

UNL.BR: WORKING AGAINST DIGITAL DIVIDE

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I) UNL: HELPING THE GLOBALIZATION OF KNOWLEDGE

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ABSTRACT

There has been a real revolution in the infrastructure of information access – the distance has shortened and the global communication has become more dynamic. A great problem remains, however: translating from one language to another. Several systems have been developed to extinguish the language barriers, but they were still based on a given language and the linguistic – semantic issue was also present. The UNL arises as a common language for all computer systems and programs, in other words, as a language for the computers to express information and knowledge written in a natural language. It is, therefore, one of the greatest multidisciplinary projects of knowledge Engineering – to overcome linguistic – semantic barriers and to promote the knowledge globalization.

Key words: Internet, Language barriers, knowledge globalization, automatic translation, UNL system, Knowledge Engineering and artificial intelligence.

INTRODUCTION

Internet has appeared as global information infrastructure, revolutionizing the access to information, by transmitting and receiving information rapidly.

With the electronic mail technology, people can interact in a fast and even efficient manner, regardless the distance. There is no obstacle to the information access by the web users. However, a great concern remains in communication (exchanging ideas, information, contents, knowledge, etc.) in

one's own language, in other words, translating from one language to another. That has become a great challenge for the Knowledge Engineering ¹ professionals and for communication itself.

With the advent of computers, researchers and entrepreneurs, specially in the Knowledge Engineering field of study, have worked to develop a system that would overcome or, at least, minimize the linguistic – semantic barriers in global communication. Many different systems were developed, by several organizations. However, every one presented a given language (English, French, etc.) in its depiction and did not handle the linguistic – semantic issue. Such unique system compositions resulted in an incompatibility among systems, making it impossible to break the linguistic – semantic barriers around the world, for the results are combined into a system which contains a default based language.

This way, with the objective of overcoming or minimizing the linguistic – semantic barriers in global communication (specially, the on line communication), since previous attempts have failed (for they did not consider the linguistic – semantic issues), the UNL concept arises as a common language for all computer systems and programs.

UNIVERSAL NETWORKING LANGUAGE – UNL

The UNL System aims a higher speed, ease and perfect understanding in the flow of information and, as a result, optimizing the international relations. As an example, due to the global economy, information “*IN REAL TIME*” is expected in the near future, as currently preconized.

¹ Knowledge Engineering is a term used to describe the global process of development of a specialist system (SS). It involves a special form of interaction between the SS builder, called Knowledge Engineer, and one or more specialists in some area.

The process of knowledge Engineering objectives to capture and incorporate the fundamental knowledge of a domain specialist, as well as his/her prognosis and control systems. This process involves the gathering of information, the domain familiarization, analysis and effort in the project. Furthermore, the accumulated knowledge must be codified, tested and refined.

Acting as a tool for universal translation, UNL will be facilitating the communication interface between peoples of different languages, through the net. The results from previous researches may be used in present researches and may also straighten solid structures of future research projects.

UNL may be defined as an electronic language that makes the communication in different languages possible, accelerating the elimination of language barriers. It is, therefore, a language for the computers to express information and knowledge in a natural language.

The UNL system is an information system composed of a deconverter, an enconverter and a viewer, placed on the web, compatible with the international network standards. It can also be named a digital inclusion project; researchers and developers network (that is how the internet was created, restricted to a small group of people, specialists, etc.); greater mapping of the human language in all its history; and, one of the greatest multidisciplinary projects of Knowledge Engineering in the world, along with GENOMA² and SETI³.

Briefly, the *UNL System* can be represented as follows:

UNL Tool	- <i>Universal Word's</i> (UWs) – Dictionary of simple and compound concepts; - <i>Relation</i> – connection between two UWs; - <i>Attributes</i> – used expressions that describe the sentence subjectivity; - <i>Knowledge Base</i> (KB) – Set that defines possible relations which will give a possible meaning (a semantic
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² The Project GENOMA (genetic inheritance received through the fertilization of each of the progenitors) seeks the identification of all the approximately 30.000 Human DNA genes. That way, it hopes to determine the sequences of 3 billions chemical connections that constitute the human DNA.

