URBAN ONTOLOGY-BASED GEOGRAPHICAL INFORMATION SYSTEM

[1]HACENE BELHADEF , [2]MOHAMMED KHIREDDINE KHOLLADI

[1,2] Faculty of Engineering, Department of Computer Sciences, University Mentouri of Constantine, Algeria

E-mail : hacene_belhadef@umc.edu.dz , hacene_belhadef@yahoo.fr

ABSTRACT

The main objective aimed by this paper, is the construction of an urban ontology for a publicity panels management system implanted along roads and public way. This paper shows how the GIS domain can take advantage of new ontologies-based approaches of modelling and conceptualization. The Roads department of Constantine city (Algeria country) in which we were interested in our case study, gave us a clear idea on the problems concerning the decision making to critical situations as the accidents, the optimization of the road traffic, management of publicity panels and all underlying problems; the orientation and the good organization of the road also make a primordial preoccupation of this service.

Our objective in this paper is, to assure a best use of the geographical information, by the good representation and interpretation of this information what also implies the understanding and the good decision making. The Department of Roads city of Constantine, uses an information system based on a classical conceptual model E / R (Entity Relationship) and a relational database, but the new system we have developed is based on a ontology obtained in two different ways the first is the manual application of the methodology of ontologies development, called METHONTOLOGY, and the second automatically uses the mapping rules between the model E/R and ontology, but in both cases the user has the impression that works in a classical system, by against behind the interface There are only ontologies, this is the transparency that is ensured by our system to move (migrate) from one system to the an other without disturbing the users.

***Keywords**: GIS, Methontology, mapping rules, migration, Public roads network, urban ontology.*

1. INTRODUCTION

The development of the Internet technologies opens some new horizons in the domain of the information sharing. The geographical information doesn't escape this tendency and the needs of models, methods and oriented tools to represent, to manipulate and to share the geographical information on the Web, become crucial. A promising answer to these objectives is the development of ontology. The ontologies permit the specification of knowledge accepted by people community and divisible on the Web. This sharing requires the semantics representation of the information in order to return them understandable to users' community, relatively to a domain or to an activity [1].

In this paper we have tried to design an urban ontology, representing the essentials sub-services of the roads service of Constantine city, which we need in our study. The task of publicity management that is task purely commercial, requesting service road information to manage the various tasks underlying, such as the exactly location of panels on the roads order to control the situation; when we want to do such PUB on a product launch or an announcement, etc.. So we must choose the signs which will display based on the nature of the product and its own specific characteristics so that we can take the appropriate decision.

The ontology in our study represents all the properties on the panels (N°., size, location, location ... etc.), and administrator it was he who launch the display on the panels, after querying the ontology and having an answer on panels responding to the needs of the query, eg the PUB on specific products in the summer, must be displayed on billboards located in coastal cities and especially near the beach.

2. BACKGROUND AND RELATED WORK

2.1 Geographical Information System

A geographical information system (GIS) permits to manage some alphanumeric items spatially localized, as well as the graphic data permitting to display or to print plans and cards. Its practices cover the activities geomantic of treatment and diffusion of the geographical information.

The role of the information system is to propose a representation more or less realistic of the spatial environment while being based on graphic primitives as points, of the vectors (bows), of the polygons or meshing (raster). At these primitives are associated of the qualitative information as the nature (road, railroad track, forest…etc.) or all other contextual information.

The geographical information can be defined as the set of the description of an object and its geographical position on the surface of the Earth [1].

2.2. Ontology

The term "ontology", is borrowed from philosophy Greek, **ontos** (that exists, the existing) and **logos** (the speech, the study), where an ontology is a systematic account of Existence. For knowledge-based systems, what “exists” is exactly that which can be represented. When the knowledge of a domain is represented in a declarative formalism, the set of objects that can be represented is called the universe of discourse. In the computer sciences viewpoint and more particularly engineering of the knowledge, the definition most collectively accepted is the one of Gruber [2], " an ontology is an explicit specification of a conceptualization of a domain " otherwise said, an ontology indicates the representation of a conceptual and formal modelling, an ontology is considered as a structured set of concepts, these last ones are organized in a graph whose relations can be, semantic relations and /or relations of composition and inheritance (in the sense object-oriented).

2.3. Methodologies for Building Ontologies

The conception of ontologies is a difficult task requiring the implementation of processes elaborated to extract the knowledge of a domain, manipulable by the computing system and interpretable by the human beings, it raises more the ability than of the engineering.
At the moment, there is no consensus about the best practices to be adopted during the process of construction, nor technical standards governing the process of the ontologies development, although some contributions in this direction are already available [3] [4] [5].

The purpose of our study was not to elaborate a new methodology of conception of the ontologies, but it is indeed to adopt and to use the one among those, that they were considered successful, let us quote as example: ENTERPRISE ONTOLOGY [5], TOVE [6] and METHONTOLOGY [7] [13] [14].

The most important ontologies built according to METHONTOLOGY are: CHEMICALS, Environmental pollutants ontologies, The Reference-Ontology, etc, and in our study, we also adopted this method for its wide use and its framework is supported by ODE[1] [4]. This methodology has been proposed for ontology construction by the Foundation for Intelligent Physical Agents (FIPA), which promotes inter-operability across agent-based applications (*http://www.fipa.org*).

3. METHONTOLOGY

This methodology was developed within the Laboratory of Artificial Intelligence at the Polytechnic University of Madrid, 1998 by Gomez-Pérez and al. [7], covers all the life cycle of an ontology; it is one of the most complete methods. It adopts a life cycle by prototypes (see figure 1) and proposes some number of techniques for every step of the management of the cycle (prevision, control, quality assurance), of the development (specification, conceptualization,

[1] ODE (Ontology Design Environment) is the environment that enables the development of ontologies at the knowledge level using the approach proposed by METHONTOLOGY

formalization, implementation, maintenance) and of the support (acquisition of knowledge, integration, evaluation, documentation, management of the configuration). It also considers the independences between the life cycles of several ontologies managed in parallel.
The phase of conceptualization advocates a progressive conversion of the informal in the formal by using a set of intermediate representations essentially in the form of tables and graphs. The idea is to fill gradually the gap between the means of expressions of the interested and the implementation ontologies languages.

