Proposed introductory text to be inserted in the CRM specs for illustrating the assumptions at the basis of the of the first-order axioms.

The text is taken from the paper on the first-order expressions of the CRM, currently being reviewed for publication on a journal.

Text:

**About the logical expressions of the CRM**

The present CRM specifications are annotated with (accompanied by?) logical axioms. The purpose of these axioms is to provide an alternative formal expressions of the CRM ontology. This section briefly introduces the assumptions that are at the basis of the latter expression. These assumptions are given in detail in [1].

Primarily, the CRM is expressed in terms of the primitives of semantic data modelling. As such, it uses:

* *objects* to represent the individuals in the domain of discourse in a one-to-one fashion, such as the object *pisa* standing for the city of Pisa; in the CRM, objects are called ``items'' in order not to confuse them with physical objects;
* *classes* to represent general notions in the domain of discourse, such as for instance the CRM class *E53 Place* to represent the notion of a place;
* *properties* to represent the binary relations that link to each other the individuals in the domain of discourse, such as for instance the CRM property *P89 falls within* linking a place to the region where it belongs. *Inverse properties* are also used, to obviously represent the inverse of the relations represented by the corresponding direct properties.

Ontological knowledge is expressed in semantic data models by means of various kinds of constraints, such as IsA hierarchies. Factual knowledge, on the other hand, is expressed in semantic data bases by means of instantiation. In particular,

* *Class instantiation* makes an object an instance of a class, thereby expressing the knowledge that the corresponding individual belongs to the corresponding notion; for instance, in order to express that the city of Pisa is a place, the object *pisa* is made an instance of class *E53 Place*.
* *Property instantiation* makes a pair of objects an instance of a property, thereby expressing the knowledge that the corresponding relationship holds between the corresponding individuals; for instance, in order to express that Pisa is in Italy, the CRM property *P89 falls within* is instantiated with the pair of objects (*pisa*, *italy*).

In contrast to semantic data modelling, first-order logic-based knowledge representation relies on a language for formally encoding knowledge in sentences. This language can be directly put in correspondence with the elements of semantic data models as follows:

* objects are named by the *constant symbols* of the language, such as *pisa*;
* classes are named by *unary predicate symbols*, such as *Place*;
* properties are named by *binary predicate symbols*, such as *falls-within*.

Ontological knowledge is expressed in logic by means of *logical axioms*, which correspond to the constraints of semantic modelling. Factual knowledge is expressed in logic by means of ground atoms, such as *Place*(*pisa*) and *falls*-*within*(*pisa*,*italy*), which represent the same kind of knowledge expressed by the class and property instances in semantic modelling.

These basic considerations should be used by the reader to understand the logical axioms that are inserted into the present specifications. If the reader wishes to know the specific first-order language that has been used for the logical expression of the CRM, he is referred to [2], where a detailed account of a CRM knowledge base is also given.

**References**

[1] R. Reiter (1984). Towards a logical reconstruction of relational database theory. In Brodie, M. L., Mylopoulos, J., and Schmidt, J. W., editors, On Conceptual Modelling, pages 191–233. Springer Verlag, New York, NY.

[2] C. Meghini and M. Doerr (2016). A first-order logic expression of the CIDOC Conceptual Reference Model. Submitted for publication.

Discussion: the example is confusing, because of choice of ‘place’. Better to use some example like a person or actor.

References to objects and constant symbols need not be talked about here because they don’t appear in the specification - > can be rephrased by Carlo and examples can be added

Steve – can we use Harvard style references? Author, Date? Yes

Martin – axioms assumed to pertain to reality, KB may differ from this… should get a discussion of how we talk about reality