³ SETI (Search for Extraterrestrial Intelligence) is a scientific experiment project developed by the University of Berkeley, that uses computers connected to the internet, around the world, in search for extraterrestrial intelligence.

	meaning, that is).
Server Language	- <i>Deconverter</i> – language generation system (software, generation rules and native language dictionary); - <i>Encoverter</i> – UNL generation system (software, analysis rules and dictionary).
Tools for UNL	- <i>UNL Editor</i> – it produces a document in UNL using its own language; - <i>UNL Proxy</i> – it is a special type of http (hypertext pages accessed on the internet) server (the machine which provides information, access, etc.) which works inside a firewall (protection that allows authorized access only). A Proxy server makes all web pages available in every language supported by UNL. <i>UNL Viewer</i> - a viewer, placed on the web, compatible with the international network standards.

Ex: A monkey ate bananas.

eat – agt → monkey

eat – agt → banana

agt(eat(icl>do).@past@entry,monkey(icl>mammal))

obj(eat(icl>do).@past@entry,banana(icl>food).@pl)

Briefly, UNL is an application that allow the conversion from one native language to a set of semantic relations, which will further allow a new conversion to another language.

UNL AND ARTIFICIAL INTELLIGENCE⁴

The Artificial Intelligence is a knowledge domain being widely used today. It is, on one hand, a science that seeks to study and comprehend the intelligence phenomenon, in other words, it tries to comprehend the nature of intelligence itself; On the other hand, it is a field of Engineering, for it seeks to build instruments to support human intelligence.

The artificial intelligence is still the search for the way human beings think and modeling that in computer processes trying to build a body of algorithmic explanations of the human mental processes. This way, what distinguishes artificial intelligence from other fields of knowledge is its emphasis on elaborating theories and models of intelligence, such as computer programs.

The human knowledge representation in computer systems has been one of the objectives of artificial intelligence for a long time, for the definition of being intelligent is manipulating knowledge, recognizing symbols and facing a problem, being able to solve it.

The best human knowledge representation in a machine implies a more coherent raw data that will serve as a basis for the search of the solution of the problem. That way, the better and more perfect the representation of the problem, data base and solution, the better will the program comprehend what the users intend from it. The representation shall comprehend the solution of the problem.

For the use of a knowledge body in a machine, it is necessary to choose a way to represent it. When a program is installed in a computer, one may say the computer acquired the respective knowledge. This way, in artificial

⁴ For E. Charniak and D. Mc Dermott, "Artificial Intelligence is the study of the mental faculties through the use of computer models".

intelligence, the term “knowledge” means the information a computer program needs to behave intelligently. The attempts to enhance the computers intelligently have been highly compensating.

They have confirmed the unbelievable quantities of knowledge the human beings use in their daily activities, such as decodifying the meaning of a spoken line: “The computer can not entirely decodify nor work with sentences like ‘Mr. Almeida is in São Paulo.’ Without recording first an infinity of information such as ‘When a person is in town, his/her left foot is also in town’”.

In the future, the computer will need to be able to process knowledge. Such knowledge, processed by the computer, shall assume forms of human judgments and thoughts, using human knowledge. The knowledge is processed from data, information stored in its memory. Computers must have knowledge in order to process knowledge.

Therefore, it is necessary for the computers to have a language in order to process knowledge as the humans do, from elements already memorized. The UNL, this way, is a language that helps computers to obtain knowledge. It can express knowledge through a natural language.

CONCLUSION

With the aid of the UNL System, it will be possible to accumulate knowledge in the computers (providing easy access with the advantage of translating to the natural language, making the communication and, consequently the information, easy) in a similar manner to the gathering of knowledge in libraries. In other words, UNL, as a knowledge language for computers, will allow computers to have knowledge and process contents as humans do.

On the other hand, as means of translation, conversion and gathering of information, the UNL tool will soon be a technology reference in service of communication (efficient and easy), breaking language barriers and pointing horizons for a better integration and/or globalization of knowledge.

UNL, in respect to access and knowledge precision, will dispose, in natural language, an enormous variety and/or diversity of information. Not only the time, but also the cost of access to that information shall be noticeably reduced, for there will be softwares in a language for computers. However, the computer will only need to interpret the instructions written in the language in order to perform its functions.