The used intermediate representations are: the taxonomies of concepts, the diagrams of the binary relations, the dictionary of the concepts, the tables of the binary relations, the descriptions of the attributes of instances, the descriptions of the attributes of classes, the tables of constants, axioms and rules, supplementary information on the instances, glossaries of terms.

3.1. Specification

The goal of the specification phase is to produce either an informal, semi-formal or formal ontology specification document written in natural language, using a set of intermediate representations (IR) or using competency questions, respectively. METHONTOLOGY proposes that at least the following information be included:
- The purpose of the ontology, including its intended uses, scenarios of use, end-users, etc.

- Level of formality of the implemented ontology, depending on the formality that will be use to codify the terms and their meaning.

- Scope, which includes the set of terms to be represented, its characteristics and granularity.

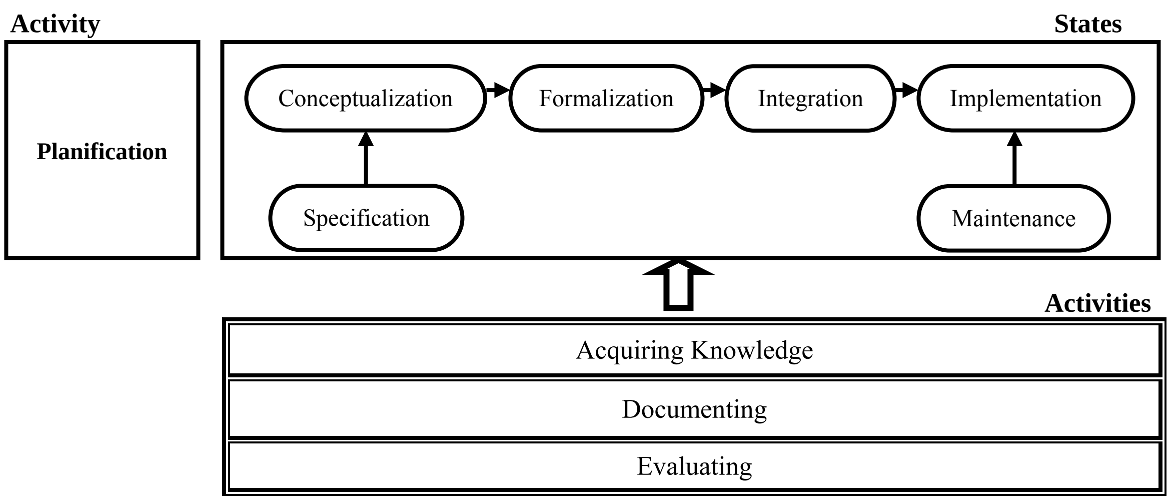


Figure 1. States and activities

3.2. Conceptualization

A conceptualization is an abstract, simplified view of the world that we wish to represent for some purpose. Every knowledge base, knowledge-based system, or knowledge-level agent is committed to some conceptualization, explicitly or implicitly. Therefore the conceptualization consists to identify and structure the knowledge of a domain, from the sources of information. The acquisition of such knowledge can rely on both the analysis of documents and on interviews with experts in the field. Once concepts are identified by their terms and their semantic, the ontology can be described in a semi-formal language (tables and graphs) through their properties, known instances and relationships that bind them.

3.3. Formalization

The formalization consists to transform the conceptual model into a formal or semi-compatible model, you need to formalize it using frame-oriented or description logic [8] representation systems.

3.4 Implementation

The implementation must be a mirror of the specification, that is, it must satisfy the complete requirements specification document. Implementation builds computable models in a computational language, but to make the ontology 'machine-readable' we need to select the formal machine process able implementation language. The result of this phase is an ontology, codified in a formal language using Web Ontology Language (OWL)[2], and preferably use a tool of implementation, visualization and manipulation ontologies as **Protégé**[3] and others related tools.
The Web Ontology Language (OWL) is a markup-language based on XML and standardized also by the W3C that formalizes a syntax in which an ontology can be defined. OWL was developed from RDF, and has been designed such that every RDF document is also a valid OWL document.

4. SYSTEM ARCHITECTURE

In this paper we were interested that to describe the ontology building method using METHONTOLOGY [7] or by applying the mapping rules [11], the latter are the subject of a big stage in a new methodology proposed by N. Ouafek and H. Belhadef [12] for the development of ontologies, based on a transformation of the conceptual model (ER) and its corresponding relational model towards a conceptual ontology.
Our system described in figure 2, has architecture composed by three elements, the workspace of the administrator, the classic information system of the roads service and display system. As shown in Figure 1, the information system of service roads is a system based on a conceptual model (ER) and a relational database.

the workspace of the administrator is composed by the ontology obtained by applying the transformation rules proposed in [11], or by applying the method METHONTLOGY and in both cases, this requires the intervention of an expert who knows the field of ontologies, but the end-users or the administrator are not necessarily experts in this field, since they work on an software fitted an interface assuring the transparency and it gives them the impression that they work in a classical context. The result of querying of the ontology, through this software will be forwarded to display system which handles the publicity and displaying the content on publicity panels, for example if the administrator tries to find or locate what are the suitable panels for displaying an publicity on articles of the summer season, especially for product-type swimming; in this case, the query results is the panels are much closer to the beach; another example, to display an publicity for school supplies; normally there will be panels that are near schools of all types (universities, institutes, schools or others), also the administrator can filter the results by choosing the type and size of panels (text, multimedia, big, small, etc.)

