Discussion of Solution to Takehome Quiz #2

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1 Topic

The topic of the ontology is the subway system of the Massachusetts Bay Transportation Authority (MBTA) in the Greater Boston, MA region.

2 Notes on Classes and Instances

The following list describes the different classes (and notes about their instances) in the MBTA subway ontology:

- **Class Organization** describes the organization responsible for managing other classes. Practically speaking, there is only one instance: the Massachusetts Bay Transportation Authority (MBTA).

- **Class Line** describes the subway lines. In the MBTA subway system, there are 4 lines (red, blue, green, orange) classified as being either rapid transit or light rail. (Note that the MBTA system also includes a 'Silver Line', but it was not included because it serves as a rapid transit bus service rather than subway service.)

- **Class Station** describes the characteristics of each station on the line, including address, city, year built, number of platforms, and lines served. Note that not all instances were included in the knowledge base due to the sheer number of stations throughout the system, but important stations (e.g. termini stations, stations with more than one line) are included.

- **Class PaymentMethod** describes the payment systems accepted by the MBTA for use in the MBTA system. All of the types of payments can store monetary value and passes. Because there are no instances of PaymentMethod but rather of its subclasses, PaymentMethod is an abstract class.
  - Subclass **CharlieCard** describes the electronic contactless payment system that the MBTA uses, including expiration date and serial number. An included instance of a CharlieCard is one that I used while in Boston.
  - Subclass **CharlieTicket** describes the ticket system that the MBTA uses, including ticket number and station that the ticket was issued at. An included instance of a
CharlieTicket is one that I used while in Boston.

- **Class Fleet** describes the vehicles used in the MBTA system. Primarily, there are three categories of vehicles used, and each is given its own subclass below:
  - Subclass **RapidTransit** includes vehicles used on the rapid transit lines (the Red, Orange, and Blue lines). Instances of the rapid transit fleet are specified by type (i.e. 1 instance of 40 alike vehicles rather than 40 instances).
  - Subclass **LightRail** includes vehicles used on the light rail lines (the Green Line).
  - Subclass **Trolley** includes vehicles used on the trolley portion of the Red Line (the "Ashmont-Mattapan High Speed Line").

- **Class Trip** describes a journey taken by a rider on the MBTA system from a starting location to an ending location, including the method of payment used. Two included instances are of a trip that I took using the Red Line to get to work and back home again.

### 3 Discussion

#### 3.1 frames-based Ontology

- The MBTA ontology focused more on the relations between the classes (e.g. how a station of class **Station hasLine** line of class **Line**) rather than hierarchies of classes. Because of this, I found the frames-based version of the ontology to be better suited to the problem. The relations were very easy to see in the Ontoviz-produced graph of classes and relations.

- The native format of frames being the same as the COOL format greatly helped in writing queries in clips. For example, it was easy to determine the MBTA stations located in Cambridge, MA by specifying the city slot, and more information could be determined (e.g. the station’s street address in Cambridge).

- Overall, I found frames easier to use in developing an ontology.

#### 3.2 OWL-based Ontology

- When creating individual instances, OWL correctly inferred that individual instances created in subclasses of other classes were inferred (rather than asserted) instances. For example, creating an individual asserted instance of my CharlieCard of class **CharlieCard** meant that the same instance was an inferred instance of class **PaymentMethod**.

- One advantage of OWL over frames was the concept of asserted conditions. It was very easy to determine which conditions were necessary to define a class, which conditions were necessary and sufficient to define a class, and which conditions were inherited as a result of a class being part of a superclass.
• I found it more intuitive that there were two distinct types of properties in OWL (cf. slots in frames): object properties that showed how individuals related to other individuals by restricting domains and ranges, and datatype properties that allowed for additional comments about individuals. Additionally, being able to create symmetric relationships with object properties was easy.

• The MBTA ontology lacked significant hierarchical structure of classes and their subclasses. Had it consisted of a structure that was more hierarchical in nature, OWL might have been better suited to developing and extending the ontology. There was not very much to infer from the class structure because of the method in which it was defined.

4 References