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II) OBJECT ORIENTED MODELING APPLIED TO UNL

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ABSTRACT

During the last few years the Internet has emerged as one of the main channels for communication and access of information. The number of people getting connected and the interchange of experiences at all knowledge levels have grown at incredible speed, but yet, along with the advantages of a rapid access at long distances, comes the difficulty of communication due to the language barrier. The UNL (Universal Networking Language) has appeared as a way out to the minimization of this problem. Along with UNL also came the need for new projects that may turn feasible the use of this technology through the WEB. In this paper we present a way of using object oriented modeling in order to organize and better understand the basic elements of UNL from a computational point of view.

Keywords: UNL, Object Oriented Modeling.

Introduction

From among all emerging social problems, digital inclusion has stood out during the last few years as a topic for discussion among those who search for equal opportunities for all citizens. The final document issued at the Workshop for Digital Inclusion in 2001 [4], concludes that digital exclusion deepens social and cultural exclusion since those who have no access to the new technologies and means of knowledge, will find themselves less prepared to live with and get adapted to the new social processes. Digital inclusion should therefore guarantee equal opportunities for all.

The reality of computer technology in the world is still a privilege of a few. Statistics show that the gap between those who are connected and those who don't even have access to a computer will continue to grow. According to data from Internet Business [1], 41% of all Internet users in the world are concentrated in the USA. Asia, in spite of having the greatest part of the world population, represents only 20% of all internet access, and Latin America, ridiculous 4%.

Besides the problem of access to technology, there is also the problem of language, which constitutes one of the main barriers for a greater dissemination of web usage. This is due to the fact that most of the information on the internet is only available in English. As an initiative to reduce this problem, UNL (Universal Networking Language) is presented as an artificial language whose goal is to allow translations between natural languages without the need to use an intermediate one, like English.

Until now, the main concerns with respect to UNL have been the questions regarding language and the definition of its structures, leaving the computational view of the problem more as a background study. In this paper, we intend to present some suggestions on how to model the basic structures of UNL as to better visualize and understand its elements, following an object oriented approach.

Basic UNL concepts

UNL is an artificial language for computers in the form of semantic networks used to express any type of information. It is made of Universal Words (UWs), relations, attributes, and a Knowledge Base (KB). The Universal Words are themselves the vocabulary of the UNL, relations and attributes constitute the syntax, while the Knowledge Base constitutes the semantics [5].

Relations

Being that relations and attributes constitute the syntax of the UNL, it is by means of relations that complex ideas can be expressed, and hence, texts

and sentences elaborated. Relations are represented by labels that bind two or more UWs. Labels are represented by strings of 3 characters or less. The following constitutes an example of a relation: agt(agent). Here, we define a “thing” which starts an action. Its syntax is agt(do,thing), where “do” is an action and “thing” the agent that executes the action. A practical example for the sentence “John breaks” is agt(break(agt>thing,obj>thing),John(icl>person)). The UNL presents a variety of around 42 types of relations which represent all possible associations between Universal Words. The UNL also tries to cover all the expressions necessary for any type of message that may be wished to be transmitted.

Universal Words

Universal Words may represent either simple or compound concepts. We have therefore two types of UWs: simple “UWs”, describing simple unit concepts, and “Compound UWs”, which are compound structures of binary relations grouped together. A UW is made up of a string of characters (in English) followed by a list of restrictions, or Constraint List. A basic UW corresponds to an English word, while a restricted UW represents a more restricted or specific concept. For example, if we take the basic word “state”, we may restrict it to more specific meanings by associating constraints to it, such as: state(icl>express), denoting an action that expresses something, or state(icl>country), which denotes a nation or country.

Attributes

Attributes are used with UWs to describe the subjectivity of sentences. They show what is said from the speaker’s point of view. This type of information may include things like feelings, attitudes, references or the moment in time when the sentence occurs. With attributes we can give more meaning and details to the message being presented. Attributes are always connected to a UW and we can have several attributes for one same word in one single UNL expression. For example, if we take the UW “eat” and associate to it the attribute @past, we will be expressing that the action of eating happened in the past. The time represented by attribute does not represent a verbal tense (like

ate or was eating), only the moment in time with respect to the point of reference.

