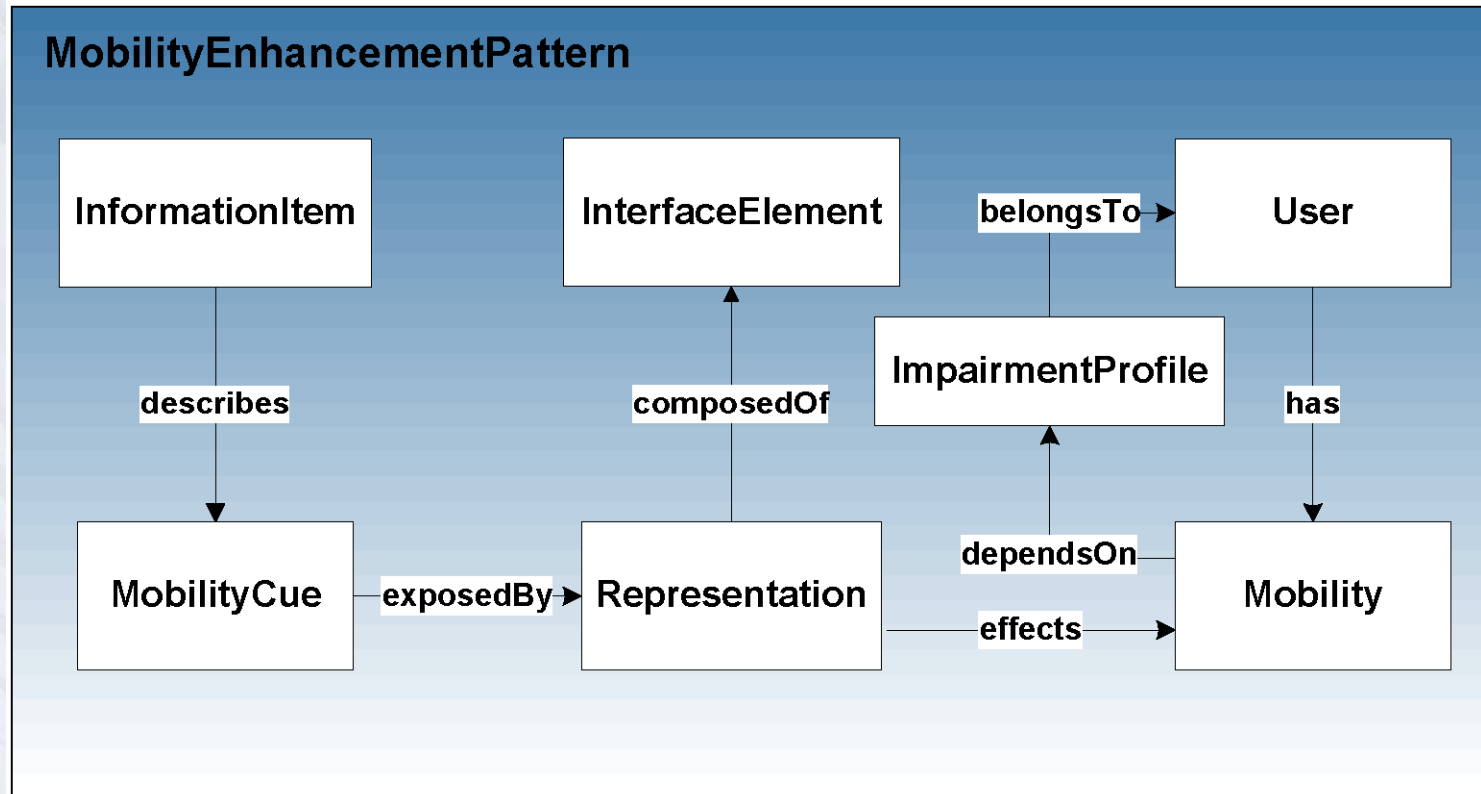
# Memory Recall Pattern



# Perception Effect Pattern



# Mobility Enhancement Pattern



# Connecting Ontology (CO for $O_1$ and $O_2$ )

- $O_1$ ,  $O_2$  not related with the same domain of discourse
  - Independence of two vocabularies
  - Independent design patterns during development
- Create new knowledge, whereas other notions of ontology mapping help reorganizing the existing knowledge

- Facilitate top-down approach of application development
- Facilitate incompatibility resolution between  $O_i$  at the ontological level without delving into the application code
- Helpful for code automation
- The approach will be beneficial for many domains including future interfaces for e-Learning. Travel on the interface and way finding consisting of tasks such as exploration, search and maneuvering can be greatly improved by interconnecting ontologies of user's tasks, impairments, interaction devices & visualizations in use

# Variations of CO's domain knowledge

- Structured documents
- Unstructured documents
- Tacit knowledge with domain experts

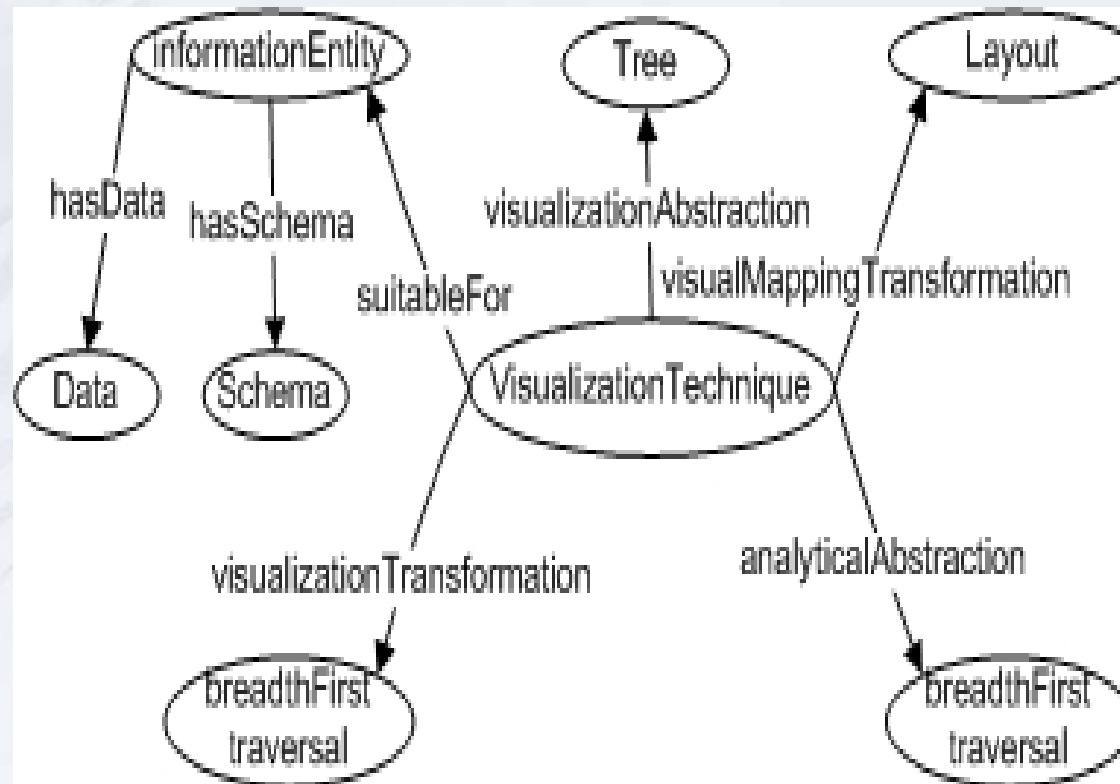
- Text processing of CO domain knowledge and the two participating ontologies
- Refinement of the above by aligning participating ontologies with global standard ontologies
- Exploiting possible queries on the two ontologies
- Exploiting result set of queries

