Semantic Modelling of Road Traffic Information elements

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Abstract

Nowadays there are vocabularies or languages that describe concepts and structures of data related to traffic, but the description is just syntactic, not semantic. No vocabularies or ontologies with semantic value that give significance to concepts and their relations were found (at least up to where the search and bibliographic revision of this work took us) which we could have taken as a starting point for our research so this emptiness was covered by its own construction. Therefore the objective to be reached in this part of the research has been to develop a representation scheme of a particular domain, road traffic, with a well defined semantics. The use of this semantic will allow us to obtain a formalized knowledge that will enable the development of an integration architecture of traffic information from semantic web services. The ontologies created here will be used to describe or give parameters the semantic value of the traffic services that might be defined.

Keywords***:*** ***S****emantic Web, Ontologies, Road Trafffic Information , Semantic language, Multilingual*

1 Introduction

John F. Sowa states that "the representation of knowledge is a multidisciplinary area that applies theories and techniques that come from different fields like Logic, Ontology and Computing". For this author, logic provides the formal structure and inference rules and without them criteria would not exist to determine if there are any contradictory or redundant sentences. Ontologies define the type of things there are in the application domain, allowing the terms and symbols to be well defined and not cause confusion. Finally, the computing models will allow the two first disciplines to be implemented in application programmes [1].

Due to the constant advances in telecommunication technologies, transport is obliged to use these technologies and therefore a demand for a stronger effort towards research and development of these technologies appears.

The analysis of new technologies for traffic information diffusion is absolutely essential since it is necessary to keep drivers properly informed.

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Several extremely important aspects describe the current problems relating to the access and distribution of information:

A great amount of traffic information is distributed among different Web sites. The main problem for a user who needs this type of information is finding these Web sites and then dealing with the different accesses as well as with the different presentation forms.

- On the other hand, a user might need a different type of information and therefore the storage of all this information in one single Web site is not feasible as regards the storage costs or even maintenance.
- It is only possible to obtain as a result information that has been explicitly detailed in advance, since it is no possible to make inferences.

The main problem, searching for and obtaining information in keeping with the user's requirements, is still the main obstacle to overcome. Generally, the search process is based on purely syntactic criteria and it is restricted to finding the occurrence of key words in the text. This way of working may lead to the recovery of irrelevant information when a key word is used in a different context to the desired one or might even completely ignore information that is relevant if the terms used are different in their content.

The current information processing and its later distribution through Web sites in Internet or in different repositories make its computer treatment possible. However the representation obtained can only be interpreted by man, and in any case the computer treatment that can be made to this type of representation although useful, it is quite limited.

Being aware of the need of help for the search and data processing, the development of an architecture based on semantics has been tackled so that it will allow the above mentioned to be done in an intelligent way.

2 State of the art

2.1 Existing vocabularies

From several years ago, the use of mark-up languages has been established as a need to allow a reliable data exchange, emphasizing the use of standards like HTML first and XML afterwards. But nowadays we know that these architectures can be inefficient if the objective is more than a simple data exchange. However, it must be stated that the use of XML is still one of the most important tools in the information distribution area in Internet, since it has been used to define most of all the new languages that are used for data exchange in the Web.

There are currently vocabularies or languages that describe concepts and structures of data related to traffic, but they are only syntactic descriptions, lacking semantics. Therefore although there are many works and developments that use XML mark-up languages (information diffusion, data exchange, traffic modelling), no semantic specifications like the ones proposed in this paper are known.

For example, regarding road information diffusion by a management centre, there are some initiatives that make use of mark-up languages for information diffusion like CARS (Condition Acquisition and Reporting System) [2] in the United States, where XML and TMDD (Traffic Management Data Dictionary) are used as well as the project of the Research and Development Department of the Hokkaido Development Bureau within the ITS/Win Research programme where they propose a language that uses XML technology called RWML (Road Web Mark-up Language) in order to manage traffic information. This language consists of the description of a vocabulary that allows the information related to roads, weather forecasts, natural disasters, geographical regions, etc to be represented. [3]

For experiences of mark-up languages for road information using XML we underline: Traffic Data Mark-up Language (TDML), where XML Schema Data is defined and used instead of DTDs [4], and also in Europe TPEG (Transport Protocol Experts Group) with Road Traffic Message Application ML (Tpeg-rtml v0.4) [5].