Dictionary

A dictionary of UNL words must be created for each native language which we may wish to make available on the web, for example: Portuguese, Japanese and German, among others. Linguists are responsible for the association of words (or radicals) and expressions of each language with the Universal Word (UWs). They must also inform all the grammatical attributes such as morphology, verbal inflexions, semantics, etc. which will make possible the translation of UNL expressions to a native language and vice versa.

Knowledge Base

The Knowledge Base (KB) is a hierarchic set of UNL expressions (UW, relations) that make up the UNL semantics. The categories of the KB allow for a better contextualization of words within a certain concept hierarchy. In this way, the word or expression that best fits to a certain translation can be found. The present categories of the KB are: thing, do, occur, be, aoj>thing, mod<thing, how.

Object Orientation

The Object Oriented paradigm has been consolidating itself during the last few decades as an efficient technique used in the process of analysis and modeling of applications. Rumbaugh [3] defines object orientation as “a new way of thinking about problems with models organized around real world concepts. The main component is the object which combines structure and behavior in one single entity”.

The main concept in object orientation is the object itself, which represents one specific occurrence or instance of a class, corresponding to something abstract or from the real world. Objects are made up of attributes, that is, information or data. Objects are also made of the operations or methods that can be executed upon them. For example, considering the object “ball”, we may specify information (attributes) about it such as color, size, material, etc.

On the other hand, we may also say that our object “ball” is capable of rolling, bouncing, being thrown, etc. (methods).

Objects can be classified considering their common characteristics (same attributes and methods). This represents the concept “class” of the object. Objects or classes may be associated with one another, forming networks known as Class Diagrams or Object Diagrams. A Class Diagram represents an abstraction of a system or concept which is desired to be modeled and understood. There are several types of associations between objects and/or classes, for example: specification, generalization, aggregation, simple association. We do not intend in this paper to enter into details of these concepts. These can all easily be found in the specialized literature.

Graphically, an object or class is usually represented with a rectangle divided into three sections: name of the class, list of attributes, and list of methods. The associations are defined with lines connecting these rectangles and, depending on the type of association, some symbol that may represent it. In this paper we shall use the UML notation for class diagrams [2].

An Object Modeling Proposal for UNL

The KB and the native words dictionary are both currently implemented in the computer in the form of sequential files [6], which is not an efficient method to access data. Knowing that the amount of gathered information will surely increase at amazing speed as applications for UNL are developed, the need appears to review the way in which this information is to be stored and retrieved by using more powerful computing tools. The use of an object oriented data base, for instance, is one of the possible solutions.

The object paradigm can be applied to any type of system or concept. It is thinking like this that we pretend in this chapter to present an initial proposal for the modeling of the basic UNL elements, seeking to obtain a diagram that may represent them graphically. This would surely facilitate its understanding and would also serve as a starting point for its implementation. **Erro! A origem da referência não foi encontrada.** shows a class diagram that represents the

UWs, including the possible classifications of the KB, that is, how the UWs can be classified according to UNL definitions. The concept of inheritance applied to UWs, according to the KB, can be desirable when we come to give more details on relations, since these define the types of UWs that can be associated. UWs are, by definition, composed of a HeadWord and may or may not be restricted by means of Constraints, associating a more specific concept to it. Constraints, in turn, are composed of Relation Labels associated to other UWs.

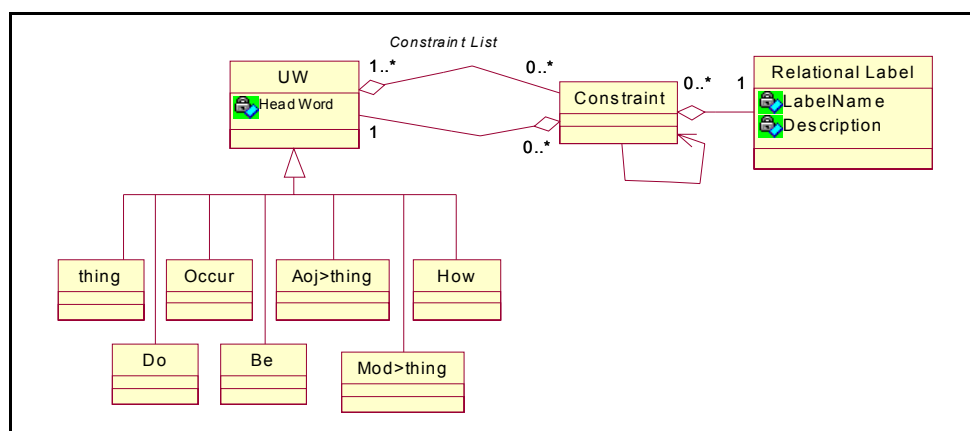


Figure 1 – Class Diagram of Universal Words (UW)