The background of the slide is a faded, light-colored image of a classical statue, possibly a figure from mythology or history, with a large, ornate headpiece. The statue is positioned on the left side of the slide, and the rest of the background is a light, textured grey.

## Connecting Ontology for Impairments & User Interface

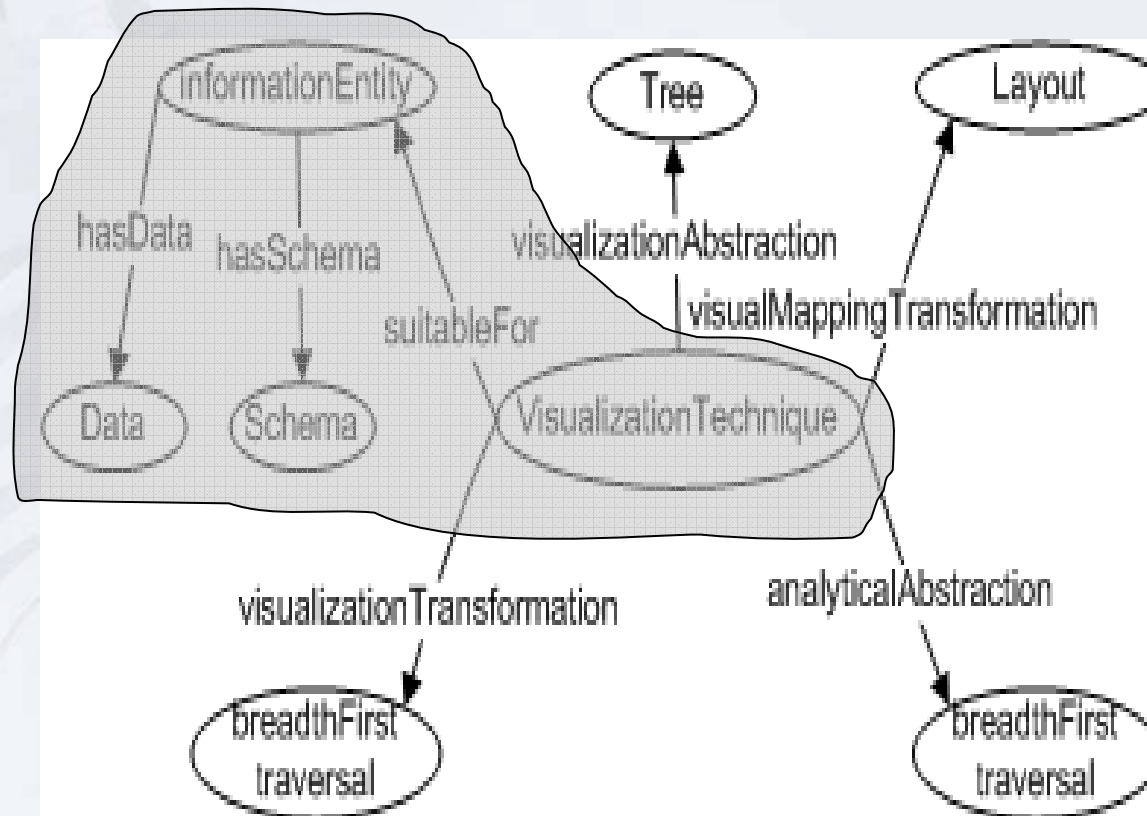
# Ontology of Visualization Techniques

- Ref: Chi E.H. A taxonomy of visualization techniques using the data state reference model. In INFOVIS, pages 69–75, 2000.



