An Ontology for Transportation System

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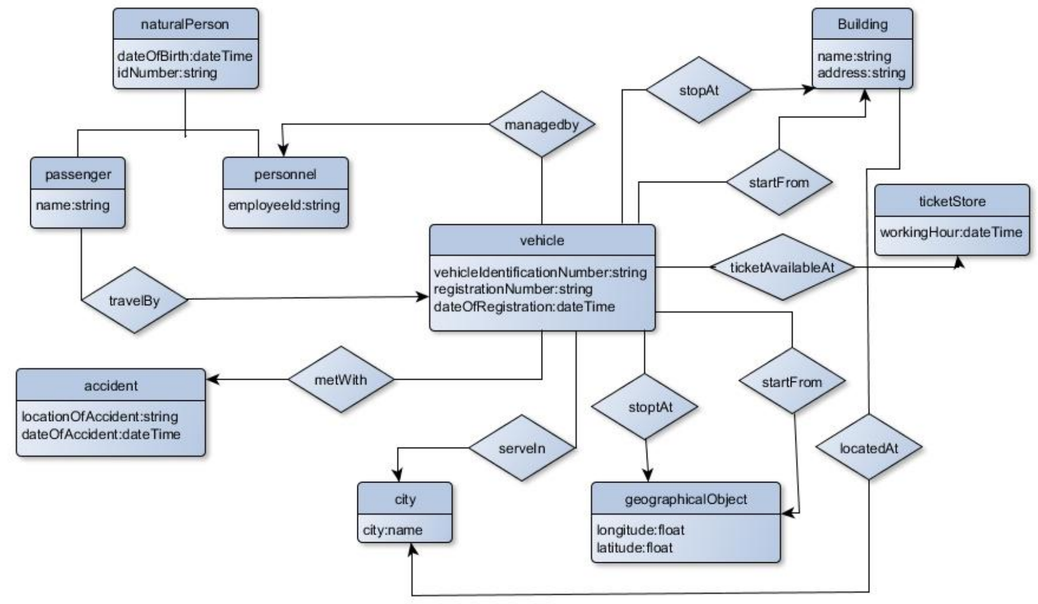
Introduction

In this work, we present a ***domain ontology*** for Transportation System. We have developed an ontology for semantics-aware transportation system ***from the perspective of a traveler user***, capable of answering general competence queries like the nearest bus stop to a particular place, the nearest parking slots available, etc. We have studied the transportation system of some of the big cities of the world and have tried to come up with a vocabulary that can be applied to any city with little modifications. This vocabulary is further aligned with an upper-level ontology, DOLCE, to have a common starting point.

Available at ***https://github.com/Gautamshahi/TransportOntology***

Extended Entity-Relationship Model



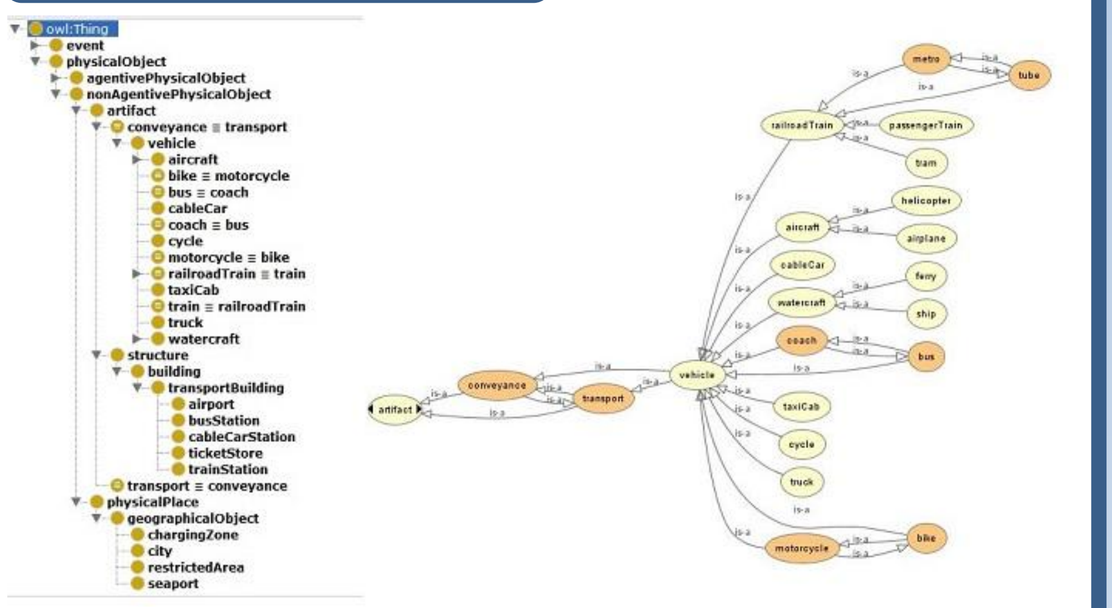
Competence Queries

The transportation system of different cities - both metropolitan and small cities were studied. Some of the cities surveyed were, for instance, London, Berlin, Paris, Koblenz, Trento, Auckland, Ohio etc.

The competence queries used for the construction of ontology were:

1. At a given bus stop, what is the schedule for buses along with their direction (route number)?
2. What is the crime rate in a particular mode of transportation?
3. What is the list of train stations in a city?
4. What is the parking space availability for a vehicle type at a given street?
5. What is the number of cycles available for hire?
6. What is the congestion charge in a given area at a given time?

Class Inferred Hierarchy



Methodology

- We have followed the ***DERA(Domain, Entity, Relation, Attribute) methodology*** to construct the ontology and enabled ontology reuse by following the ***Metadata for Ontology Description and Publication (MOD) standards***.
- DERA facets consist of Domain, Entity, Relation, and Attribute. The domain of our ontology is transport.
- Aligning with DERA gives our ontology a defined structure. The assignation shows that our ontology has a clear domain, has a correct set of entities and shows relationships between these entities.
- After the construction of the hierarchy, ***all the entities were aligned with the Descriptive Ontology for Linguistic and Cogninitive Engineering (DOLCE)***, one of the top-level ontology.
- Alignment with an upper ontology enriched our ontology to be semantically interoperable among a large number of domain ontologies by having a similar starting point.

Conclusion

- The ontology is developed by understanding the common terms used in the transportation system.
- Our ontology is ***capable of answering the user competence queries***. Although our ontology serves the purpose of providing information on transportation system from a traveler's perspective.

References

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