[2] http://www.w3.org/2004/OWL/
[3] Protégé: Ontology Editor Ontology editor and knowledge-base framework,
available at http://protege.stanford.edu/

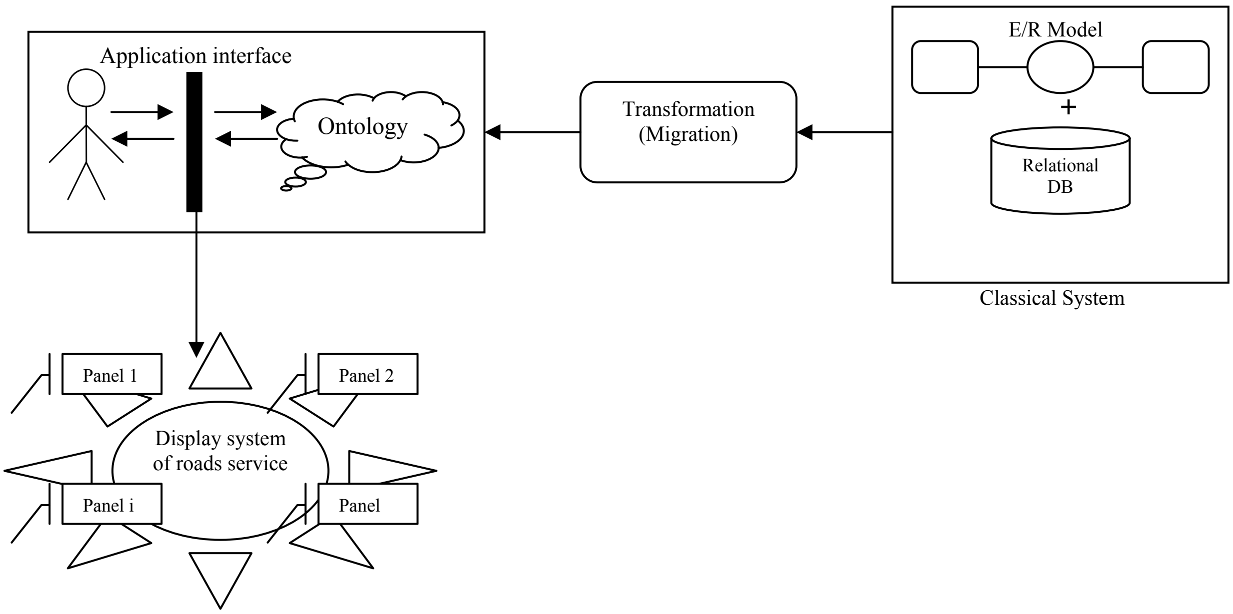


Figure 2. System architecture

4.1 Mapping Rules

Module of transformation is based on a set of mapping rules (see Section below), between ER mode, Relational model and Ontology. Before presenting this set of rules, we first define the structure of the ER conceptual model as it was defined in the [11]:

An ER is a quintuple S = (*Ls, isa$_s$, att$_s$,rel$_s$, card$_s$*) with:

- L_s is a finite alphabet partitioned into a set E_s of entity symbols, a set *AS* of attribute symbols, a set *US* of ER-role symbols, a set *RS* of relationship symbols, and a set *DS* of domain symbols
- $isa_s \subseteq E_s \times E_s$ is a binary relationship that represents the concept of subtype.
- att_s is a function that represents each entity symbol $E \in E_s$ in the following form:

  $att_s(E) = [\ldots, A : D, \ldots]$
- rel_s is a function that represents each relationship symbol $R \in R_s$ in the following form: $rel_s(R) = [\ldots, U : E, \ldots]$
- *cards* is a function from $E_s \times R_s \times U_s$ to $N_0 \times (N_1 \cup \{\infty\})$ where N_0, N1 two sets non-negative. For any $rel_s(R) = [U_1 : E_1, \ldots, U_k : E_k]$ there is a $card_s(E_k, R, U_k)$

We have proposed three sets of rules depending on the type of objects list to generate, list of Concepts, list of Relations and list of Instances(for more details see [12])

Table 1. *Generating the list of concepts*

Conceptual model ER	Conceptual ontology
For each entity $E \in E_s$	- *E* will be a concept - Add a line in the list with the ID (identifier) of *E* as a new concept
For each attribute : $A \in A_s$ / $att_s(E) = [\ldots, A: D \ldots]$	- *A* will be a property of the concept *E* - Update the column "list-of-attributes" of the concept that carries the ID of *E* as a name, by property *E-A* with *D* is the Domain of *A* **NB:** add the ID of *E* into as a prefix in the name of property, because in the ontology, a property can not be used by two concepts.
For each couple : $E_1, E_2 \in E_s$ / E_1 isa_s E_2	- The concept E_1 will be a sub-concept of the concept E_2 - Update the column "sub-concept" of concept that carries as name the ID of E_2 by the ID of E_1 **NB:** This column is used thereafter to create a hierarchical representation of ontology
For each entity: $E_1, E_2, \ldots, E_i \in E_s$ / E_i isa_s E_2	- Add to each E_i a line in the list - and in the column "list-of-attributes", add all the attributes of *E* with the name E_i-A_j where $A_j \in A_s$ / $att_s(E) = [\ldots, A_j:D, \ldots]$

Table 2. Generating the list of relations

Conceptual model ER	Conceptual ontology
For each role : $U_i \in U_s$ /$rel_s(R) = [U_1 : E_1, U_2 : E_2]$	- U_i will be a relationship - Add a line in the list with the ID of Ui as a new relationship - Update column "concept-source" by the ID of E_1 - Update column "concept-target" by the ID of E_2 - Update column "inverse-relationship" by the ID ofU_2
For each cardinality : cards (E_1, R, U_1) and cards (E_2, R, U_2) / $rel_s(R) = [U_1 : E_1, U_2 : E_2]$	<u>if</u> $U_i \in$ in "relationship" column <u>then</u> update "cardinality-source" column by $card_s(E_1, R, U_1)$ else / * U_i is an inverse relationship * / U_i must be compared with all elements of the "inverse-relationship" column, if there is, to update the column "cardinality-target" cards (E_2, R, U_2)
For each attribute : $A \in As$ / atts $(R) = [\ldots, A: D, \ldots]$ with $R(E_1, E_2)$, cards(E_1, R, U_1) and cards (E_2, R, U_2)	<u>if</u> the type of relationship is 1: n <u>then</u> <u>if</u> cards $(E_1, R, U_1) = 1{:}1$ <u>then</u> update "list-of-attributes" column of the concept that carries as name the ID of E_1, by the property E_1-*A* with *D* the domain of *A* else / * $(E_2, R, U_2) = 1.1$ * / update "list-of-attributes" column of the concept that bears as name the ID of E_2 , by the property E_2-*A* with *D* the domain of *A* if the relationship type is 1: 1 update "list-of-attributes" column of the concept that bears as name the ID of E_1 or E_2, by the property E_1-*A* , E_2-*A* respectively with *D* the domain of *A*