In **Erro! A origem da referência não foi encontrada.** we show a proposal for the modeling of a complete text in UNL. A text is made up of sentences, which in turn is composed of UNL binary relations. Relations associate two UWs, which in turn may have a series of attributes that will give them more meaning in the sentence.

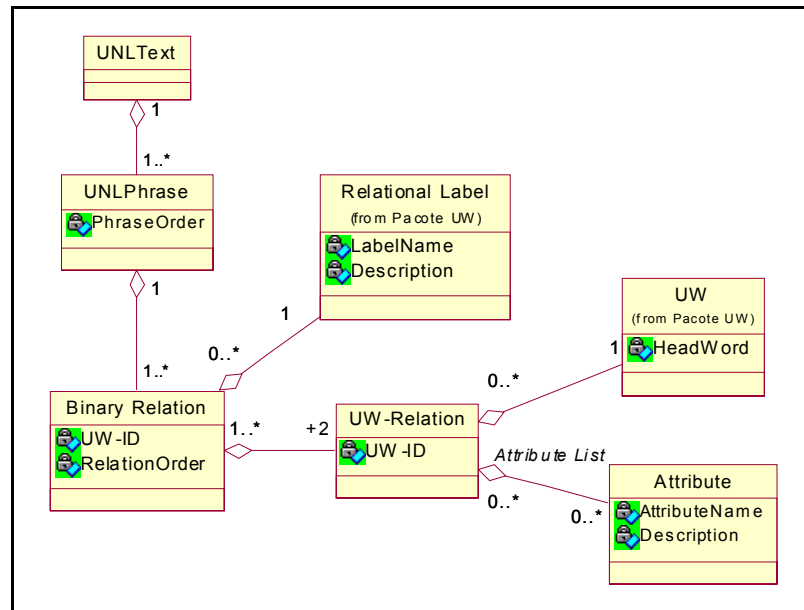


Figure 2 - Text Modeling with UNL

But, to use this model, we still have to include some restrictions between the Relational Labels and the UWs. This is due to the fact that for each type of relation the types of UWs that can be related together are well defined in UNL. This problem and other details like this one will remain to be treated in a revision of the models we have just presented. We suggest for this matter the collaboration of researchers on UNL that possess knowledge on object oriented programming.

Conclusion

The UNL appears as an artificial language that pretends to substantially increase as well as to improve the quality of communications among people from different places and of different tongues. It is not only concerned with serving as a mere tool for translations. It also seeks to put built-in knowledge into the process of interpretation of texts, preserving the original ideas.

There is still a lot to be done so that UNL may effectively be used at large scale. In the area of computer sciences, many projects will still appear that may come to use the technology behind UNL or to improve the quality of the information processing. This paper presented some ideas on how the basic elements of UNL could be modeled by means of the object oriented paradigm. Nevertheless, there is still a lot left to detail and specify so that the model may be considered robust and stable.

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III) ELECTRONIC TRANSPARENCY – HOW INFORMATION TECHNOLOGY BASED ON INTERNET STRUCTURE (USING UNL) ABLE TO CONTRIBUTE FOR PUBLIC BUSINESS TRANSPARENCY IN THE COUNTRIES

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Abstract

This article aims to present case studies carry out in the public administration area, specifically in the purchase sectors, in which information technology based on internet

infra-structure makes possible better improvements in the public administration purchase control and strongly contributes for purchase prices reduction and for society monitoring. This creates what is called e-transparency (electronic transparency) with UNL technology allows people to communicate in different languages which is an important price reduction factor due to a corruption indices reduction in this area.