On the other hand, several specifications. Have been developed about traffic modelling in the Transportation Research Center of the University of Florida: TMML (Traffic Model Markup Language). This markup language facilitates sharing data among the different software products for traffic modelling. They propose a specification that will cover all the data commonly used by a group of software products that manage information related to signalled intersections and roads. The use of TSDD (Traffic Software Data Dictionary) is good as a reference for the used vocabulary and labels used for identifying classes and attributes [6].

Other researches focus their interest on the development of specific vocabularies for accidents like CRML (Crash Records Mark-up Language), transport and logistics like [7] or travel information like the one developed by Mitretek where the Society of Automotive Engineers (SAE) has developed an XML vocabulary for ATIS called Traveller Information Mark-up Language [8], based on the SAE ATIS data dictionary and the groups of standard messages (J2353 y J2354) defined using ASN. 1. The final result is a Standard mark-up language documented by XML Schema.

2.2 ¿Why are traffic ontologies necessary?

All the above mentioned demonstrates that the current computer traffic information processing is quite limited and can be improved from different points of view. These ideas are precisely the ones that have been taken as a starting point for this research.

The representation schema will have the following aspects:

- It will have to be interpreted by the computer and be easily exchangeable among applications.
- It will have to join the existing information representation standards in their syntactic aspects.

As examples of possible applications based on the chosen representation schema, the following can be mentioned:

- An intelligent consultation and search system of traffic information.
- A tool for the visualization of the structured information.

If a user or an operator of the system needs to know specific information about the accidents occurred in a certain road, he will probably wants to know details about the vehicles involved, types of roads, etc, and therefore this type of question will not only involve one knowledge source but several. That is why the use of ontologies is so important, thanks to some of their characteristics like the distribution and the possibility of inferring non explicit knowledge beforehand.

As a particular case let us take an accident occurred in a particular toll motorway like “AP-7”. If we use the terminological specifications of these types of roads and considering the attributes (number of toll sections, origin, destination, alternative roads, name) we could establish some questions that would immediately be solved by our inference system:

- What number of toll sections are there in all the A-7 motorway? 4
- What is the origin and destination for each one of these sections? Section 0: La Jonquera-Puzol, Section 1 Silla-Alicante.
- Which roads can be used as alternative routes? N-340.
- What is the origin and destination of these alternative roads? Origin: Cádiz, Destination: Barcelona.
- What particular name does each one of them have? AP-7 (A-7) is named “Mediterráneo”.

3 Ontological development

The development of ontologies is the first step towards the automatic reasoning based on knowledge since the definition of its elements (concepts, relations among concepts, axioms and the rest) allows knowledge that is not explicitly indicated, to be inferred. Additionally software applications must be developed for these to realize reasoning operations on these ontologies and on the data themselves.

3.1 Methodologies

There are different methodologies in order to build ontologies like Skeletal Methodology, Kactus, Sensus, Cyc, Uschold and King, On-to-Knowledge (OTK) and Methontology, as well as ontology development guides.

The existing methodologies and the development experiences have certain common phases such as starting the construction identifying the purpose and scope of the ontology and the need for a certain knowledge acquisition domain. They differ in the approach and the following steps [9].

3.1.1 Proposal of a process or methodology to be applied in order to change from an ER model to a formal semantic model

The steps that form the methodologies for the development of ontologies generally identify the work method starting from scratch; this is, without the previous existence of ontologies. In METHONTOLOGY [10], the authors consider the need to organise and turn informal knowledge of a domain into a semi-formal specification using a group of what the authors call intermediate representations (IR), mainly based on graphical notations. On the other hand, the inverse reengineering process proposed by METHONTOLOGY takes ontology implementations as origin of the knowledge and from these implementations they obtain conceptual schemes which will be extended or modified further on.