Table 3. Generating the list of instances

Relational schema (DB)	Conceptual ontology
For each *N* name of a table	- N will be the name of the concept - Add a line in the list with the ID of E as a new concept
For each attributes of the table N	- Add the prefix N- - Compare the attributes of the table N with the properties of the concept that bear as name the ID of N - For all attributes doesn't belong in the set of properties of the concept N, replace the prefix N- by "in–relation-with"
For each modified table N	Update the column "list of instances" of the corresponding line in the name of concept is N, by the modified table N

4.2 Methontology

In this section we are going to describe how we constructed our ontology while following the conceptualization phase of METHONTOLOGY described in [4].

The conceptualization phase is constituted of a set of phases permitting to succeed to a set of intermediate representations (IR) semi–formal (see figure 3), that one calls a "conceptual ontology". This last identifies and definite the vocabulary of the domain, independently of the languages of formalisation to use to represent the ontology**.**

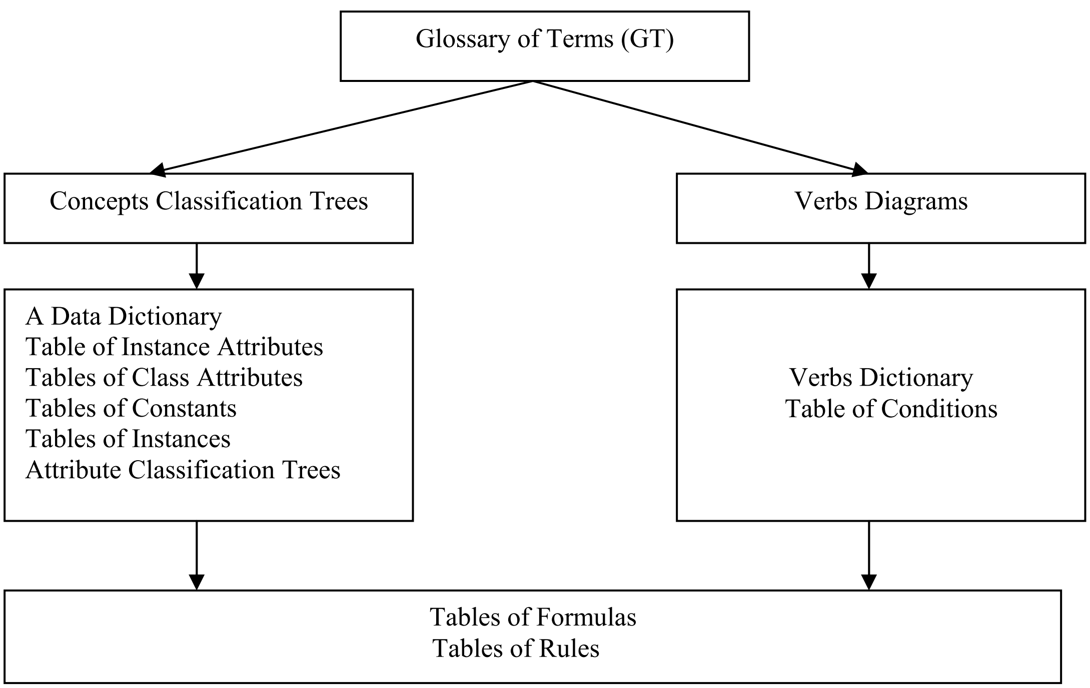


Figure 3. Set of Intermediate Representations in the conceptualization phase.

In the conceptualization phase, Methontology recommends to structure the domain knowledge in a conceptual model. The activities to be carried out are as follows:

4.2.1. Build a complete glossary of terms (GT)

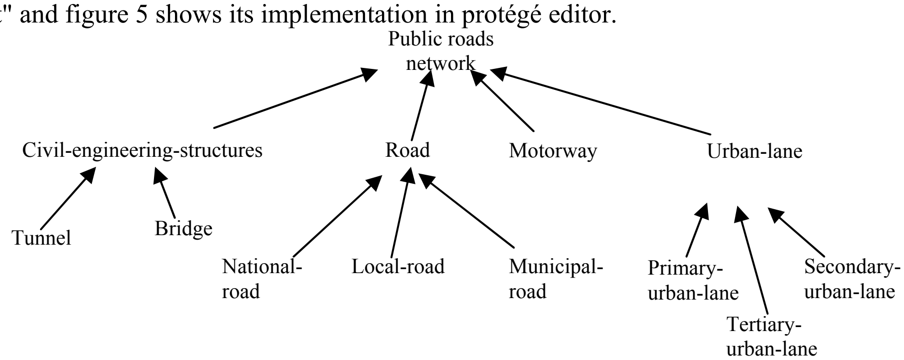
The terms include nouns, verbs, concepts, instances properties etc. The designer should gather all potentially useful information about the concepts and their meanings. Table 1, provides a detailed list of the various terms used in our study (but not all terms) and as mentioned above, the terms are described in French language and we add a column for the English translation.