Key words

UNL - The Universal Networking Language consists of a platform to assist the challenge of automatically make information and knowledge available in different languages. It has an electronic language that makes possible express,

store, retrieve, produce, and divulge knowledge in different languages. It is an ONU important contribution helping people communication and access to information and knowledge through automated systems in a democratic way, reducing the digital exclusion. Its copyright was required by ONU, signed by General Secretary, Kofi Annan, who considers it a strategic world issue.

e-Transparency – Transparency in public and private business provided by information technology tools.

e-Business – all buying and selling process of products and services through the internet.

Virtualization – run the companies using communication channels, as the Internet.

1. Introduction

“In many cases that texts seem to be incomprehensible, this derives from the reason they don’t want to mean nothing.” From the book *Imposturas Intelectuais*, (Alan Sokal and Jean Bricmont, 1999, p.48), we do not hope to make this mistake.

The coming of network computers, the micro informatics growing, and the increase of Internet usage, became the word “Virtual” more and more ordinary.

In the global economy era, the economy is not been reinvented, but promoting a commercial revolution. It is not maritime anymore, but it is electronic and requires deep knowledge in navigation and new instruments so that businesses do not failure in the new millennium’s end communication network, the Internet.

Despite it is beginning, the international electronic commerce has more than 200 million internet users, hundreds of billion dollars, and expects to achieve in five years more than 10% of the international commerce.

The different idioms act as a barrier in the businesses, making difficult the international business relationships.

The technological dissemination allows the cultural evolution that is a pre-requisite for the new technologies adoption.

The Brazilian numbers divulged by IDC have shown more than US\$ 3 billion in 2001, and project US\$ 25 billion in 2005. Brazil has more than 12 millions of internet connections, which may represent 24 to 32 millions of internet users. Brazil owns a world record of income tax declaration through the Web, totalizing 90 % of total Brazilian declarations.

As in Brazil as in others countries, the electronic commerce between companies represents 80 % of total volume in internet business.

The electronic commerce have been registered important success cases, as the Eletronic Bidding System -Sao Paulo- (BEC/SP), which has 1200 buyers, and 85 thousand items catalog served by 37 thousand suppliers. The BEC have been provided 22% savings on purchase prices and reduction of buying periods from months to days. The Florianópolis city administration, capital of Santa Catarina State, has 11 thousand suppliers and 10 thousand items catalog, and savings are around 30%. São Luís city, in Maranhao State, has started its public purchase process through the Internet. The Federal Government started to discuss this issue, and is going to launch, with considerable delay, its solution for public purchases.

This article aims to present the technological tools as a support to considerable reduction in the corruption indices in these sectors, if the dissemination and use of these tools are supported by correct politics determinations.

2.WHY UNL promotes e-transparency?

It is extremely important to have friendly and comprehensive systems for the end users so that they can access worldwide information in their mother languages.

The Universal Networking Language (UNL) is presented as a highly important initiative within the scope of actions of the United Nations Organization,

representing a solution to overcome the barriers of linguistic differences. E-transparency asks a language that must be understood in anyplace. With UNL is possible doing that.

“UNL is an artificial language in the form of a semantic network, allowing computers to express and exchange any kind of information. It is made up by: a vocabulary formed by Universal Words (UW); a set of relations and attributes representing the syntax of UNL; and UNL’s knowledge base, which is the semantic of the language.”(*Theiss,2002*)

The representation of information using UNL is done sentence by sentence. The sentence is represented by a hyper graph where the UW are the nodes and the relations and attributes constitute the arcs of the graph. There is at least one binary relation between the UW of a sentence, and the classification of subjects and objects of the sentence is expressed, respectively, by relations and attributes. In this way, a UNL document assumes the format of a long list of relations between concepts.

3. Definition

For this article, electronic business B2G (business to government) is defined as the use of technology to the easiness of public institutions relationship and their suppliers relation, leading to buying process automation followed by productivity improvements (buying prices, bureaucracy, and purchase time reductions), all of that motivated by electronic transparency and allowing a better society control. It is formed by all services and goods flow, the information and the financial processes among buyers and sellers using electronic technology. Through out electronic commerce, businesses between companies are conduct and through out electronic cooperation, information and common objectives are shared. Also, electronic compensation allows finance negotiations on the net.