However, we may find ourselves in an intermediate situation midst those previously mentioned, since many of the currently existing information systems have been or are being studied from the perspective of semantic data models and the use of this information becomes a valuable source in view of its formalization process. This is why we propose an extension to the previous methodologies in order to detail the way in which existing knowledge can be integrated in the analysis and design of databases. This methodological extension will be therefore applied to those systems which already have previous studies based on data semantic models. In this approach, different existing methodologies aspects are integrated as well as lessons learnt from experience.

It is a question of "translating" data semantic models into formal semantic models and in turn, if possible, proceeding to their improvement.

The criteria to choose this methodological extension is the simplicity.

Methodology's steps: There are 8 clearly differentiated steps.

1) Scope and purpose adjustment.
2) Standardization and modularisation. Sub-domain creations.
3) Ontology recycling
4) Basic translation
5) Refinement
6) Knowledge extension: Application addition.
7) Test or Evaluation.
8) Documentation.

1) Scope and purpose adjustment.

Adjustment of the purpose and scope for the development of the data model to our formal semantic model. Analysis of new requirements the new model will have to achieve.

2) Standardization and modularisation. Sub-domain creation.

Analysis of the conceptual scheme and proposal of creation of different modules or sub-domains:

- Identification of all the existing entities in the ER model, with its attributes and with the relations they have with the rest of entities of the model.
- On the basis of the previous classification, a table is made where entities will be inserted in order of priority established by the number of relations and if there is an equal result, by the number of attributes. This table should show the links between each one of the entities.
- Extraction from the table of the entity with the highest priority which with this first extraction will become the base for the development of the main domain of the model, from which the rest will take their place.
- Try to establish that other entities could be part of the domain and take them out from the table. To do so, and picking out from those entities related to the entity selected in step c), the ones to be chosen will be those that for their characteristics and using common sense must be together in the same domain.
- Go back to step c) and extract from the table the next entity in a priority order for the creation of the rest of peripheral sub-domains, until the table is empty.

3) Ontology recycling

Once the different sub-domains have been determined, recycling of existing and public ontologies that can be taken into account in each one of the sub-domains, should be considered. Their use can simplify the phases of the following methodology.

Once the standardisation phase has been finished and analysing the possible use of existing ontologies, we shall go onto the next phase as far as methodology is concerned, which will be applied to each one of the established sub-domains.

4) Basic translation

It means the translation from the different elements of the conceptual scheme to a formal semantic model.

- Entities

  This entails the transformation of the entities into classes and/or individuals according to criteria and establishment of its hierarchy. There are two ways of representing the elements of one type of class, as individual or as sub-classes [11]. The use of classes is semantically richer and makes the ontology more easily extensible. Even with a greater complexity, the use of classes is better except for when individuals are necessary as for example when establishing members of a listed class.
- Attributes of Entities

  This means the transformation of the attributes that appear in the semantic model of data in properties, taking into account that each one of these entities has a series of attributes that frequently are only good for the semantic data model due to the intrinsic characteristics of the relational data models. For example, attributes that refer to versions of the Data Dictionary. These attributes will be excluded from the formal specification. Steps to be followed:

  a) These properties can be of two types: Object Property or Datatype Property, which will determine the range of elements that can be taken.

     i. The Object Property types are used to relate a resource with another one.

     ii. Datatype Property only relate a resource with a rdfs:literal or with a type of data belonging to an XML schema.

b) The convenience of limiting these properties in a global way will be studied according to given criteria: Range and Domain.
   i. Later on in the process, it will be possible to limit the specified range in a property of a father class, when this property affects descendent classes, so far as this new group of elements is a sub-group of the original elements range of the ancestry class. This will generally be achieved by quantification operators.
c) Definition of characteristics of the properties: Transitivity, Inverse, Symmetrical.
   It has to be taken into account that the transitivity or symmetrical characteristics will only be applied in Datatype Property (they relate to two resources).
d) Inclusion of such a property in a property hierarchy (election of super-properties) that will help with the application of possible inference methods.