Table 4. Glossary of terms

Concept Name	Description
Bridge	A bridge is a structure of civil engineering achievement, intended to allow the crossing of an obstacle (river, channel of communication, etc.) through it
Civil-engineering-structures	These are the bridges and tunnels for planning.
Country	Territory of a nation
Local-road	Vehicle road between two major cities of a Wilaya
Motorway	Road infrastructure containing two separated causeway and reserved to the fast automotive vehicle circulation
Municipal road	Vehicle road between a “Daïra” and a village. NB: The Daïra is a subdivision of the wilaya in Algeria Territorial Administration
National-road	Terrestrial way that is destined to the circulation outside agglomeration (of the vehicles) enters two wilayas (departments)
Primary-urban-lane	This is an urban road that leads from one sector to another
Public-roads-network	Set of the network of the communication channels belonging to the public domain
Secondary-urban-lane	This is an urban road that leads from one street to another
Tertiary-urban-lane	This is an urban road that leads to sub streets such as deadlocks
Tunnel	Underground communication channel
Urban-lane	Band communication traffic in the combination of a city
Wilaya	Administrative division in Algeria territorial administration

4.2.2. Build concept classification trees

For each set of closely related concepts, the designer should build a Concepts Classification Tree; this last shows the organization of the ontology concepts in a hierarchical order which expresses the relations sub-class and super-class, using relations [4] like: subclass-of [4], mutually-disjoint-subclass-of [5], and exhaustive-subclassof [6]. Figure 4 shows one of the hierarchies of concepts, concerning the concept "Roads-department" and figure 5 shows its implementation in protégé editor.



[4] Class C is a subclass of parent class A if and only if every instance of C is also an instance of A.
[5] Is a set of subclasses of a class C whose objects have no elements which belong to different sets.
[6] A subrelation-partition of a class C is a set of mutually-disjoint classes (a subclass partition) which covers C. Every instance of C is an instance of exactly one of the subclasses in the partition.

Figure 4. Concepts Classification Tree for " Public roads network" concept

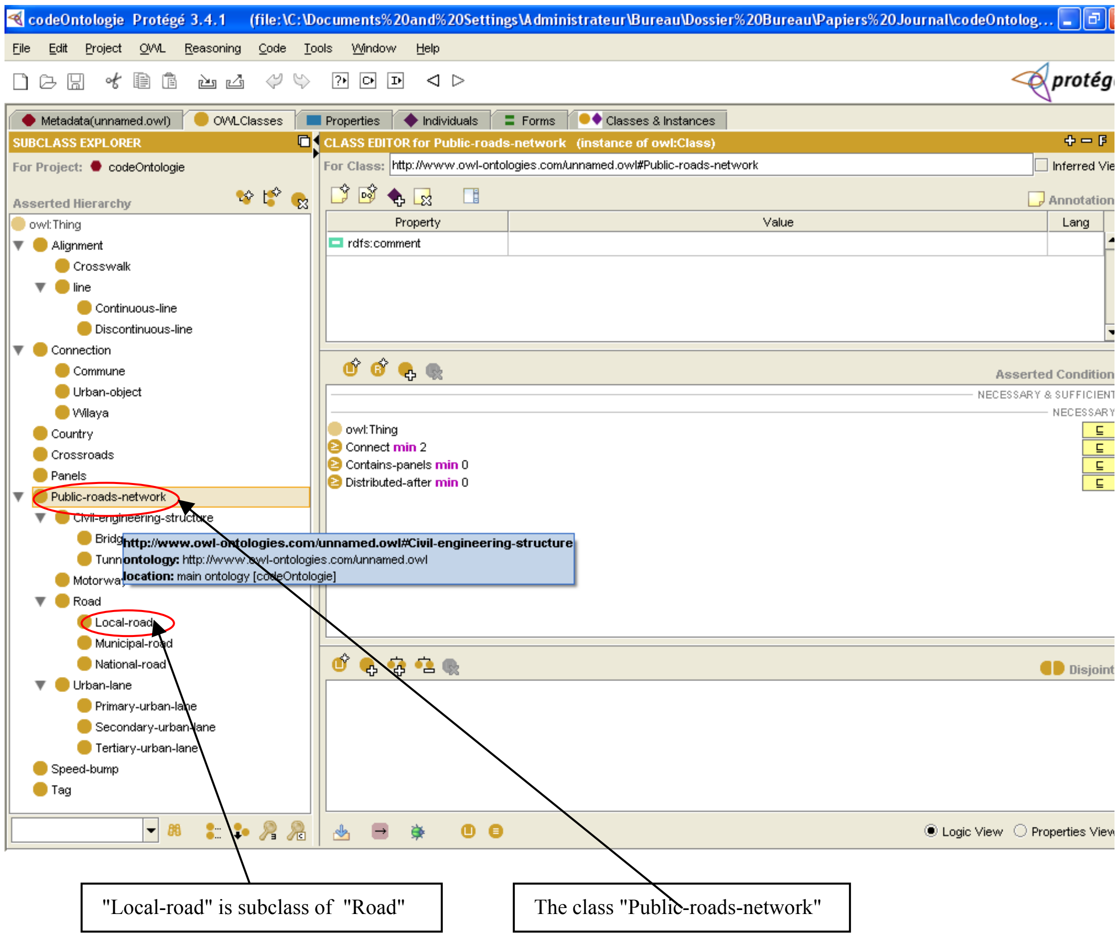


Figure 5. Concepts Classification Tree in Protégé editor

4.2.3. Build Diagram of binary relations

This phase consists to build binary relations diagrams between concept classification trees. The goal of this diagram is to establish relationships between concepts of the same or different trees. In this diagram the relations are represented by the arcs (the sense of a arc is directed toward the concept targets), while the concepts are represented by rectangles, for example a concept X is bound with the concept Y by the relation R.

Figure 6 shows the implementation of the ontology via the OWLViz Plugin of "protégé" which is, a schema editor ontologies for "protégé" and Figure 7 (at the end of this paper) shows the tree of binary relations of the ontology in question.

Figure 6. The ontology schema via OWLViz Plugin

For each concept classification tree generated, we built the following IRs, but in this paper, we describe only the case of the tree *"Public-roads-network"*.