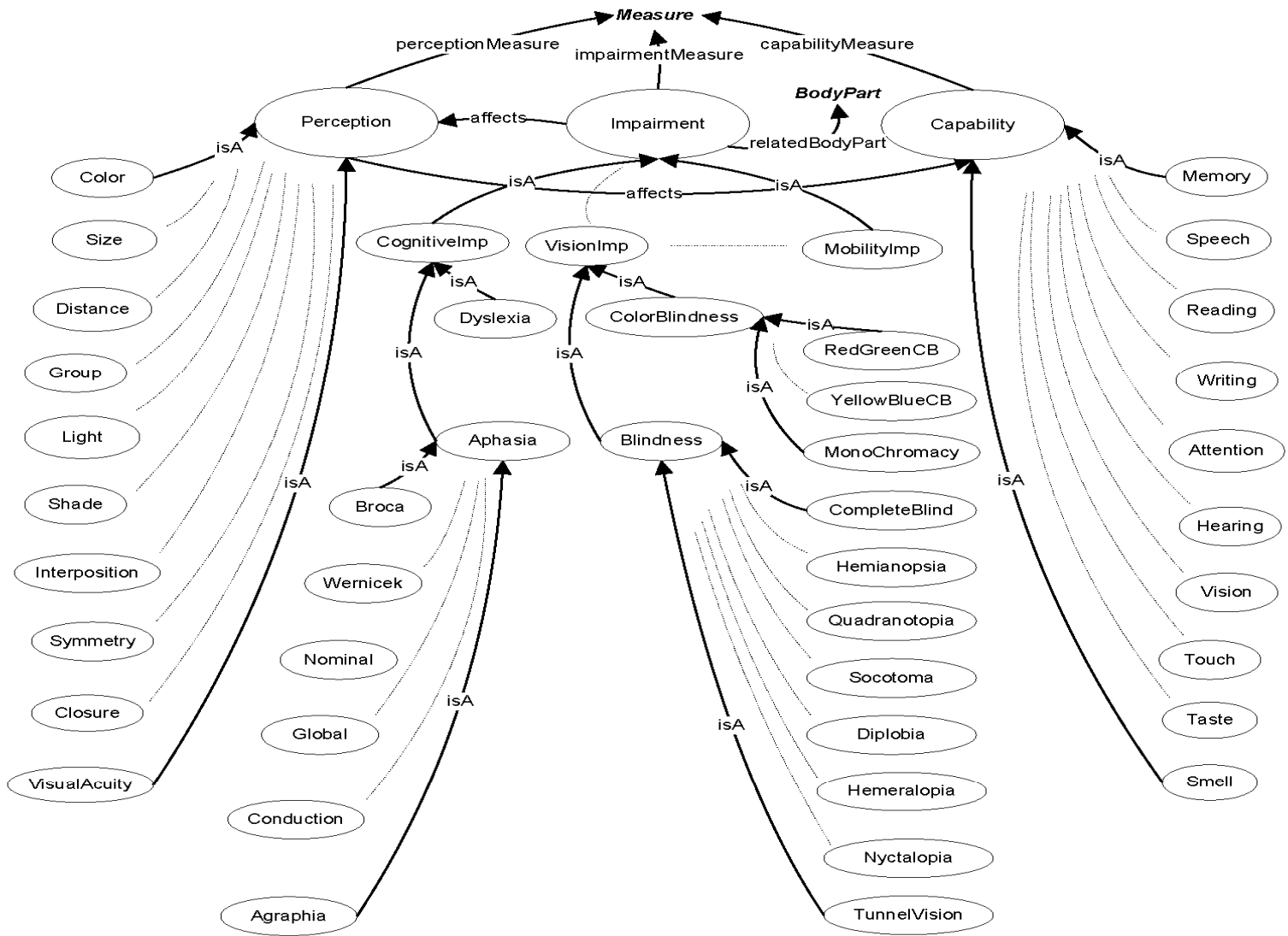
# Ontology of Visualization Techniques

- Ref: Chi E.H. A taxonomy of visualization techniques using the data state reference model. In INFOVIS, pages 69–75, 2000.



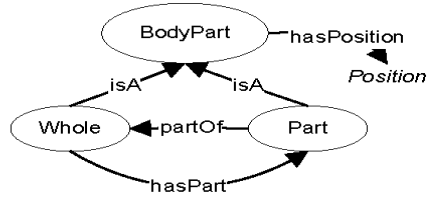
For a given impairment name;

- What is / are the related body parts ?
- What is the impaired side (right, left,...) ?
- What is its severity (on a predefined scale) ?
- What are the perception cues which are affected, and up to what degree (on a predefined scale) ?
- What is the effect of one impairment on another w.r.t. affected perception ?



**Measure**  
 OneOf:  
 #Nil, #Low, #Medium, #High, #VeryHigh

**Position**  
 OneOf:  
 #Right, #Left, #Front, #Back,  
 #Top, #Bottom, #Inner, #Outer



- LeftSidedImpairment





- isA Impairment
- $\exists$  relatedBodyPart some BodyPart
- $\exists$  relatedBodyPart some (hasPartPosition has Left)

- RightSidedImpairment

- isA Impairment
- $\exists$  relatedBodyPart some BodyPart
- $\exists$  relatedBodyPart some (hasPartPosition has Right)

- BothSidedImpairment

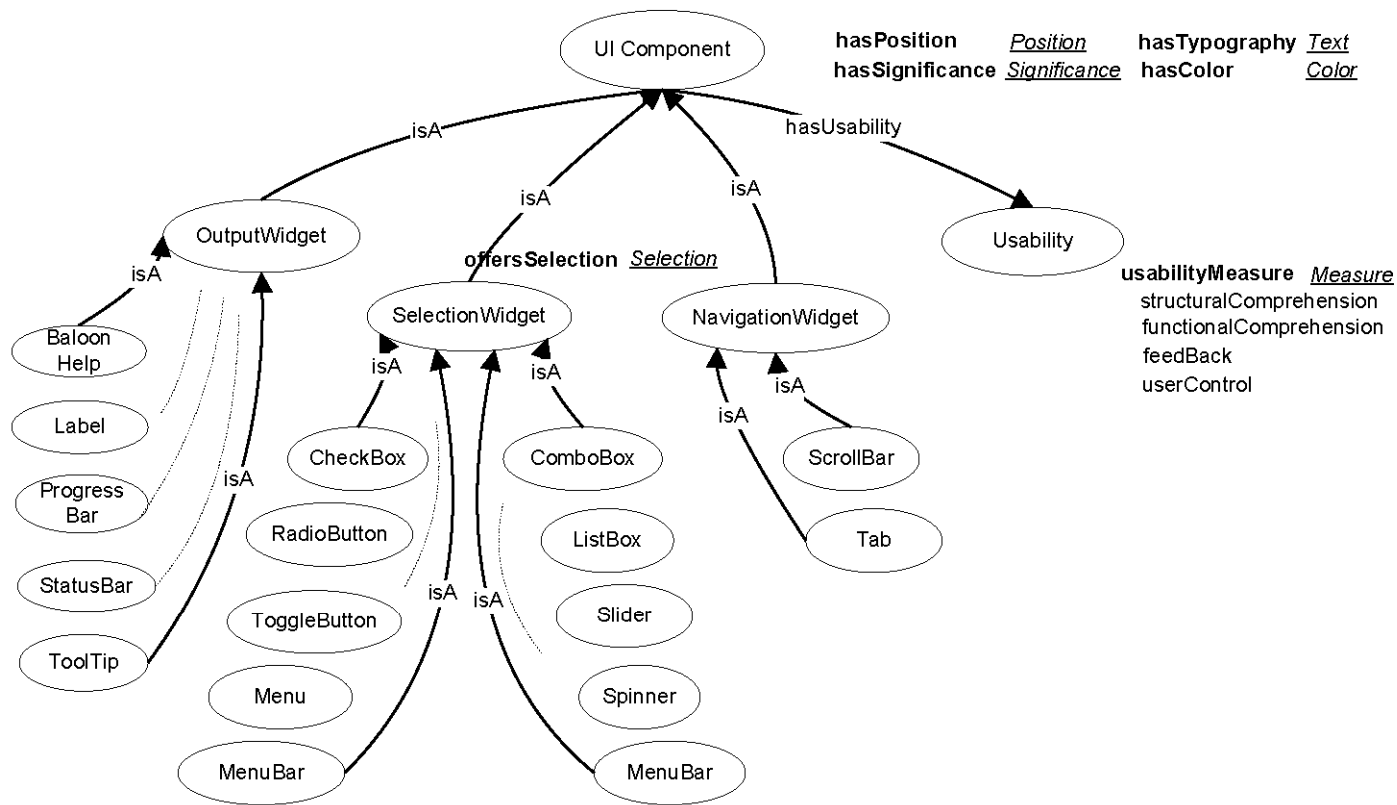
- isA Impairment
- $\exists$  relatedBodyPart some BodyPart
- $\exists$  relatedBodyPart some (hasPartPosition has Left) and
- $\exists$  relatedBodyPart some (hasPartPosition has Right)