- Relations
  This is a processing of the relations that appear in the scheme and a distinction according to the degree of relation and the fact of having or not having their own attributes in;
  - Binary Relations, which can be directly translated to the formal specification language by Object Property type.
  - n-ary Relations, from which translation cannot be made directly.
  - Relations with their own attributes.

  a) For the first case, they will be introduced as properties, in the same way the attributes were introduced, except that now they can only be of the object type since two resources or entities have to be related. The same criteria as the one taken to specify the attributes, will be taken as regards the characteristics of such properties.
  b) Since in traditional DL (and therefore in formal languages based on it) only unary or binary relations are considered, the method proposed by Calvanese et al. [12] will be taken into consideration. It consists in "to reify" the relations, generally by translating each relation in a concept whose instances represent the tuples of the relation. Greater detail of the definition of this type of relations and its use with individuals can be found in the technical report by Alan Rector in W3C [13].
  c) For the case of relations with attributes, again it will be taken into consideration if such an attribute (property) can be assumed by any of the related entities, if not, a new class will be created which will establish the range of a new relation (Object Property), taking this new attribute as a starting point.

  Grades in relations
  a) Observation of the model to determine the existing cardinal grades in each one of the relations. The translations to the formal language will be made by the use of cardinal restrictions to each one of the affected classes or otherwise limiting the property in a global way with the functional characteristics or inversely functional.
     i. The characteristics Functional or Inversely Functional can be applied to any type of property (object and datatype).

Specification of the local restrictions to each one of the classes by the use of universal and/or existencial quantification operators.
Complete/primitive definitions: Use of axioms.
Deciding which classes should be part of a complete definition or which should simply be primitive classes.

Taking the previous paragraph into account, for that part of the specification that should not be part of a definition (complete or partial), coverage axioms, disjunction, etc. will be used. The axioms will provide additional information about all the classes.

5) Refinement

It means the revision of entities and properties since it might be necessary to have a much more elaborated expressivity or knowledge base in such a way that some of these properties or entities will need the elaboration of new specific domains not considered in the semantic data method. Let us think for example in attributes of the data models which take elements from its data dictionary. In these cases it might be convenient to introduce new domains corresponding to simple taxonomies that later on can become complex ontologies adding the new information coming from other sources, different from the dictionary. For example, again regarding the development of the ontology "Roads", certain attributes such as "motorway" of the entities Point and Section of the semantic data model or in the ontology Vehicles ("type" attribute of the entity Vehicle) or Geography (Province, Town, etc. attributes of the entities Area and Point) were converted into ontologies.

Once the first "translation" has been established, the possible applications of our model will be studied.

6) Knowledge extension: Addition of instances.

It means the addition of extensional knowledge, that is, contribution of instances or individuals. The addition does not have to be necessarily in the same physical file where the terminological (terms and relations) system lies, although they will have to be connected.

Starting from this phase the system will be considered globally.

7) Test or Evaluation:

Requirement trials on the knowledge base that will show its efficiency. At this point a test will be made to confirm that the knowledge base is capable of satisfying all the requirements specified in the initial phase of purposes and scope. That is, answer the questions that were initially approached. The use of an inference system will solve this question, possibly by the elaboration of queries.

8) Documentation

The ontological specification must be widely documented in such a way that anyone can easily understand its composition and structure. Thus, the maintenance and scale tasks of the model will be done more adequately. In this phase it is considered useful although not necessary to specify the correspondence between both models.

4 Road traffic modelling

What common vocabularies can be defined to represent road information relating to accidents, traffic management plans, traffic modelling, etc?

To tackle the problem of a road traffic ontology development the definition of sub-domains related among themselves, has been planned. In this sense the relevant sub-domains that have been defined are as follows:

- Road classification (Motorways, dual carriageway, etc.)
- Vehicle classification (Truck, car)
- Location (Area, Point, Section, etc.)
- Geography (Towns, Countries, etc.)
- Events (Accidents, Incidents, Measures)
- People (Driver, Passenger etc.)
- Routes (Urban, interurban etc.)

