Attendees

- Kris McGlinn [TCDublin]
- Maxime Lefrançois [MINES Saint-Etienne]
- Georg Ferdinand Schneider [Fraunhofer IBP]
- Mathias Bonduel [KU Leuven]
- Richard Pinka [CTU Prague]
- Gonçal Costa [LaSalle University]
- Anna Wagner [TU Darmstadt]
- Claudio Mirarchi [Polimi]
- Jun Wang [Curtin University]
- Claudio Benghi (Northumbria University)
- Odilo Schoch (ETH Zurich)
- Mads Holten Rasmussen (DTU)
- Walter Terkaj (ITIA-CNR)
- Pouya Zangeneh [University of Toronto]

Excused

- Pieter Pauwels [Ghent University]

Date and time

- 26/02/2018
- 16:00 CET

Agenda

1. Recap (Georg)
2. Technical work:
    a. Mining a properties ontology from Wikidata (Mads/ Matthias)
3. Knowledge Engineering:
    a. Use case example: Building Automation and Control (Walter)
    b. Competency questions (All, Maxime)
4. Next steps/ Aim/ Scope (All)

Minutes

Recap

- LDAC 2017 Report containing discussions and initial competency questions LINK
- Product taxonomy derived from IFC termed PRODUCT (Initial Version, Enhanced version)
- Properties derived from IFC property sets termed PROPS LINK

- A (non-exhaustive) list of existing product classification schemes LINK
- Initial subgroup document LINK
- Discussion of Emilio towards aligning GR, BOT and PRODUCT LINK
- Minutes of informal call on product data modelling on the web LINK
- Maxime initiated a document to host USE CASES related to product data. Feel free to push your own use cases there LINK

Action items:

- Setup UCR document (Maxime) Done
- Martin Hepp PTO for properties PPO Ontology? (Georg) Done
- Investigate possibilities to use dbpedia/wikidata instead of wikipedia (Mads) Done
- Compile use cases and add to UCR document
    - multi-functional products (Anna) → Agenda item knowledge engineering
    - design processes use cases (Richard) → Agenda item knowledge engineering

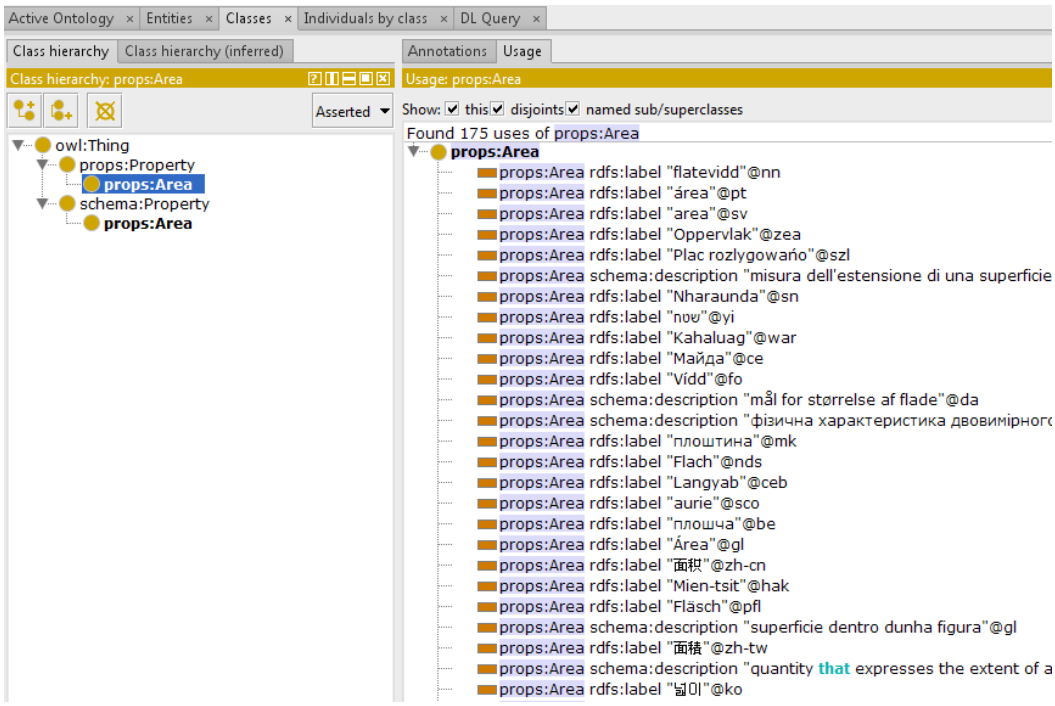
Summary:

- Conceptual work and technical work done
- Need for a manifest -> UC document
- Need to answer Why?-questions
    - Why care about product data modelling?
    - Why not use existing approaches?
    - What are the limitations of existing approaches?

Technical work:

- Mads and Matthias implemented similar to the PTO ontology a service to use wikidata for deriving a property ontology from wikipedia entries https://props-gen.herokuapp.com/id/Area

Example result:



Knowledge Engineering:

Maxime: The ontology design pattern item -> property -> somethingAboutProperty

Collection of use case towards UCR document for a Working Group

- Querying definitions over multiple classification systems
- Describing multi-functional products

Richard: Comments on competency questions for HVAC product data github

Notes: Requirement to HVAC properties: There is the requirement to have not only simple values described but complex data structures such as tables or function (also c.f. ISO 16757/ VDI 3805)

Georg: What methods and tools can be reused c.f

- GenTax Methodology (10.1007/978-3-540-72667-8_11),
- PCS2OWL tool
- Product family method 10.1115/1.2190237

Discussions:

- Product-property Relationship: Object property vs. data property vs. specification of class
    - object property: more general approach compared to data properties, ability to specialise property-instances (value range, state, ...)

- data property: specific value connected by relation with semantically meaningful name, easy to query (better performance), Problem when specifying max value or min value i.e. “Say something about the property”
- Specification from class: -> Product type ontology/ schema.org/additionalType, Generic property is used between product and property, specialisation of product or property by classification

Notes: PROV/SEAS ontology does multiple level of complexity (hasSimpleArea (DatatypeProperty), hasArea (ObjectProperty), Area (Class))

Competency Questions (extended from LDAC 2017 Report):

- What is the cheapest/most effective product fulfilling the requirements?
- What are the technical properties of individual A?
- Which products of (vendor A) fulfil the requirements?
- Which variations of product A are available?
- What are the differences between product A and product B?
- In which project has individual A already been used?
- What properties of an individual A changed since the last update?
- What product A is similar to product B (for replacement)?
- What properties of product A can be modified individually?
- What properties of product A may change during operation?
- What is the most appropriate product for a project? (modelling properties, location, installation, compatibility with other products, …)
- Query a product with properties defined in multiple classification systems

By Walter:

Relation between Product and ProductModel

· Which properties of a product are inherited from its product model? Which properties are overridden?

Properties of a Product

· Which are the static properties of a product? Which is its assigned value?

· Which are the dynamic properties of a product? Which is the feasible range of its values?

· Which is the unit of measurement of a property value?

State of a Product

- Which are the possible states of a product? Which are the possible state transitions?
- Which the historical behaviour of a product in terms of actual states and property values?
- Which is the current state of a product? Which is the current value of a dynamic property of a product?

Requirements

Characterize the evolution of a Product in terms of states, property values, role of the product in a project.

Possibility to define an expression that includes references to properties or states of an object. Such expression can be used to characterize the control logics of a device.

Use Cases

Building Automation and Control (Walter)

This use case deals with the design and management of an automation and control system for the control of a room in a building. The room contains a window, a controllable sunblind, a room air temperature sensor and an outdoor illuminance sensor. An ontology model of the use case can be relevant to integrate heterogeneous data, since the description of the technical equipment, the room and the control logic is typically stored in disparate databases and formats. An efficient and effective design and management of the control logics can significantly impact on the energy consumption and comfort conditions of the people living in the room.

The sunblind can be in three different states (*noShade*, *dayShadeDeployed*, *nightShadeDeployed*) and its behaviour is modelled as a UML state machine (Figure 1), taking inspiration from the example presented in [1]. The state transitions depend on the current state of the sunblind and on the room air temperature and outdoor illuminance.

