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IA301: Report
Transport Ontology

For screenshots on the asserted graph, inferred graph and class hierarchy, please visit the Github repo.

Description

Our ontology is structuring the field of transports. It includes different kinds of transports, their characteristics suchs as their lifetime, their autonomy or their source of energy but also other information like environmental impact and level of security involved.

Ontology Facts[1] :

A. The basics

- **A.1 Ontology name**: **Transport Ontology**
- **A.2 Ontology owner**: owners are Pierre Mathieu, Ivan Lopes and Pascal Nguyen**.**
- **A.3 Ontology license**: The licence which governs the permissions surrounding the ontology.
- **A.4 Ontology URL**: https://github.com/ivalotp/transport-ontology/blob/main/ontology.owl
- **A.5 Ontology repository**: https://github.com/ivalotp/transport-ontology
- **A.6 Methodological framework:** the first step was to decide on which types of transportation we wanted to work on. Then we set out to find the most meaningful classes to classify those means of transport, in regard to their impact on the environment and on people. The next step was to research each transportation's characteristics in order to fill out our ontology.

[1] based on the specifications of https://github.com/owlcs/miro/blob/master/miro.md

B. Motivation

- **B.1 Need**: Finding out the most respectful means of transportation for the environment is not a straightforward answer. Indeed, there is no magic bullet. There is no easy solution and it will most certainly depend on the requirements for that particular vehicle: capacity, speed or cost to give some examples.
- **B.2 Competition**: There are other transport ontologies, but our transport ontology is focused on the environmental impact to choose the most eco-friendly means of transportation depending on your needs.
- **B.3 Target audience**: It can actually be used by anyone who needs to perform a trip and has to choose a way of travelling. Thanks to our ontology, that person can enter the characteristics of his/her trip, personal constraints and decide the best way to travel.

C. Scope, requirements, development community (SRD)

- **C.1 Scope and coverage**: The coverage of our ontology is the following : different means of transports and their impact on the environment, on multiple criteria. The ontology must be able to define in what type of travel a transport should be used, what are the actors involved and what consequences.
- **C.2 Development community**: The developpement community is composed of Pierre Mathieu, Ivan Lopes and Pascal Nguyen.
- **C.3 Communication**: Pierre Mathieu pierre.mathieu@ensta-paris.fr, Ivan Lopes ivan.lopes@telecom-paris.fr and Pascal Nguyen pascal.nguyen@ensta-paris.fr.

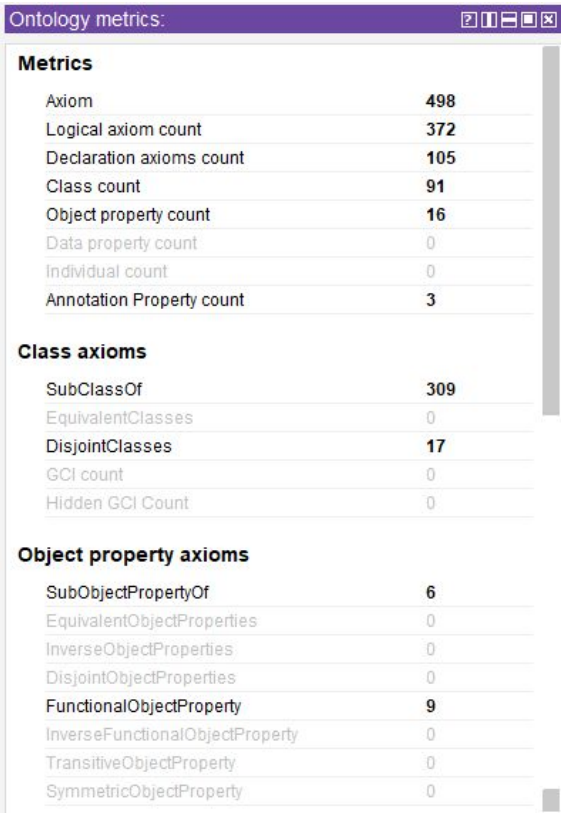
D. Knowledge acquisition

- **D.1 Knowledge acquisition method**: Internet searches on transportation.
- **D.2 Source knowledge location**: Our main sources are www.wikipedia.org , www.youmatter.world , www.eesi.org, and www.aarp.org. Additionally, we used a quantity of other smaller websites and forums to gather general information regarding transportation statistics: vehicle speeds, capacities, average lifetime, etc...
- **D.3 Content selection**: We selected the most common means of transportations used in the world.

E. Ontology content

- **E.1 Knowledge Representation language**: we used OWL.

- **E.2 Development environment**: We used the software Protégé 5.50 .
- **E.3 Ontology metrics**:



- **E.4 Incorporation of other ontologies**: No external ontologies have been imported into our work.
- **E.5 Entity naming convention** :The naming convention for the identifier in our ontology is capital letter for each word and without space or " _" between words. Example : *EcosystemRespect*, *SafetyRegulationLevel*.
- **E.6 Identifier generation policy**: We used the following prefixes**:** *Short*, *No*, *Low*, *Medium* and *High* to create subclasses of *Geography*, *Pollution*, *NoisePollution* and *EnergyEfficiency*
- **E.7 Entity metadata policy**: Entities don't have to include a natural language definition as long as its identifier is meaningful and the entity is being used. This comes as an example on how the entity is meant to be used.
- **E.8 Upper ontology**: We did not use upper ontologies, although it may be possible to generalise some classes for other domains in other ontologies. For example most means of transportation pollute but there are other activities which pollute as well. We could for instance have some high level classes of our ontology being used by another ontology: an *agriculture methods* ontology for instance.