4.1 Relation among the ontologies

The different ontologies of concepts that describe the traffic knowledge domain (Events, Roads, etc), together with the ontologies of time and geography, use one of the characteristics typical of ontologies, which consists in sharing knowledge, this is, the reuse or feedback that some make over others in order to define correctly the semantics of each one of the concepts they want to express in their ontology without having to define concepts already defined in others.

For example, the concept *Incident* defined in the ontology *Events*, has characteristics like the time at which it occurs, a property that will have as objective instances of the class *Time* defined in the ontology Time, or another property like *town*, where the town where the incident takes place is indicated which will have as objective instances of the class *Town* defined in the geography ontology.

There are many relations among the different ontologies that are used to specify correctly each one of the different knowledge domains. This shows that knowledge is global and that it is shared and reused by other knowledge since they only have to refer to the ontology where they are defined and then use any concept, relation or instance.

Fig 1 shows how the different ontologies defined and designed here have used definitions of concepts or properties from one another. The ontology Concepts will be the ontology that summarizes the main *Concepts* defined in the rest of ontologies.

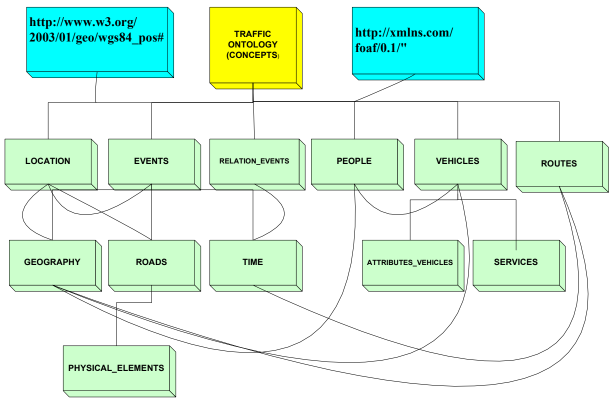

Fig. 1. Relations among the different sub-domains

4.2 Main subject of the Model: Ontology Events

4.2.1 Modelling of terms, relations and instances

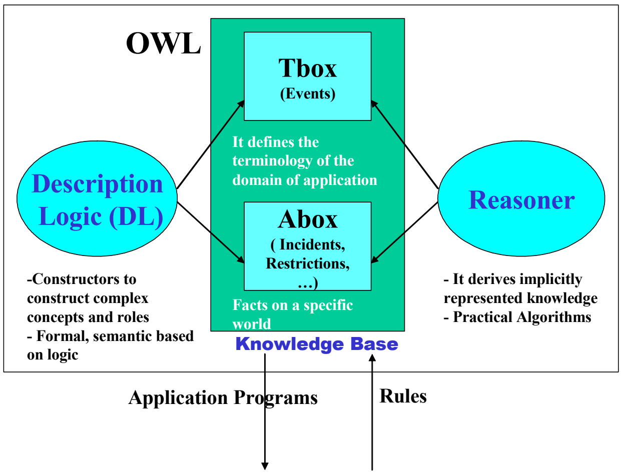

Fig. 2. Architecture of a representation system of knowledge of "Events" or traffic events based on Description Logics

In Fig 2, taking the general architecture of a knowledge representation system as a starting point, adapted to our partial model (Events), we find two clearly differentiated parts: Tbox, formed by terms and their relations and ABox which will be formed by instances of the concepts defined in the terminological part. Such elements can be in the same file, although it is an advisable practice for them to be separate, since instances will generally be modified periodically.

4.2.1.1 TBox: modelling terms and relations

Taking the entity "Event" as our point of reference, it establishes a series of relations with other entities (Location, Information Sources, Cause, Feasibility, Action and Scenario) that under the chosen modularity criteria will be specified in other sub-domains.
To understand these relations let us see Fig 3:

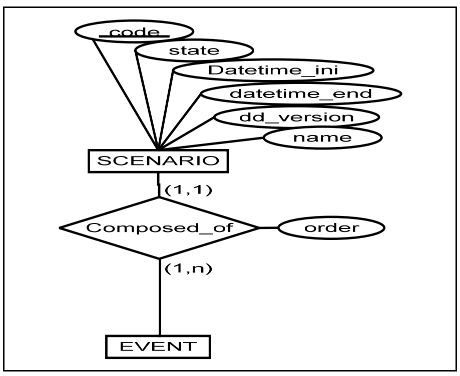

Fig. 3. View of the Conceptual Scheme

As can be seen in the partial view of the semantic data model (Fig 3) there are two entities clearly differentiated: entity Scenario and entity Event. These entities will become classes of the new formal semantic model.