A) Build concept dictionary table

A Concept Dictionary containing all the domain concepts, instances of such concepts, class and instance attributes of the concepts, relations whose source is the concept and optionally, concept synonyms and acronyms. Tables 5 show a small part of the concept dictionaries of ontology.

Table 5. Concepts Dictionary Table

Concept Name	Synonyms	Attributes	Instances
Public-roads-network	-	Code Nbr-causeway Width-causeway Length-causeway	-
Motorway	-	-	The East-West Motorway
Road	-	-	-
National-road	-	-	RN5
Local-road	Road of Wilaya	-	CW63
Municipal-road	-	-	CC123
Urban-lane	Rural way	Width-pavement	-
Primary-urban-lane	Boulevard	-	Prim1
Secondary-urban-lane	Street	-	Secd1 ; secd2
Tertiary-urban-lane	Avenue	-	Tert1 ; tert2 ; tert3
Civil-engineering- structures	-	-	-
Bridge		Height	-
Tunnel	-	Diameter	-

B) Build binary relations table

For each relation in the table of binary relations we will specify: its name, the name of the source and target concept, its inverse relation, and the source and target cardinality.

Table 6. Binary Relations Table

Relation Name	Source Concept	Source Cardinality	Target concept	Target Cardinality	Inverse Relation
Connect	Public-roads-network	(1, n)	Connection	-	-
Distributed	Public-roads-network	(1,1)	Crossroads	(1, n)	Divided
Contains-panels	Public-roads-network	(1,n)	Panels	-	-
Contains-speedBumps	Urban-lane	(1, n)	Speed-bump	-	-
Join-RoadPub	Civil-engineering- structure	(1,n)	Public-roads-network	-	-
Results-from-road	Primary-urban-lane	(1,1)	Road	-	-
Results-from-primary	Secondary-urban-lane	(1,1)	Primary-urban-lane	-	-
Results-from-secondary	Tertiary-urban-lane	(1,1)	Secondary-urban-lane	-	-
Connect-wilaya	National-road	(1,n)	Wilaya	-	-
Connect-commune	Local-road	(1,n)	Commune	-	-
Contains-speedBumps	Road	(1,1)	Speed-bump	-	-
Connect-two-country	Motorway	(1,2)	Country	-	-

C) Build attributes table

The attributes are properties which take its values in the predefined types (String, Integer, Boolean, Date…). For each attribute that appears in the concepts dictionary, we specify its name; the value type; minimum and maximum cardinality; default values and range of values.

Table 7. Attributes Table

Attribute Name	Value Type	Cardinality (Min/Max)	Default value	Range of Values
Code	String	(1,1)	-	-
Nbr-causeway	Int	(1-n)	-	1 ;2
Width-causeway	Real	(1,1)	-	-
Length-causeway	Real	(1,1)	-	-
Nbr-lane-each-causeway	Int	(1,n)	-	-
Width-central-reservation	Real	(1,1)	-	-
Altitude	Real	(1,1)	-	-
Diameter	Real	(1,1)	-	-

D) Build logical axioms table

This is used to define the concepts by means of logical expressions that are always true. Each axiom defined includes: its natural language description, the concept to which the axiom refers and logical expression that formally describes the axiom using DL.

Table 8. Logical Axioms Table

Concept Name	Axiom Description	Logical Expression
Public-roads-network	"Public-roads-network" is a concept that regroups all elements carries the following features: code, the number of causeway, number of lanes in each road, the length of the causeway and the width of strip of Central-reservation.	∀X, Public-roads-network(x) ⇒ (∃ code.String) and (∃ Nbr-causeway.Int) and (∃ Width-causeway.Real) and (∃ Length-causeway.Real) and (∃ Nbr-lane-each-causeway.Int) and (∃ Width-central-reservation.Real) and (∃ y,z, Connection(y), Connection(z) and Connect (x,y,z))
Road	A Road is a "Public-roads-network" that contains colored tags.	∀x, Road(x) ⇒ Public-roads-network(x) and ∃y, Tag(y) and Contains-tag(x,y)
Motorway	The Motorway avoids agglomerations and the width of the pavement is greater than or equal to 2 m and width strip of land greater than or equal to 7 m.	∀ x, Motorway(x) ⇒Public-roads-network(x) and not-traverse(x) and Width-causeway(x) >=7 and Width-central-reservation(x) >= 2
Urban-lane	An Urban-lane is a "Public-roads-network" that has sidewalks and humps.	∀ (x),Urban-lane(x) ⇒ Public-roads-network(x) and ∃ y, pavement(y), ∃ z, Speed-bump(z) and Contains-pavement(x,y) and Contains- Speed-bump(x,z)
Civil-engineering-structure	A Civil-engineering-structure is a part of "Public-roads-network" that connects these parts.	∀(x), Civil-engineering-structure(x)⇒Public-roads-network(x) and ∃ y,z, Public-roads-network(y),Public-roads-network(z) and Join(x,y,z)
National-road	A National-road is a Road that contains Tags colored and a width of causeway between 6m and 7m.	∀ (x), National-road (x)⇒Road and (∃y, Tag(y) and color-tag(y)='red' and contains-tag(x,y)) and (7m> Width-causeway(x) >= 6m)
Local-road	A Local-road is a Road contains Tags colored 'green' and a width of causeway between 4m and 6m.	. ∀(x), Local-road(x) ⇒ Road and (∃y, Tag(y) and color-tag(y) ='green' and contains-tag(x,y)) and (6m> Width-causeway(x) >= 4m)
Municipal-road	Municipal-road is a Road contains Tags of 'yellow' colour and a width of causeway between 3m and 4m.	∀(x), Municipal-road (x) ⇒ Road and (∃y, Tag(y) and colour-tag(y)=' yellow' and contains-tag(x,y)) and (4m> Width-causeway(x) >= 3m)
Primary-urban-lane	A Primary-Urban-Lane is located in an urban zone and it results directly from a road after that this last one finds a crossroads in the entrance of the urban zone, and it divides the zone into sectors.	∀(x), Primary-urban-lane(x) ⇒ Urban-lane(x) and (∃ y,Road(y) and Results-from-road(x, y))
Secondary-urban-lane	A Secondary-Urban-Lane is located in an urban sector, it results directly from a primary urban lane and it divides each sector into cartiers.	∀(x), Secondary-urban-lane(x) ⇒ Urban-lane(x) and (∃ y, Primary-urban-lane(y) and Results-from-primary(x, y))
Tertiary-urban-lane	A way urban tertiary is located in an urban sector,it results directly from a primary urban lane or secondary and it divides each cartier into streets.	∀(x), Tertiary-urban-lane(x) ⇒ Urban-lane(x) and (∃ y, Urban-lane(y) and Results-from-urban-lane(x, y))
Bridge	A bridge is a structure which has an elevation.	∀(x), Bridge (x)⇒ Civil-engineering-structure(x) and altitude(x)>1
Tunnel	A Tunnel is a structure which has a diameter.	∀(x),Tunnel(x)⇒ Civil-engineering-structure(x) and diameter(x)>3