According to the example made in [2], the following observations have been made in the room:

- room temperature: 20°C at 2017-03-09T08:00:00; 24°C at 2017-03-09T10:00:00
- room illuminance: 90 lx at 2017-03-09T08:00:00; 200 lx at 2017-03-09T10:00:00
- sunblind state: *noShade* at 2017-03-09T09:30:00

Based on the observations and the state machine of the sunblind, it is expected to have a transition from state *noShade* to *dayShadeDeployed* at time 2017-03-09T10:00:00.

Domain models needed:

This use case asks for the modelling of building elements (BOT), sensors and actuators, automation systems (PRODUCT), and control logics. The room is characterized by properties

that can be monitored by sensors. The actuation of the sunblind depends also on observable properties of the room.

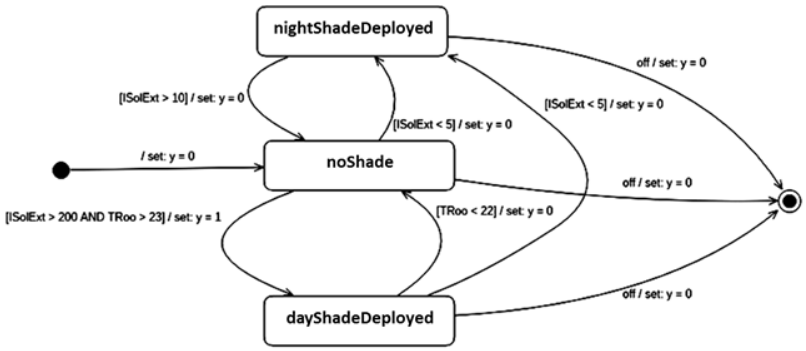


Figure 1: State Machine to control a sunblind in a room [1].

References

[1] C. Ptolemaeus, editor. System Design, Modeling, and Simulation using Ptolemy II. Ptolemy.org, 2014.

[2] Terkaj W, Schneider GF, Pauwels P (2017) Reusing Domain Ontologies in Linked Building Data: the Case of Building Automation and Control. Proceedings of the 8th Workshop Formal Ontologies Meet Industry, Joint Ontology Workshops 2017, CEUR Workshop Proceedings, vol. 2050.

Next steps and work items

- Summarise work in a contribution to LDAC conference proceedings
- Top-level modelling/ multiple complexity
- Top level ontology for evaluation and possible discussion : https://ris.utwente.nl/ws/portalfiles/portal/6042428 Ontological Foundations for Structural Conceptual Models, G.Guizzardi
    - Anyone use it somewhere,somehow ? Wouldn´t be UFO-A and UFO-B ontologies help to solve some problems within this area ?
- Product property pattern visualisation via SPARQL-Viz
    - SEAS
    - SAREF
    - SOSA
    - GoodRelations/ Schema.org
    - ifcOWL (example: https://madsholten.github.io/sparql-visualizer/?file=https:%2F%2Fdl.dropbox.com%2Fs%2Fx7z1aw4hzgtv0c9%2FifcOWL-properties.json
        - It's possible to download the json clicking on the download arrow just below the selection and then edit it to test alternative content. Then use the new file in the url (?file=[yourfile] part).
        - (original JSON file: https://www.dropbox.com/s/x7z1aw4hzgtv0c9/ifcOWL-properties.json?dl=0)

    - IFC-to-LBD converter
    - Building requirements ⇔ designed properties ⇔ actual properties
- Add more use cases
- LDAC call for papers: http://linkedbuildingdata.net/ldac2018/

Next events

Attendees of the BuildingSMART summit 26-29 march in Paris:

- Claudio Benghi - claudio.benghi@gmail.com - +447882490525
- Mads Holten Rasmussen - mhra@niras.dk - +45 29461988

Next Calls

12.03.2018 (16:00 CET) - Properties modelling

Previous minutes

https://docs.google.com/document/d/1sGgwK1haG9ZHCAbFu8i9hC4-rZY4NcCuGlqX5I3eKEc/edit#

Next Calls

12 March 2018 (16:00 CET)
26 March 2018 (16:00 CET)
9 April 2018 (16:00 CET)
23 April 2018 (16:00 CET)