Each one of these entities has a series of attributes that very often are only useful in the semantic data model, due to the intrinsic characteristics of the relational data models. For example, the attributes that refer to versions of the Data Dictionary. These attributes will therefore be excluded from the formal specification.

The binary relation that appears can be seen in two different ways depending if one entity is applied as domain or as range to the other one, in this way, we find that the relation “composed_of” has its corresponding inverse in “contained_in” and both express the relation between these two entities. The use of both of them can give a greater expressivity to our model.

As is clear from the ER diagram and after a revision of its domain analysis, there are a series of requirements and restrictions that the semantic model fulfils and therefore the formal model also has to be echoed.

The requirements that have the main concepts of the ontology Events (such is the case of the concept *Incident*, from the point of view of the ontologies) will be treated as restrictions of the concepts, most of them cardinality restrictions.

Incident $\rightarrow$ Event $\wedge$ {Restrictions} or
Incident $\subseteq$ Event $\wedge$ { Restrictions }

Where *Restrictions* is equivalent to the combination of all those restrictions on properties that affect locally the concept of the Incident.

Therefore any reasoning system will be able to infer that “something” is an incident, it will equally be an Event and besides it will have to meet the restrictions (requirements) that fulfil its specification.

4.2.1.2 ABox: modelling specific states of the world

Once the main part of knowledge (terms and relations) has been specified, the next step is to add instances, that is, to specify or extend knowledge. In our case study, the file that contains the instances about incidents will be a different file (incidents.owl) to the one that contains the concepts on which it is based (events.owl).

Contrary to what happens with Tbox, where the use of editors that facilitate its specification has been turned to, in the case of instances, agents “wrapper” (agent that extracts information from the Web) have been used by Scripts developed in WebL. These agents periodically extract information from the Internet with the help of support from Ontologies.

5 Specification by semantic language

In order to select the language, different studies about the different semantic type mark-up languages [14], [15], [16] have been taken into account. The instances corresponding to this terminological system show the appearance of Fig 4:

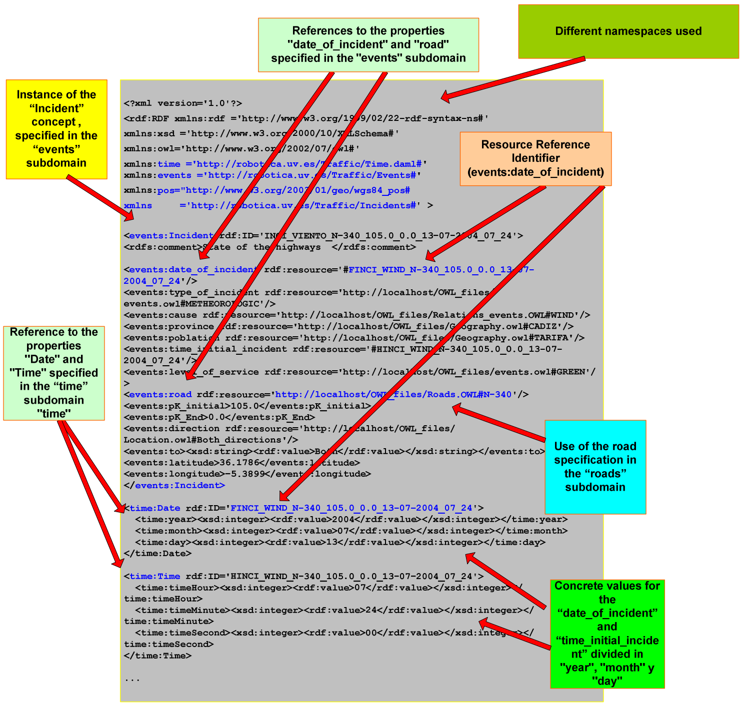

Fig. 4. Instance of the class "Incident" specified in "Events.owl"

This will allow us to ask questions about details that explicitly did not appear in the specification: What is the meaning of the service level being yellow, for driving conditions in that location,? What type and characteristics does the road N-340 have?