E) Build instances table

The Instances Table describes each instance that appears in the concept dictionary, this table includes: the name of the instance, the attributes and the values of the above attributes. Figure 8 shows an example of instances of concept "Tag".

Table 9. Instances Table

Instance Name	Attributes	Values
National road 5	Code Nbr-causeway Width-causeway Length-causeway Nbr-lane-each-causeway Width-central-reservation	RN5 2 6.5 450000 2 2
Local road 63	Code Nbr-causeway Width-causeway Length-causeway Nbr-lane-each-causeway Width-central-reservation	CW 63 2 5 30000 1 1.5
Municipal road 123	Code Nbr-causeway Width-causeway Length-causeway Nbr-lane-each-causeway Width-central-reservation	CC 123 2 4 15000 1 1
Primary Urban Lane 1	Code Nbr-causeway Width-causeway Length-causeway Nbr-lane-each-causeway Width-central-reservation	Prim1 2 2.5 1000 1 0
Secondary Urban Lane 1	Code Nbr-causeway Width-causeway Length-causeway Nbr-lane-each-causeway Width-central-reservation	Secd1 1 2.5 500 1 0
Secondary Urban Lane 2	Code Nbr-causeway Width-causeway Length-causeway Nbr-lane-each-causeway Width-central-reservation	Secd2 1 3 450 1 0
Tertiary urban Lane 1	Code Nbr-causeway Width-causeway Length-causeway Nbr-lane-each-causeway Width-central-reservation	Tert1 1 2.5 100 1 0
Tertiary urban Lane 2	Code Nbr-causeway Width-causeway Length-causeway Nbr-lane-each-causeway Width-central-reservation	Tert2 1 2.5 95 1 0
Tertiary urban Lane 3	Code Nbr-causeway Width-causeway Length-causeway Nbr-lane-each-causeway Width-central-reservation	Tert3 1 2.5 80 1 0

Note that the process of building these IRs is not sequential in the sense of a waterfall life-cycle model, but some order must be followed to assure the consistency and completeness of the knowledge already represented. However, the experience in the use of the model shows that the first table built is the glossary of terms. After this, we build concept classification trees and binary relations diagrams. Then, we proceed to build the concept dictionary, the binary relations tables, the attributes tables and axiom tables.

