The Second EC Workshop on Materials and Manufacturing Ontology

Templates for Input

This workshop, on invitation only, will take place in Brussels, Champ de Mars building on 6th June 2019, from 9:30 to 17:00.

See https://emmc.info/Onto19 for more information.

Details solicited input

The purpose of the one-day workshop is to continue the discussion on "materials and manufacturing informatics" more particular about ontologies in this domain.

The goal in the long run is to build and find wide-spread agreement on an ontology that can be the basis of access and interoperability in the NMBP domain.

This will prepare Industry Commons activities in the NMBP domain but also Big Data and Artificial Intelligence in Horizon Europe.

At the meeting there will be experts on ontologies but also interested parties.

We have now two possibilities for the scope of the slides based on these definitions:

Taxonomy: definitions of concepts and their classification

Ontology: taxonomy plus an organisation of concepts according to relations other than is-a . Examples are parthood relations (e.g. is part of, is proper part of). Examples can be found on http://geneontology.org/docs/ontology-relations/

If you only have a taxonomy, you only need to answer questions 1-7.

If you also have an ontology, then please answer also question 8-15.

Here are some short-cut definitions of other terms we use

> Nominalism: deals with the things we measure by means of the specific sensory and cognitive faculties that we possess. The question whether we perceive reality or not is not answered (pragmatism).
>
> Realism: our faculties — much like spectacles, microscopes, and telescopes — do indeed provide us with information about reality.
>
> Idealism: our perceptions and thoughts are not about reality at all, but are entirely about mental objects such as perceptions, appearances, ideas, or concepts, because — for the idealist — that is all there is.
>
> Knowledge: relations between concepts: how this is done relies on your philosophical view of the world (nominalist, idealist, realist,)
>
> Representation: representing logically the concepts. This involves identifying concepts, classes and relations between them. Example: making use of theories like semiotics, mereotopology and set theory
>
> Logic: first order logic gives relations between concepts (examples OWL_DL; graphs see below, mereotopology), second order logic also allows relations between functions.

Taxonomies are limited in their reasoning capabilities as they only can reason on sub-classes. Ontologies have much wider capabilities.

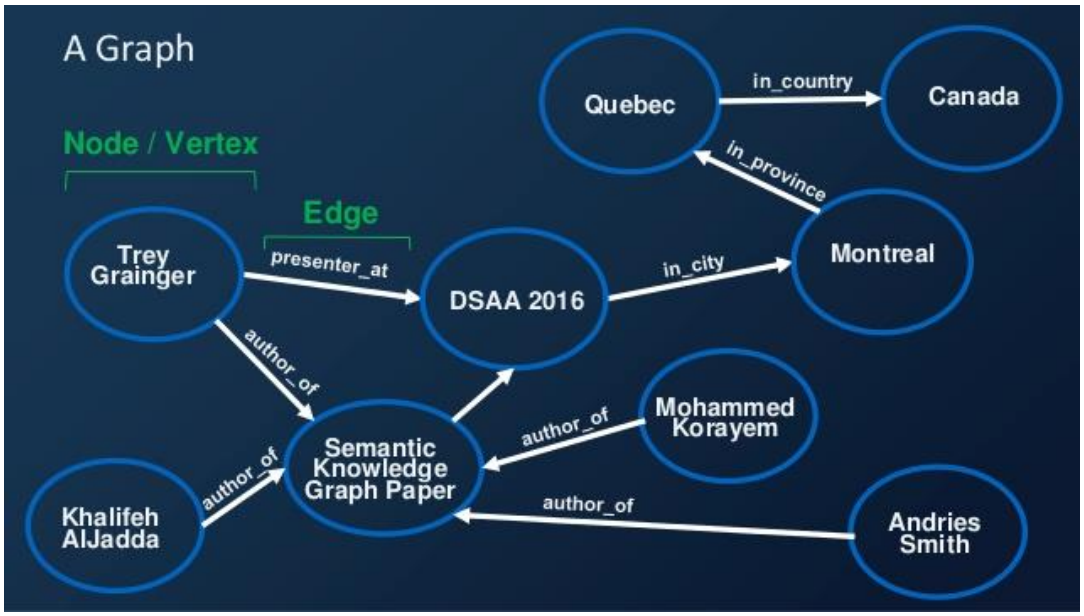
Granularity: discrete and continuum view of the same object.

Relations between granularity levels: example parthood relations

Representation of processes: many types of processes exist chemical processes, manufacturing processes, translation processes and they need to be described: examples 4D objects that treat materials and processes in a merged way; 3D material objects and separate time evolution descriptions;

Representation of materials: how do you deal with the different granularity views of one and the same object? If you only have a continuum view that this questions is not answered in your work.

Connection between physical properties, materials models and measurement: Is there a 1_1 relation in your view?



More background information:

- Background to ontologies can be found in these files <introduction to ontologies> <metaphysics and terms>
- The elaborate Road Maps that are strongly reflected in the EU work programmes: https://emmc.info/roadmaps
- After the Review of Materials Modelling VI and its consolidation in to a standard via a CEN/CENELEC procedure.
- The EMMC is elaborating the taxonomy into an ontology called the European Materials and Modelling Ontology (EMMO). Visit the ontology and interoperability information resources on emmc.info (coming soon)

- Two international ontology workshop held in Cambridge in 2017 and Freiburg 2018 and the reports can now be found
    - https://emmc.info/intop17
    - https://emmc.indo/intop18
- A report on the first EC ontology workshop on materials modelling and manufacturing ontology can be found https://emmc.info/Onto18

Templates for the slides

Taxonomies and Ontologies

1. Your name and name of your taxonomy and/or ontology
2. What is the application domain of your taxonomy and/or ontology?
3. What is the intended purpose of the taxonomy and/or ontology? (Taxonomies are used for data documentation, while ontologies add the possibility of extended reasoning)
4. How do you represent the world:
    - as a continuum?
    - as discrete particles?
    - with quantum mechanics?
5. What are the concepts, with definitions, in the upper level of your taxonomy and/or ontology?
6. What are the industrial use cases (e.g. in ontology-driven tools) demonstrating the value of the taxonomy and/or ontology?
7. What overlaps do you see with other taxonomy and/or ontologies?

Ontologies

8. What are the (main) relations in your ontology?
9. What is the knowledge your specific ontology represents?
    a. Knowledge necessary for a pragmatic description of current practices
    òr
    b. Explanation of the world according to one of the philosophical views called realism/conceptualism/nominalism
10. How does your ontology represent the relations between different granularity views on the same object?
11. How does your ontology represent materials?
12. What type of processes do you address? How does your ontology represent these processes?
13. How does your ontology represent manufacturing?
14. How does your ontology address the circular connection between physical properties, materials models (see definition in RoMM Review of Materials Modelling VI) and measurement?
15. What is the representation language and implementation (logics)?