Once it has been instanced, we can test our inference system by RACER and the client interface RICE in order to recover the instances of a determined concept, etc. from the knowledge base.

6 Approach to the multilingual aspect

In order to achieve the objective of multilingual ontology, several techniques can be used like describing the same knowledge in various ontologies, each one in a different language, maintaining the whole structure and semantics described in the original ontology, and using the equivalent operator between terms and relations (see Fig 5).

```
________________SPANISH_____________

<owl:Class
rdf:about="http://robotica.uv.es/Traffic/Sucesos#VERDE">
<rdfs:label>VERDE</rdfs:label>
<rdfs:comment><![CDATA[Circulacion normal a
velocidad moderada. No obstante es conveniente
extremar la prudencia por estar proximo al nivel
amarillo.]]></rdfs:comment>

<owl:sameClassAs rdf:resource="
http://robotica.uv.es/Traffic_English/Events#GREEN
"/>

<rdfs:subClassOf>
<owl:Class
rdf:about="http://robotica.uv.es/Traffic/Sucesos#Nivel_Servicio"/>
</rdfs:subClassOf>

</owl:Class>
________________ENGLISH____________________

<owl:Class
rdf:about="http://robotica.uv.es/Traffic_English/Events#GREEN">
<rdfs:label>GREEN</rdfs:label>
<rdfs:comment><![CDATA[Normal circulation at
moderate speed. However it is advisable to drive
carefully since the yellow level is drawing
near]]></rdfs:comment>
<rdfs:subClassOf>

<owl:Class
rdf:about="http://robotica.uv.es/Traffic_English/Events#Service_Level"/>
</rdfs:subClassOf>

</owl:Class>
```

After obtaining the following instance from a Spanish Traffic Web Site and therefore in Spanish,

```
<?xml version='1.0'?>
<rdf:RDF
...
```

xmlns ='http://robotica.uv.es/Traffic/Incidencias#' >

<sucesos:Incidente rdf:ID='INCI_105.0_0.0_13-07-2004_07_24'>
<sucesos:nivel_servicio rdf:resource='http://robotica.uv.es /Traffic/sucesos#VERDE'/>
...

</sucesos:Incidente>
</rdf:RDF>

We can determine by the URI that the type of service GREEN is defined in http://robotica.uv.es /Traffic/Sucesos#, and since in such an ontology we have specified that GREEN is an equivalent class (sameClassAs) to GREEN in http://robotica.uv.es/Traffic_English/Events#", we shall be able to obtain information from either of the two languages.

Through a language requirement in English and from an instance in Spanish, we shall be able to obtain a definition in the required language. If a client interacts with the system specifying that the chosen language is English, the request will specify this requirement in such a way that the information it gives will be translated (actually recovered in Spanish but documented in English).

A different problem will be the fact of recovering information from services or web sites from other countries or administrations. The solution to this problem is describing these Web sites as specific web services where the use of ontologies in such languages will help both with the search and with all the other tasks.

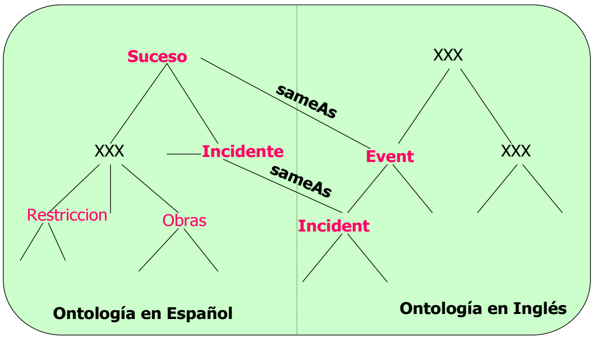

Fig. 5. Equivalence between ontologies

Another possibility is to use the attributes *XML:lang* in the comments so that a single ontology will be able to describe their terms in several languages. However, this last technique does not work in some reasoners like RACER due to the limitation of its requirement language to access some fields like *rdf:comment* of the concept description.