- **E.9 Ontology relationships**: Some means of transportation could be detailed further more by introducing sub-classes. For example *GasolineCar* and ElectricCar both stem from the same class *Car*, yet they are different is some ways.
- **E.10 Axiom pattern**: The domain modelling pattern used was to take a means of transportation then find all classes that are associated with it through an object property.
- **E.11 Dereferencable IRI**: the IRI used is not dereferenceable to a Web resource.

F. Managing change

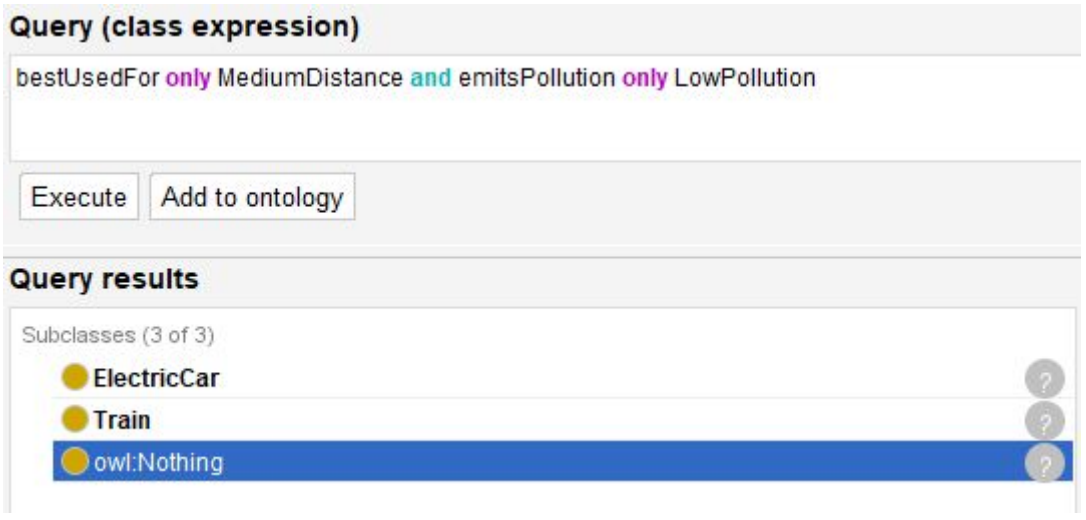
- **F.1 Sustainability plan**: The ontology can be kept up to date by adding new means of transportations. Also new classes can be introduced to confront the different transportation solutions under a different perspective.
- **F.2 Entity deprecation strategy**: we removed some subclasses which were not useful for the user decision (we removed the subclasses *PrivateParking* and *PublicParking* to only let the class *Parking*)
- **F.3 Versioning policy**: A new version of the ontology is released when the main *.owl* ontology file is modified on the master branch of the Github repo.

G. Quality Assurance (QA)

- **G.1 Testing** :

  The default reasoner of Protégé didn't find inconsistency.

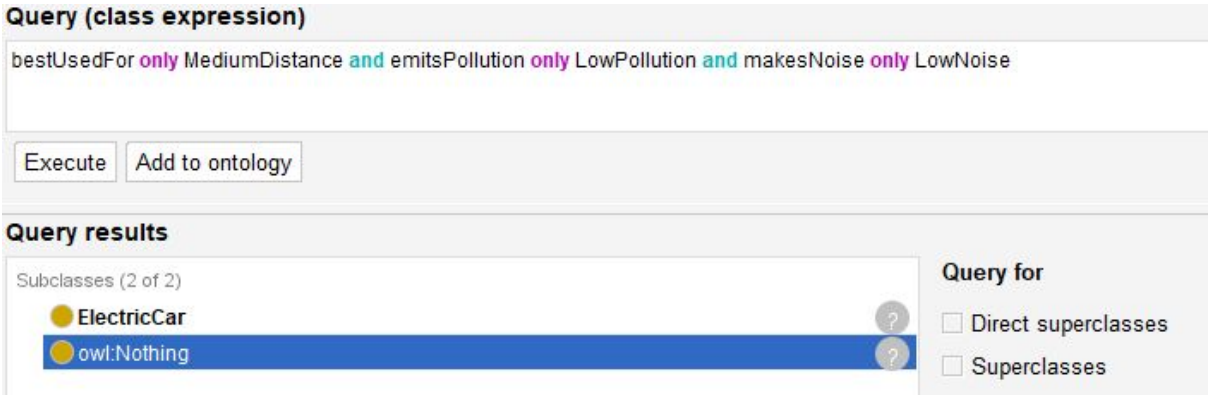
  We tested on simple queries :



- **G.2 Evaluation** : The ontology seems to work on queries. It fulfills its goal which is to be a recommendation system for which means of transportation is the best suitable for our needs.

- **G.3 Examples of use**:

  We can make queries to choose which means of transportation is the most eco-friendly depending of our needs :



- **G.4 Institutional endorsement:** The ontology is not endorsed by any organisation representing a community.
- **G.5 Evidence of use:** Not used as of November 2020.

Bonuses

- **UN SDG :**

Our ontology greatly contributes to sustainable goals. In fact, one of today's biggest problems is our emissions through transports. We know that some transports are more adapted and respectful in some conditions, but they are not systematically preferred due to comfort or non knowledge.

- **2 pitfall fixed (scanned on OOPS!) :**

- Domains and range of properties were missing.
- Naming convention for properties.