- AnySidedImpairment
  - isA Impairment
  -  relatedBodyPart some BodyPart
  -  relatedBodyPart some ((hasPartPosition has Left) or (hasPartPosition has Right))
- AnySidedImpairment\_1
  - isA Impairment
  -  relatedBodyPart some BodyPart
  -  LeftSidedImpairment or RightSidedImpairment

- Find the part-whole relationship of UI components
- Find the attributes of a component and their values (according to predefined usability scale for a normal user in normal conditions)
- Given specific attribute name, find the related UI components

Refs: <http://java.sun.com/docs/books/tutorial/uiswing/components/components.html>

<http://java.sun.com/products/jfc/tsc/articles/containers/index.html>

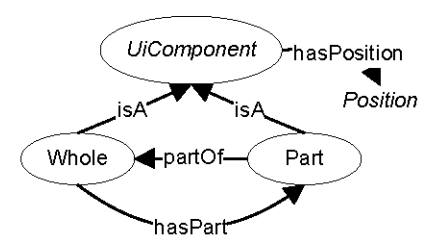


Measure  
 OneOf:  
 #Nil, #Low, #Medium, #High, #VeryHigh

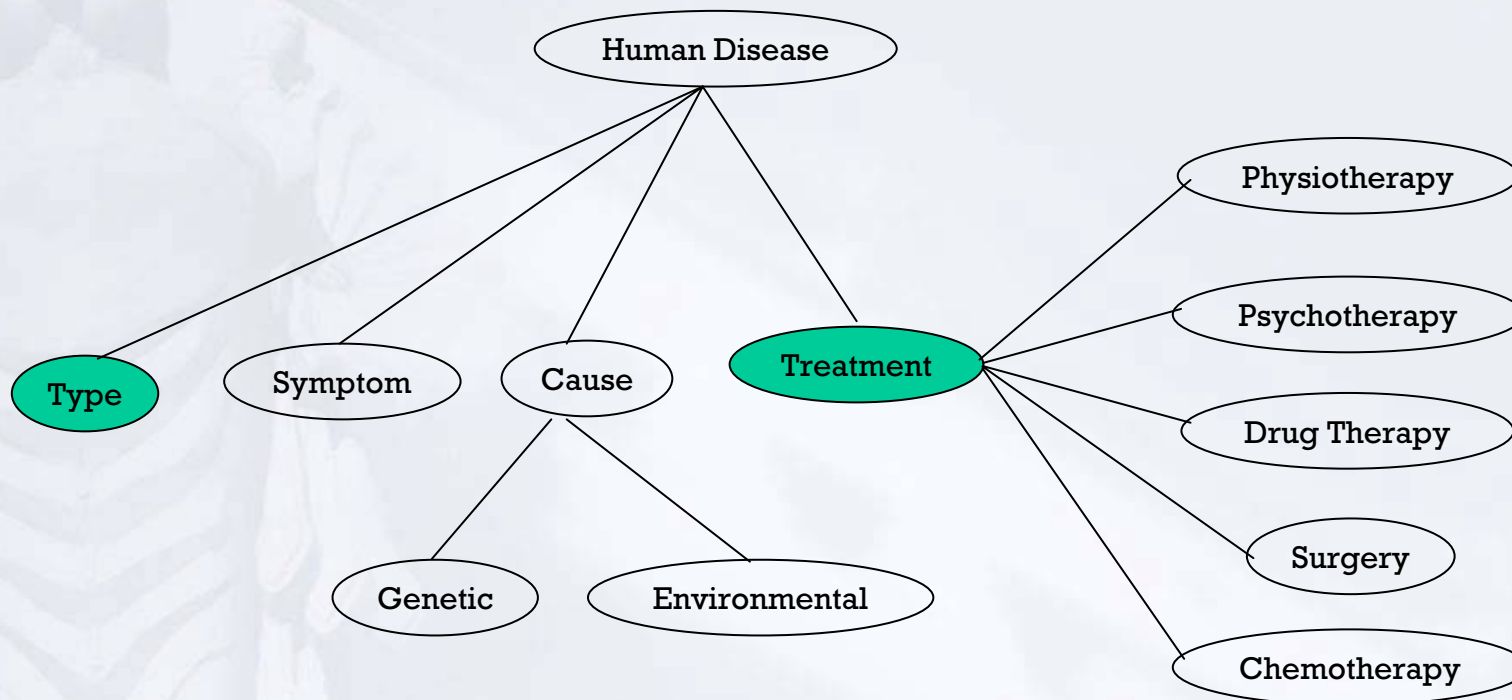
Significance  
 OneOf:  
 #Functional, #Aesthetical

Position  
 OneOf:  
 #Right, #Left, #Front, #Back,  
 #Top, #Bottom, #Inner, #Outer