In Fig 6 we can see how starting from an "Incident" instance, it is possible to obtain non explicit information in advance (in this case the meaning of service level "green") both in Spanish as in English, while in Fig 7 due to a specification when consulting that the required language must be Spanish, information only in this language is obtained.

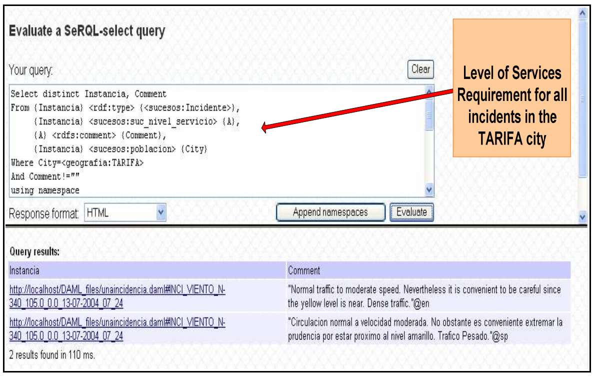

Fig. 6. Request without specifying the language in a knowledge base with two languages (SeBOR)

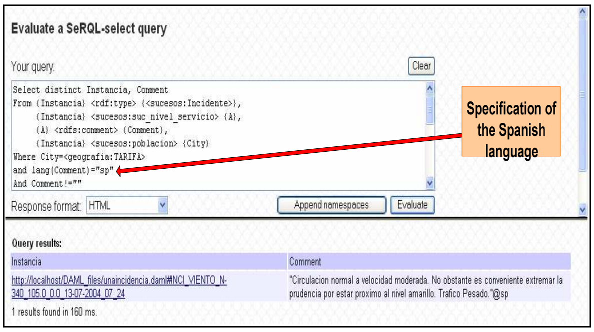

Fig. 7. Request with specification of the Spanish language

7 Conclusions

The work we have presented here has served us as a proof of the concept about the use of ontologies in the traffic domain and their use to make automatic treatments of the information that will allow the distributed and heterogeneous information to be handled and homogenized. The way in which to approach the development of these ontologies has been set up by explaining some relevant aspects for its constitution. For the elaboration of the work two different points of view have been taken, like the need of an information interchange among the different organisations or traffic administrations as well as the decision-taking according to the data obtained and on the other hand from the point of view of the driver or traveller who might need to have certain information from different sources, with information in different formats. In this last sense it is our intention to make the user's consultation much more precise so that with the use of ontologies the objective of finding all the pertinent information will be achieved. We are currently trying to improve the prototype that will allow this type of searches to be done in a quick and efficient way meeting a categorization of traffic services that will guide the system towards obtaining all the web resources it might need.

On the other hand and within the range of options that look for the information diffusion for the final user, evaluating and testing solutions that will facilitate the access to information has been intended. Now new questions to be solved arise:

What sort of new traffic information access mechanisms can be designed for the correct diffusion for users?

To what extent should these types of alternative solutions involve the use of common vocabularies? Due to the different origins of the source information, and also to the fact that it can sometimes be a semantic data model, an extension of the existing methodologies has been proposed for the translation of a model of this type to formal semantic models based on traditional methodologies, but with the addition of new elements that evolve from our own experience.

In order to handle the problem of possible multilingual applications, several techniques have been used. The first one is to use the *XML:lang* attributes in the comments, that will make the description of its terms in several languages possible. Another possibility is based on the creation of correspondences between concepts, between different ontologies equivalent in their structure and content but translated into different languages. Nowadays, the implemented prototype integrates the ontologies in a multiagent platform to search the best information given by traffic services. Different tests have been made to date.

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