4. Back ground

In the following quotation, De Masi (1999, p.25) tries to explain in his book *A Sociedade Pós-industrial*, it is not the reality that is in crisis, but our way to understand and evaluate it.

“Noting much have been said on crisis since the promotion of new technologies that eliminate man physical fatigue, increase his memory, calculus and intelligence capacities, help his physical health, improve his knowledge, make possible new perspectives to biogenetics, agriculture, and transportation, and allow, a this time, to transform the employers’ job time into free time to be used in people and society growth.”

Table 1 shows the kinds of public administration purchase, in which may be added the electronic Bidding model, defined by decree 3.697 on 21 December 2000.

Table 1 - kinds of public administration purchases

Procedure	Value	Period	Applicability
<i>Dispensa</i>	R\$ 8,000.00	Not applicable	Anyone
<i>Convite</i>	R\$ 80,000.00	At least 5 work days in advance	At least 3 competitors
<i>Tomada de preços</i>	R\$ 650,000.00	In advance	Recorded competitors
<i>Concorrência</i>	R\$ 650,000.00	At least 30 days in advance	Anyone who meet the conditions

In order to show the “international ranking” of corruption, the results of Annual Corruption Perceptions Index, prepared by Transparency International (TI), are presented (Table 2).

This index consists of “poll of polls” drawing upon numerous distinct surveys, which uses different indices prepared by international consultancy companies specialized in country risks and advices for international investors. These indices are based on surveys that show the perception of national and international business man in different countries. The results were compiled to prepare the Corruption Perception Index by the professor Johann Graf Lambsdorff, of the Göttingen University, in Germany. This index ranges the countries in a scale from 0 (highly corrupt) to 10 (highly clean), corresponding to an average of the different indices used.

In 1995, for example, among the 41 surveyed countries, Brazil held the 36° position, average about 2,70. In 1996, with 54 surveyed countries, Brazil held the 40° position with little better average, 2,96. In 1997, it had some improvement grading 3,56, backing to 36° position, among 52 countries. In 1998, TI had include 85 countries and Brazil held 46° position, average about 4,0.

In 1998, in Latin America, Chile, Costa Rica, Peru and Uruguay held better positions than Brazil, but Jamaica, El Salvador, Mexico, Guatemala, Argentina, Nicaragua, Bolivia, Equator, Venezuela, Colombia, Honduras and Paraguay were in worse positions.

In 1999, the business man Antonio Ermírio de Moraes, in his weekly article in Folha de Sao Paulo newspaper, said that Brazil would face problems in its evaluation due to recently dishonesty events in public management.

The Latin America 2001 report conclusion states the main causes of corruption derives from government no-transparency structures that maintains a law disrespect tradition and the need to finance politicians and money laundering from traffic and other illegalities.

Transparency International – Annual Corruption Perceptions Index *

Country Rank	Country	2001 CPI Score	Surveys Used	Standard Deviation	High-Low Range

1	Finland	9.9	7	0.6	9.2 - 10.6
2	Denmark	9.5	7	0.7	8.8 - 10.6
3	New Zealand	9.4	7	0.6	8.6 - 10.2
4	Iceland	9.2	6	1.1	7.4 - 10.1
	Singapore	9.2	12	0.5	8.5 - 9.9
6	Sweden	9.0	8	0.5	8.2 - 9.7
7	Canada	8.9	8	0.5	8.2 - 9.7
8	Netherlands	8.8	7	0.3	8.4 - 9.2
9	Luxembourg	8.7	6	0.5	8.1 - 9.5
10	Norway	8.6	7	0.8	7.4 - 9.6
11	Australia	8.5	9	0.9	6.8 - 9.4
12	Switzerland	8.4	7	0.5	7.4 - 9.2
13	United Kingdom	8.3	9	0.5	7.4 - 8.8
14	Hong Kong	7.9	11	0.5	7.2 - 8.7
15	Austria	7.8	7	0.5	7.2 - 8.7
16	Israel	7.6	8	0.3	7.3 - 8.1
	USA	7.6	11	0.7	6.1 - 9.0
18	Chile	7.5	9	0.6	6.5 - 8.5
	Ireland	7.5	7	0.3	6.8 - 7.9
20	Germany	7.4	8	0.8	5.8 - 8.6
21	Japan	7.1	11	0.9	5.6 - 8.4
22	Spain	7.0	8	0.7	5.8 - 8.1
23	France	6.7	8	0.8	5.6 - 7.8
24	Belgium	6.6	7	0.7	5.7 - 7.6