Selection  
 OneOf:  
 #Boolean, #Multiple

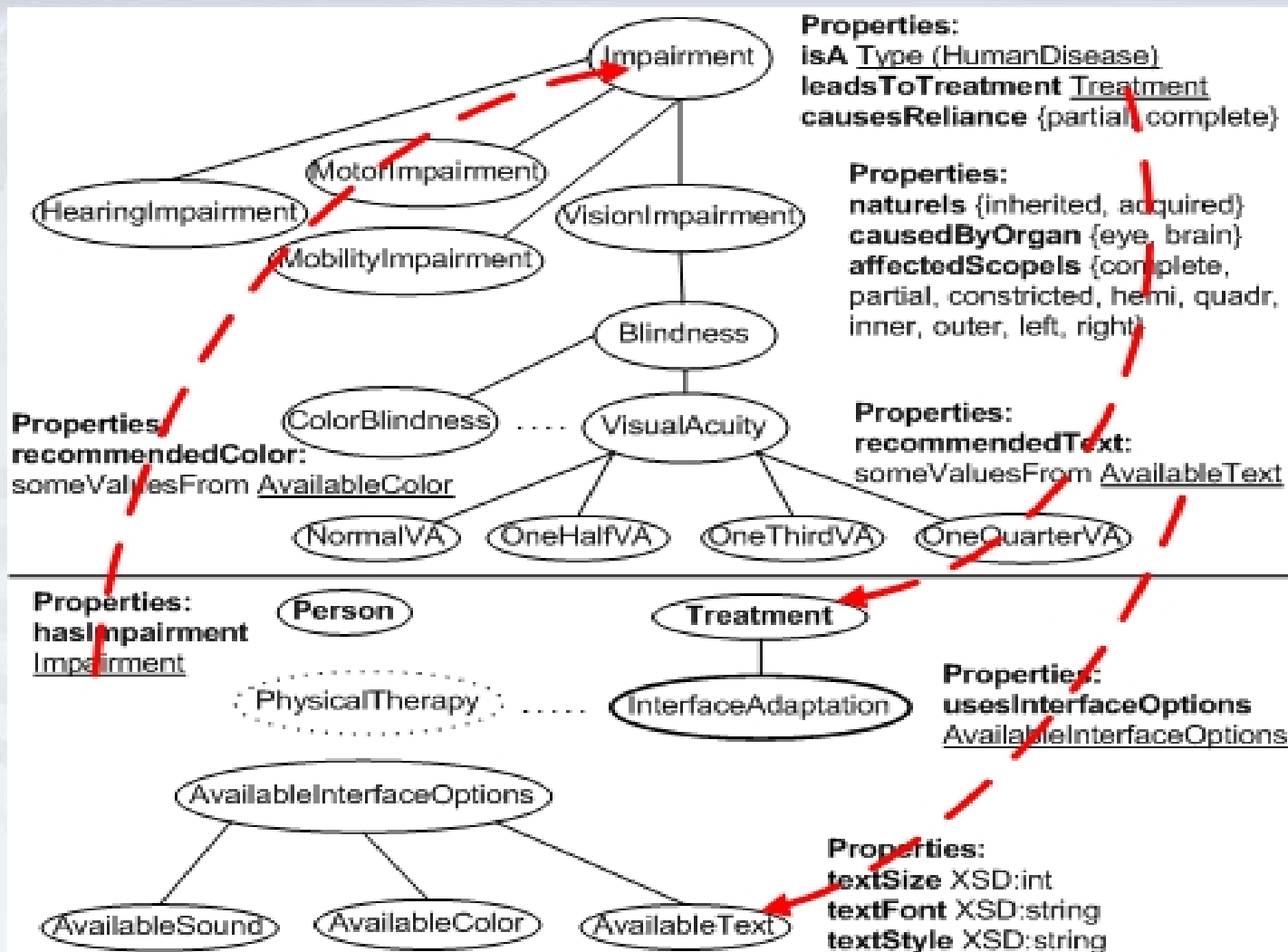


# Extension of ontology (Ref: "Hadzic M. and Chang E., Ontology-based Support for Human Disease Study, HICSS'05")



- Avoiding the confusing colors on an interface for a user with particular type of color blindness
- Font adjustments according to user's visual acuity
- Information presentation on the better part of the screen for a user suffering from Hemianopsia (absence of vision in half of visual field)

# Impairment-User Interface Ontology (Ref: "Shuaib Karim and A Min Tjoa, Towards the Use of Ontologies for Improving User Interaction for People with Special Needs. ICCHP 2006: 77-84")



Low perception implies suggesting high usability components (**VisualAcuityLow** → **uiLegibilityGood**)

(**?x rdf:type imp:VisualAcuity**) (**?x imp:perceptionMeasure imp:Low**) (**?y rdf:type ui:UiComponent**) (**?y ui:hasLegibility ui:Good**)

→ (**?x eg:suggests ?y**).

High perception implies suggesting fair usability components (**VisualAcuityHigh** → **uiLegibilityFair**)

(**?x rdf:type imp:VisualAcuity**) (**?x imp:perceptionMeasure imp:High**) (**?y rdf:type ui:UiComponent**) (**?y ui:hasLegibility ui:Fair**)

→ (**?x eg:suggests ?y**).

High rheumatism implies suggesting easily operatable components (**RheumatismHigh** → **uiUserControlGood**)

(**?x** **rdf:type** **imp:Rheumatism**) (**?x** **imp:impairmentMeasure** **imp:High**) (**?y** **rdf:type** **ui:UiComponent**) (**?y** **ui:userControl** **ui:Good**)

→ (**?x** **eg:suggests** **?y**).

