



# Ur\_Namma

## An OWL Ontology of a Sumerian Grammar

by

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with

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based on an idea of

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## **Foreword**

The construction of an ontology of the Sumerian language has been part of a wider project of the company Epistemica for testing "Semantic Web Technology" and its application on the computational linguistics. In this context, the company has already completed a project, with the collaboration of Dr. Marco Romano, to design an ontology of Esperanto to demonstrate the possibility of realizing a linguistic parser with reasoning skills. After this experience, it seemed appropriate to test this procedure on a language that was not artificial like the Esperanto, but natural; a language that had an evolving grammar and a more complex history.

The Sumerian language flourished in a region called "Mesopotamia" (between the two rivers Tigris and Euphrates in the modern Iraq) documented from the half of IV millennium BC. It was spoken until the end of III millennium when the Sumerian disappeared. But people that during the centuries took the power in Mesopotamia continued to use it as refined speech in the written documents until the II century AD given its enormous literary, religious and political tradition.

The main characteristic of Sumerian is to be agglutinative, that is the word (verb, substantive, adjective etc.) we read in a given text is identical with the word we find in the vocabulary. In other words the modifications (for example from singular to plural) do not change it directly (like, for example in English dog → dogs); the specification of the meaning happens with morphemes added, agglutinated to the unmodifiable word in a fixed order before or after it or by duplicating a word (lugal = king → lugal-lugal = kings). This characteristic makes it particularly suitable for the construction of an ontology due to an easier identification of the morphemes.

## **The Research**

This project has been developed in two different steps: in the first one a tutor (Dr. Marco Romano) taught me how to use the programs to manage the ontologies OWL format: Protégé 3.2 e RacerPro 1.8, whilst in the second one, the ontology was developed.

An ontology is composed by two elements: a T-Box (Terminological Box), and an A-Box (Assertions Box). The T-box is the taxonomic part of ontology, where concepts (and the hierarchy that exists among them) are defined, and where we formalize the relationships holding between different concepts. It is the "shape" of the ontology. The A-Box is the part of the ontology that contains the facts, where individual instances are classified as belonging to a specific class and where properties that are defined for the classes are given a value for each instance. It is the "substance" of the ontology. In the case of Sumerian, the T-Box is the Sumerian grammar, while the A-Box is represented by every Sumerian text that can be formalized in the grammar described in the

T-Box. Given the fact that this ontology represented an "experiment", it was decided not to use a long text, but one which could show some of the most common grammatical features of the Sumerian language in order to obtain a small but consistent and fully instantiated A-Box.

After analysing some texts the choice fell on a foundation brick of the king Ur-Namma, king and founder of the Third Dynasty of Ur, who ruled in Mesopotamia between 2112 and 2095 BC. The transliteration and translation of the text is the follow:

<sup>d</sup> Nanna	to the God Nanna
lugal-a-ni	his king
Ur- <sup>d</sup> Namma	Ur- <sup>d</sup> Namma
lugal-Urim <sub>5</sub> <sup>ki</sup> -ma-ke <sub>4</sub>	king of Ur
e <sub>2</sub> -a-ni	his temple
mu-na-du <sub>3</sub>	he built
bad <sub>3</sub> -Urim <sub>5</sub> <sup>ki</sup> -ma	the walls of Ur
mu-na-du <sub>3</sub>	he built

This transliteration in Latin characters shows the value of each sign that appears on the brick, but the reality of the grammar of this text is not highlighted by this transliteration. To highlight the different grammatical parts it is necessary that the scholars make a further effort adding the elements that do not appear on the brick or joining the signs that represent a unique grammatical element:

Nanna.ra  
 lugal.ani  
 Ur-<sup>d</sup>Namma  
 lugal.Urim<sub>5</sub><sup>ki</sup>.ak.e  
 e<sub>2</sub>.ani.Ø  
 mu.na.n.du  
 bad.Urim<sub>5</sub><sup>ki</sup>.ak.Ø  
 mu.na.n.du

This text represents our A-Box. The T-Box has been formalized based on the grammar in this text. It is obvious that this text does not show all the grammatical features of Sumerian language, that is the T-Box developed here represents only a part of the grammar.

The Sumerian has two main structures: the nominal chain and the verbal chain. Both are composed by different elements and their positions are unmodifiable. So I have developed two classes “ElementsOfNominalChain” and “ElementsOfVerbalChain”

### **The “ElementsOfNominalChain” class**

In the Sumerian grammar the elements that compose the nominal chain are six: noun, adjective, genitive, possessive, plural suffix “-ene” and case. In our A-Box there were not all the six elements. As sub-classes I took only the elements in the Ur-Namma brick foundation that is noun, genitive, possessive and case. I added to this four sub-classes, a fifth one “particle”, which was used to better define the “genitive”. Three of these five sub-classes (possessive, case and particle) represent sets that are numerically limited so I defined it with the elements that composed it:

- Possessive: gu10, zu, ani, bi, me, zunene, anene
- Case: e, 0, ra, da, še3, ta, a, gin7
- Particle: ak

Moreover, to better define the sub-class “particle”, I created an “object property” “FollowedBy” with the condition that the “particle” is followed by the particle “ak”; the sub-class “noun” was defined as a word that is always followed by the “case”.

### **The “ElementsOfVerbalChain” class**

The verbal chain of Sumerian language is composed by eight elements: modal prefixes, conjugation prefixes (here called simply “prefix”), dimensional infixes, pronominal infixes, verbal root, suffix “-ed”, pronominal suffixes, postpositions. Even in this case, as already written above, our A-Box does not contain all these elements. Our sub-classes are therefore just the followings: Prefix, DimensionalInfix, PronominalInfix and VerbalRoot; three of them are composed by a defined number of elements:

- Prefix: mu
- DimensionalInfix: na
- PronominalInfix: n

The definition of “VerbalRoot” was, on the contrary, more complex. The solution was to use the structure for position of Sumerian. So I defined “VerbalRoot” as the elements of Verbal Chain that follow the “PronominalInfix”. Therefore I created an “object property” “PrecededBy” applying it to the “VerbalRoot” with the condition that it was preceded by the sub-class “PronominalInfix”.

## **Conclusion**

As I said above, this ontology is only an experiment, an attempt, but this work shows, however, that it is possible to apply the technologies of the Semantic Web to a natural language as well. This seems to be the right track and I am sure that these technologies will be able to provide important new tools not only for Sumerian, but also for many other linguistic aspects.

Rome, 11th July 2006

# Annex

## Ur\_Namma.owl

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  xmlns:xsd="http://www.w3.org/2001/XMLSchema#"
  xmlns="http://www.epistematica.com/ontologies/Ur_Namma#"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
  xmlns:owl="http://www.w3.org/2002/07/owl#"
  xmlns:daml="http://www.daml.org/2001/03/daml+oil#"
  xmlns:dc="http://purl.org/dc/elements/1.1/"
  xml:base="http://www.epistematica.com/ontologies/Ur_Namma#">
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```

```

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```

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                        <Case rdf:ID="ra"/>
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