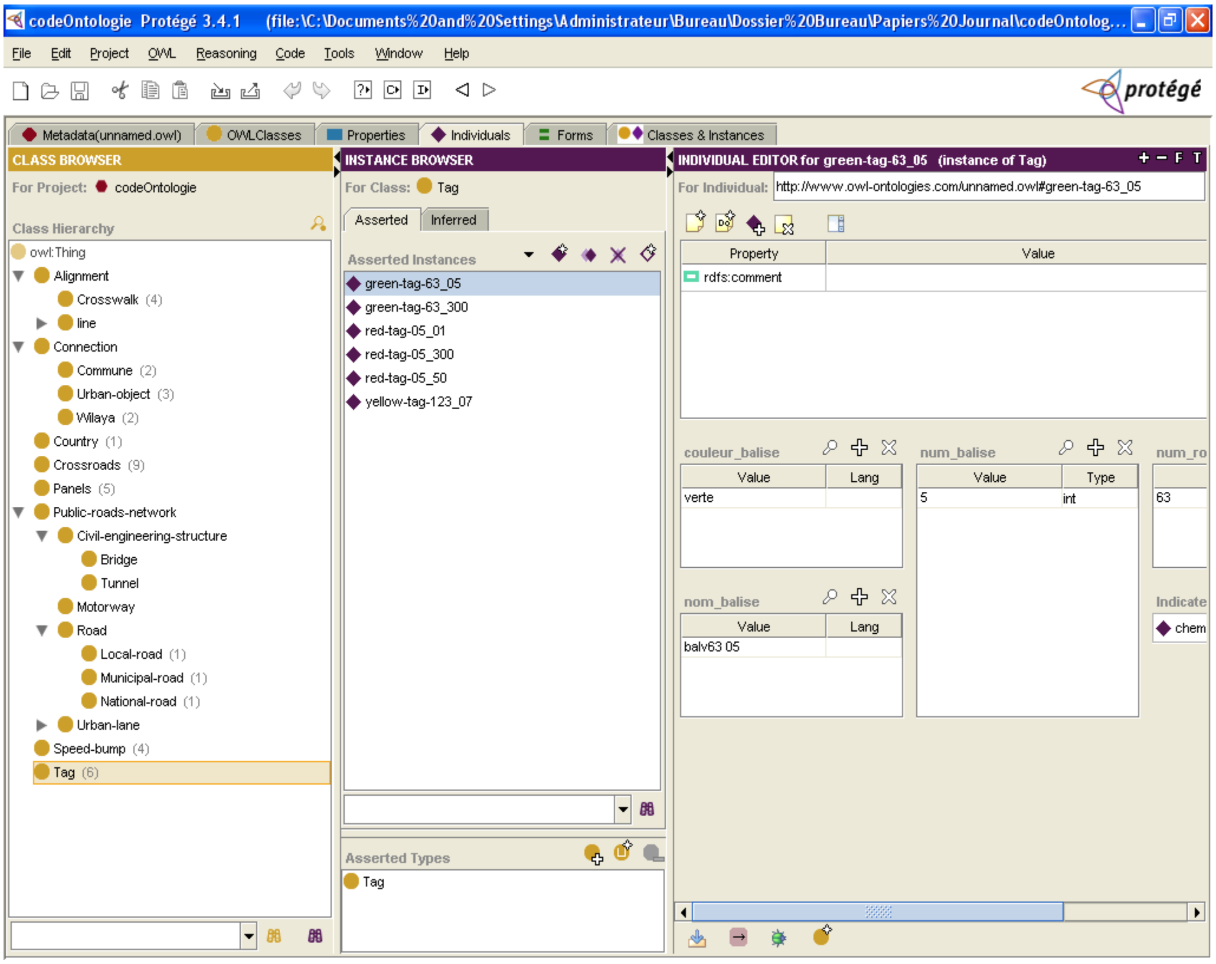


Figure 8. Instantiation browser in protégé editor

5. CONCLUSION

In this paper, we tried to design an information system that is characterized by a special architecture (figure 2), it is based on two conceptual models (ontologies and entity relationship), our idea is to combine these last to take advantage the benefits provided by the ontologies, and give the impression for the end-users that they work in a classical system and not to complicate the task for them. The ontology used in this paper is an urban ontology may be designed either by the application of mapping rules or by applying the method METHONTOLOGY.
the Conception of an ontology is not really a goal in either (principal or final) but rather intermediate, in our case the ontology is used to ensure the smooth functioning of information system in question (Roads department of Constantine city), which in turn ensures the automation of publicity panels management, the system is composed of three components (figure 2) and the ontology is part of it. The role of the end-users or the administrator is to interrogate this ontology via graphical interface that ensures transparency and returns a result understood by the interrogator, who in turn will transmit them to the display system on the network of publicity panels.

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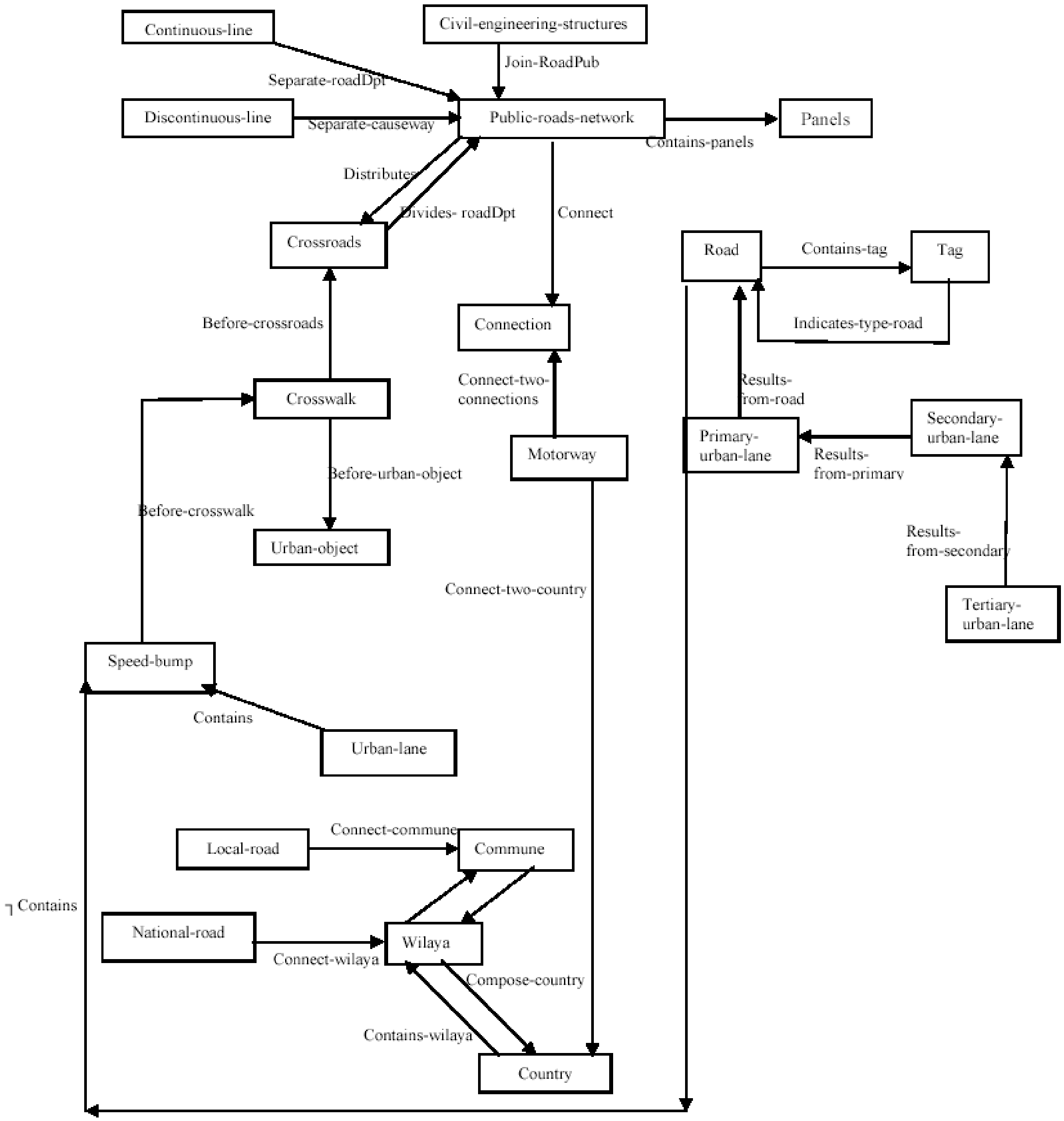

Figure7. Diagram of Binary Relations and concepts classification