# Generated triples by rules

```
- <rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#" xmlns:j.0="urn:x-hp:eg/">
- <rdf:Description
  rdf:about="http://www.ifs.tuwien.ac.at/ontologies/imp#VisualAcuity_Low">
  <j.0:suggests
    rdf:resource="http://www.ifs.tuwien.ac.at/ontologies/ui#TextSize_18" />
  <j.0:suggests
    rdf:resource="http://www.ifs.tuwien.ac.at/ontologies/ui#TextFont_TimesNewRoman" />
  <j.0:suggests
    rdf:resource="http://www.ifs.tuwien.ac.at/ontologies/ui#TextSize_10" />
  <j.0:suggests
    rdf:resource="http://www.ifs.tuwien.ac.at/ontologies/ui#TextStyle_Bold" />
  <j.0:suggests
    rdf:resource="http://www.ifs.tuwien.ac.at/ontologies/ui#TextSize_22" />
  <j.0:suggests
    rdf:resource="http://www.ifs.tuwien.ac.at/ontologies/ui#TextSize_11" />
  <j.0:suggests
    rdf:resource="http://www.ifs.tuwien.ac.at/ontologies/ui#TextSize_20" />
</rdf:Description>
- <rdf:Description
  rdf:about="http://www.ifs.tuwien.ac.at/ontologies/imp#Rheumatism_1">
  <j.0:suggests
    rdf:resource="http://www.ifs.tuwien.ac.at/ontologies/ui#LabelledButton_Swing" />
</rdf:Description>
</rdf:RDF>
```

[GoogleItem](#) [FileItem](#) [ContactItem](#) [WebItem](#) [MailItem](#)

## MailItem

-  **URL:** [http://localhost:4664/cache?event\\_id=132460&schema\\_id=1&s=dPBzTDjvBp7x3vqMaf0y\\_Iggo5U](http://localhost:4664/cache?event_id=132460&schema_id=1&s=dPBzTDjvBp7x3vqMaf0y_Iggo5U) **ITEMDATE:** 2006-11-17T22:01:57  
**ATTACHMENT:** [http://www.ifs.tuwien.ac.at/slfe-google#item\\_4c3584d36b8031636cf2fac6fff905fc4aa50caf](http://www.ifs.tuwien.ac.at/slfe-google#item_4c3584d36b8031636cf2fac6fff905fc4aa50caf) **TITLE:** [SPAM?] Sport **MAILFROM:** Tony <exr@gr.initiative.com> **MAILTO:** <skarim@ifs.tuwien.ac.at> **SUBJECT:** [SPAM?] sport
-  **URL:** [http://localhost:4664/cache?event\\_id=132454&schema\\_id=1&s=OtriiTt9GS\\_omG3JramAYE51RNA](http://localhost:4664/cache?event_id=132454&schema_id=1&s=OtriiTt9GS_omG3JramAYE51RNA) **ITEMDATE:** 2006-11-17T18:57:20  
**TITLE:** RDF Profiles in Link Values **MAILFROM:** Xiaoshu Wang <wangxiao@musc.edu> **MAILTO:** 'Richard Cyganiak' <richard@cyganiak.de>, 'Sean B. Palmer' <sean@miscoranda.com> **SUBJECT:** RE: RDF Profiles in Link Values
-  **URL:** [http://localhost:4664/cache?event\\_id=132511&schema\\_id=1&s=5WfTIIUnu6MVSih8awFg0e6ruMg](http://localhost:4664/cache?event_id=132511&schema_id=1&s=5WfTIIUnu6MVSih8awFg0e6ruMg) **ITEMDATE:** 2006-11-18T19:01:21  
**ATTACHMENT:** [http://www.ifs.tuwien.ac.at/slfe-google#item\\_a58d2b53f5359d471d70f838a17479550914be53](http://www.ifs.tuwien.ac.at/slfe-google#item_a58d2b53f5359d471d70f838a17479550914be53) **TITLE:** [SPAM?] All-important PKXM **MAILFROM:** clemson <antiperspirantaegis@xef-group.com> **MAILTO:** <stolba@ifs.tuwien.ac.at> **SUBJECT:** [SPAM?] all-important PKXM
-  **URL:** [http://localhost:4664/cache?event\\_id=132643&schema\\_id=1&s=FiyDZ-mauCydmeuaD9m1\\_162WUs](http://localhost:4664/cache?event_id=132643&schema_id=1&s=FiyDZ-mauCydmeuaD9m1_162WUs) **ITEMDATE:** 2006-11-19T13:49:07 **TITLE:** [protege-owl] Rule Engine bridge for other Rule engin..  
**MAILFROM:** Jan-Olav Eide <Jan-Olav.Eide@fast.no> **MAILTO:** <protege-owl@lists.Stanford.EDU> **SUBJECT:** [protege-owl] Rule Engine bridge for other Rule engines than Jess ?
-  **URL:** [http://localhost:4664/cache?event\\_id=132557&schema\\_id=1&s=Y-q9xmzzyfXa39ajVS2\\_a9neQp4](http://localhost:4664/cache?event_id=132557&schema_id=1&s=Y-q9xmzzyfXa39ajVS2_a9neQp4) **ITEMDATE:** 2006-11-18T19:58:33 **TITLE:** ID2050 HCII2007 FUITEL STS Congratulations, your..  
**MAILFROM:** shuaib <skarim@ifs.tuwien.ac.at> **MAILTO:** <skarim@ifs.tuwien.ac.at> **SUBJECT:** FW: ID2050 HCII2007 FUITEL STS Congratulations, your proposal is accepted!
-  **URL:** [http://localhost:4664/cache?event\\_id=132463&schema\\_id=1&s=evezIAHmY5jzTd41y4at354aBFk](http://localhost:4664/cache?event_id=132463&schema_id=1&s=evezIAHmY5jzTd41y4at354aBFk) **ITEMDATE:** 2006-11-18T00:06:20 **TITLE:** [ATScholars] Poll results for ATScholars  
**MAILFROM:** ATScholars@yahoo.com **MAILTO:** ATScholars@yahoo.com **SUBJECT:** [ATScholars] Poll results for ATScholars
-  **URL:** [http://localhost:4664/cache?event\\_id=132563&schema\\_id=1&s=7YbNABiDzArP-BLaLrzRvDHL3rI](http://localhost:4664/cache?event_id=132563&schema_id=1&s=7YbNABiDzArP-BLaLrzRvDHL3rI) **ITEMDATE:** 2006-11-19T13:10:54  
**ATTACHMENT:** [http://www.ifs.tuwien.ac.at/slfe-google#item\\_d7c247282d0a1c21efb8a6fdb8ddc113eab2f282](http://www.ifs.tuwien.ac.at/slfe-google#item_d7c247282d0a1c21efb8a6fdb8ddc113eab2f282) **TITLE:** [protege-discussion] Where is the difference?  
**MAILFROM:** ling huo <royana\_326@yahoo.com.cn> **MAILTO:** protege-discussion@lists.Stanford.EDU **SUBJECT:** [protege-discussion] where is the difference?



about:blank

Address file:///C:/ts\_1177314354734/ts\_GoogleItem/contents.htm#MailItem

[GoogleItem](#) [FileItem](#) [ContactItem](#) [WebItem](#) [MailItem](#)

## MailItem

-  URL: [http://localhost:4664/cache?event\\_id=132460&schema\\_id=1&s=dPBzTDjvBp7x3vqMaf0y\\_Iggo5U](http://localhost:4664/cache?event_id=132460&schema_id=1&s=dPBzTDjvBp7x3vqMaf0y_Iggo5U) ITEMDATE: 2006-11-17T22:01:57  
ATTACHMENT: [http://www.ifs.tuwien.ac.at/slfe-google#item\\_4c3584d36b8031636cf2fac6fff905fc4aa50caf](http://www.ifs.tuwien.ac.at/slfe-google#item_4c3584d36b8031636cf2fac6fff905fc4aa50caf) TITLE: [SPAM?] Sport MAILFROM: Tony <exr@gr.initiative.com> MAILTO: <skarim@ifs.tuwien.ac.at> SUBJECT: [SPAM?] sport
-  URL: [http://localhost:4664/cache?event\\_id=132454&schema\\_id=1&s=OtrüTt9GS\\_omG3JramAYE51RNA](http://localhost:4664/cache?event_id=132454&schema_id=1&s=OtrüTt9GS_omG3JramAYE51RNA) ITEMDATE: 2006-11-17T18:57:20  
TITLE: [RDF Profiles in Link Values](#) MAILFROM: Xiaoshu Wang <wangxiao@musc.edu> MAILTO: 'Richard Cyganiak' <richard@cyganiak.de>, 'Sean B. Palmer' <sean@miscoranda.com> SUBJECT: RE: RDF Profiles in Link Values
-  URL: [http://localhost:4664/cache?event\\_id=132511&schema\\_id=1&s=5WfTIIUnu6MVSih8awFg0e6ruMg](http://localhost:4664/cache?event_id=132511&schema_id=1&s=5WfTIIUnu6MVSih8awFg0e6ruMg) ITEMDATE: 2006-11-18T19:01:21  
ATTACHMENT: [http://www.ifs.tuwien.ac.at/slfe-google#item\\_a58d2b53f5359d471d70f838a17479550914be53](http://www.ifs.tuwien.ac.at/slfe-google#item_a58d2b53f5359d471d70f838a17479550914be53) TITLE: [SPAM?] All-important PKXM MAILFROM: clemson <antiperspirantaegis@xef-group.com> MAILTO: <stolba@ifs.tuwien.ac.at> SUBJECT: [SPAM?] all-important PKXM
-  URL: [http://localhost:4664/cache?event\\_id=132643&schema\\_id=1&s=FiyDZ-mauCydmEuaD9m1\\_162WUs](http://localhost:4664/cache?event_id=132643&schema_id=1&s=FiyDZ-mauCydmEuaD9m1_162WUs) ITEMDATE: 2006-11-19T13:49:07 TITLE: [protege-owl] Rule Engine bridge for other Rule engin.. MAILFROM: Jan-Olav Eide <Jan-Olav.Eide@fast.no> MAILTO: <protege-owl@lists.Stanford.EDU> SUBJECT: [protege-owl] Rule Engine bridge for other Rule engines than Jess ?
-  URL: [http://localhost:4664/cache?event\\_id=132557&schema\\_id=1&s=Y-q9xmzzyfXa39ajVS2\\_a9neQp4](http://localhost:4664/cache?event_id=132557&schema_id=1&s=Y-q9xmzzyfXa39ajVS2_a9neQp4) ITEMDATE: 2006-11-18T19:58:33 TITLE: ID2050 HCII2007 FUTEL STS Congratulations, your.. MAILFROM: shuaib <skarim@ifs.tuwien.ac.at> MAILTO: <skarim@ifs.tuwien.ac.at> SUBJECT: FW: ID2050 HCII2007 FUTEL STS Congratulations, your proposal is accepted!
-  URL: [http://localhost:4664/cache?event\\_id=132463&schema\\_id=1&s=evezIAHmY5jzTd41y4at354aBFk](http://localhost:4664/cache?event_id=132463&schema_id=1&s=evezIAHmY5jzTd41y4at354aBFk) ITEMDATE: 2006-11-18T00:06:20 TITLE: [ATScholars] Poll results for ATScholars MAILFROM: ATScholars@yahooogroups.com MAILTO: ATScholars@yahooogroups.com SUBJECT: [ATScholars] Poll results for ATScholars
-  URL: [http://localhost:4664/cache?event\\_id=132563&schema\\_id=1&s=7YbNABiDzArP-BLaLrzRvDHL3rI](http://localhost:4664/cache?event_id=132563&schema_id=1&s=7YbNABiDzArP-BLaLrzRvDHL3rI) ITEMDATE: 2006-11-19T13:10:54  
ATTACHMENT: [http://www.ifs.tuwien.ac.at/slfe-google#item\\_d7c247282d0a1c21efb8a6fdb8ddc113eab2f282](http://www.ifs.tuwien.ac.at/slfe-google#item_d7c247282d0a1c21efb8a6fdb8ddc113eab2f282) TITLE: [protege-discussion] Where is the difference? MAILFROM: ling luo <royana\_326@yahoo.com.cn> MAILTO: protege-discussion@lists.Stanford.EDU SUBJECT: [protege-discussion] where is the difference?

about:blank

Address about:blank

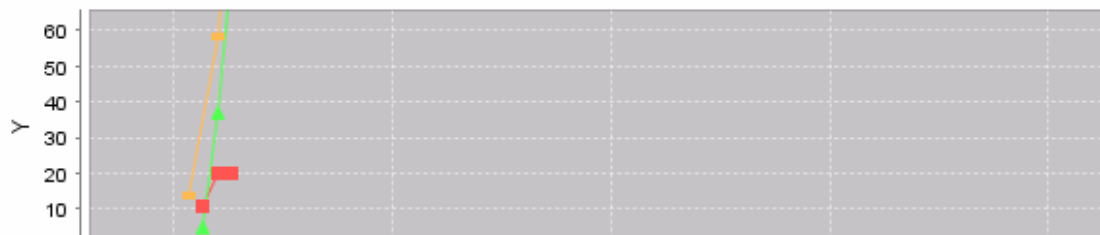
FileItem ContactItem WebItem MailItem

### FileItem

- FILEPATH: C:\PROGRA~1\COMMON~1\SYMANT~1\VIRUSD~1\20061117.017 URL: file://C:\PROGRA~1\COMMON~1\SYMANT~1\VIRUSD~1\20061117.017\CCERASER.DLL event\_id=132423&schema\_id=8 FILESIZE: 2406760 FILENAME: CCERASER.DLL ITEMDATE: 2006-11-18T00:27:26 TITLE: CCERASER.DLL FILETYPE: 0
- FILESIZE: 28672 FILENAME: Outlook.jpg ITEMDATE: 2006-11-18T15:20:13 FILETYPE: 0
- FILEPATH: C:\Program Files\MySQL\MySQL Server 5.0\Data\slife URL: file://C:\Program Files\MySQL\MySQL Server 5.0\Data\slife\jena\_sys\_stmt.frm?event\_id=132672&schema\_id= FILESIZE: 8654 FILENAME: jena\_sys\_stmt.frm ITEMDATE: 2006-11-19T20:13:21 TITLE:

Timeseries Visualization

### Timeseries for SemanticLIFE Information Items



ViewControl

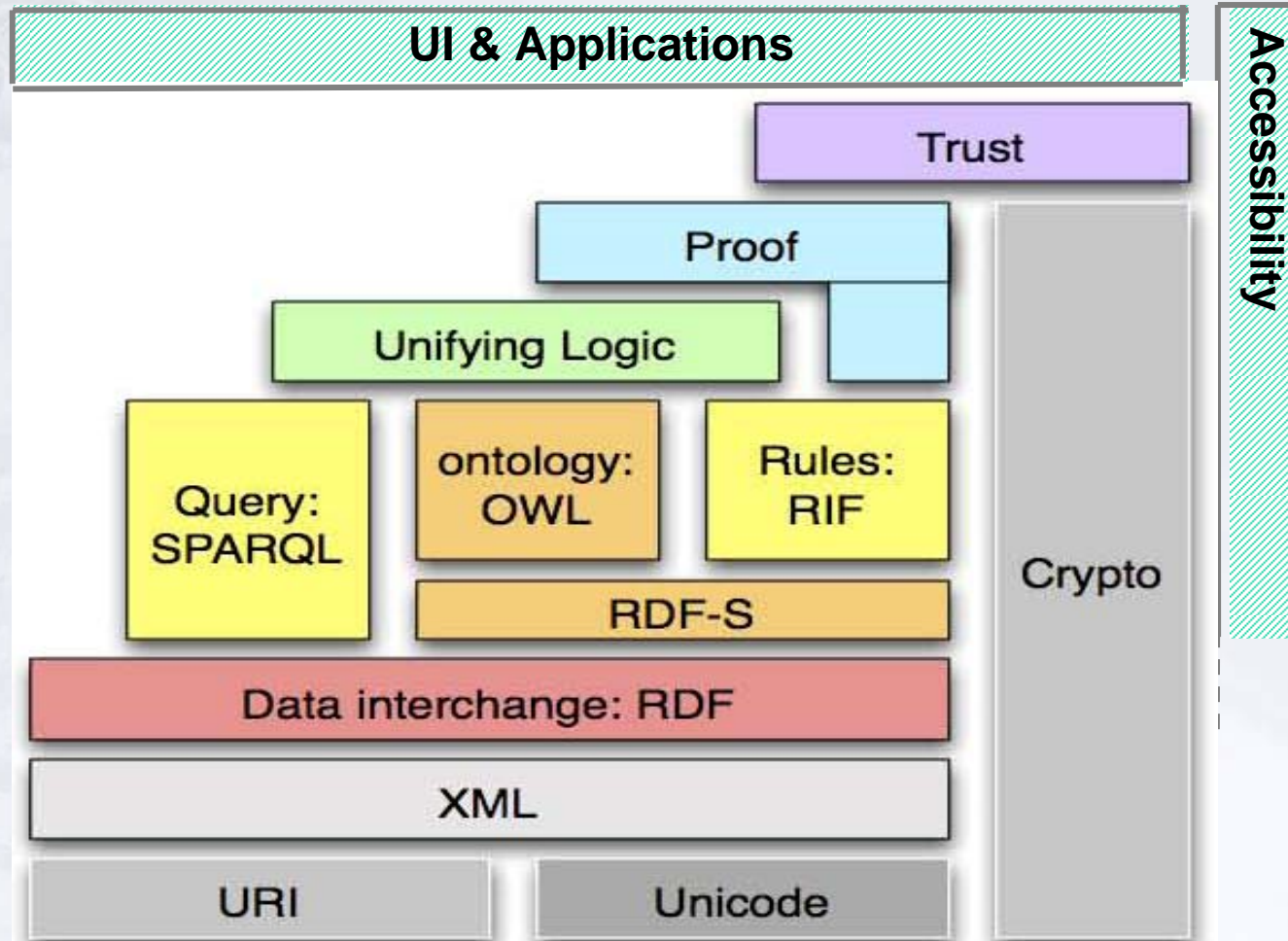
Shapes  
 VisualAcuity\_Low  
 ColorBlindness  
 MotorProblems

# Consequences of impairments-user interface ontology

- Helpful in automatically adapting UI for a specific user
- Helpful in deducing the best match of UI characteristics for a user with multiple impairments
- Possibility to use the ontology for diversity
- Historical data for studying the cause-effect relationship b/w the impairments and the computer interfaces
- Useful for rehabilitation purposes
- Possibility to extract impairment related semantics from user's information stored in SemanticLIFE repository, and modify the impairments ontology accordingly

- Presenting information to different users with varying impairments is a difficult task
- The ontological approach paves the way for a generic solution
- The effort could be equally useful for diversity
- Is user interface accessibility enough?? (EARL / HTTP)

# Semantic Web – Modified Architecture



- User testing
- Integration of profile tracking tools for populating impairments ontology, and UI toolkits like SWT for populating UI ontology
- Integration of capability measuring tools by automating task execution tests such as MMSE (Mini Mental State Examination)
- Integration for ontology of visualization techniques

Thanks a lot!

<http://www.ifs.tuwien.ac.at/~skarim>

SemanticLIFE Project <http://storm.ifs.tuwien.ac.at/>