25	Portugal	6.3	8	0.8	5.3 - 7.4
26	Botswana	6.0	3	0.5	5.6 - 6.6
27	Taiwan	5.9	11	1.0	4.6 - 7.3
28	Estonia	5.6	5	0.3	5.0 - 6.0
29	Italy	5.5	9	1.0	4.0 - 6.9
30	Namibia	5.4	3	1.4	3.8 - 6.7
31	Hungary	5.3	10	0.8	4.0 - 6.2
	Trinidad & Tobago	5.3	3	1.5	3.8 - 6.9
	Tunisia	5.3	3	1.3	3.8 - 6.5
34	Slovenia	5.2	7	1.0	4.1 - 7.1
35	Uruguay	5.1	4	0.7	4.4 - 5.8
36	Malaysia	5.0	11	0.7	3.8 - 5.9
37	Jordan	4.9	4	0.8	3.8 - 5.7
38	Lithuania	4.8	5	1.5	3.8 - 7.5
	South Africa	4.8	10	0.7	3.8 - 5.6
40	Costa Rica	4.5	5	0.7	3.7 - 5.6
	Mauritius	4.5	5	0.7	3.9 - 5.6
42	Greece	4.2	8	0.6	3.6 - 5.6
	South Korea	4.2	11	0.7	3.4 - 5.6
44	Peru	4.1	6	1.1	2.0 - 5.3
	Poland	4.1	10	0.9	2.9 - 5.6
46	Brazil	4.0	9	0.3	3.5 - 4.5
47	Bulgaria	3.9	6	0.6	3.2 - 5.0
	Croatia	3.9	3	0.6	3.4 - 4.6

	Czech Republic	3.9	10	0.9	2.6 - 5.6
50	Colombia	3.8	9	0.6	3.0 - 4.5

Table 2 - Annual Corruption Perceptions Index

* Ranking prepared by national and international businessman, in a scale from 0 (highly corrupt) to 10 (highly clean). This index is composed of different indices prepared by international consultancy companies specialized in country risks and advices for international investors. In 1998, TI ranking used a minimum of three and a maximum of ten indices.

According to Fernando Dal Piero, in his article *Informação & Corrupção*, published in *Guia da Imprensa*, on June 16, 2000, "Indeed, If we intend to control the corruption, it requires to activate the citizens and companies power, creating a technology society network, in which everybody is able to communicate with producers and receptors of information, establishing transparency in the developed strategic actions aiming at control the sociopolitical system. This depends on website construction and its frequently updated on corruption, observing and promoting how it appears."

Many samples are found around the world, and in Brazil there are pioneer initiatives focusing the network construction on electronic transparency to solve the following problem: the public area purchases used frequently as a way to finance political campaigns in the Latin America countries.

The Eletronic Bidding System -Sao Paulo (BEC/SP), in Sao Paulo state government (www.bec.sp.gov.br) operates since September 2000 and the Florianopolis city electronic purchasing system have started its operation on December 2001. In the first sample, the system results have been showing 22% prices reduction and around 30% in the second one. This derives from transparency applied by the government in its purchase process.

Public Area Cases Sumary

Description	UNIT	BEC-SP	Florianopolis City
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Purchase price decrease (annual average)	%	22,23%	30,00%
Bureaucracy reduction (indirect cost)	%	73,00%	-
Bidding time reduction	%	80,00%	-
Annual purchase volume	Millions	2,900.00	-
Suoliers number	Unit	37,000	11,000
Itens number	unit	85,000	10,000

Table 3 – Practical results on Internet acquisitions

5. Bases

Based on complete revolution new technologies have been promoting in international scenery, agreeing with new economy tendencies and aiming at prepare people and company competitors to act in global market, the Internet business platform was created. Called “e-transparency”, it intends not to have the writing and speaking idioms limitations and expects to have help from public and private companies for its virtualization process. The basic project concepts are:

- To promote transparency in public purchases and public revenue so that citizens can see quotations through the Internet in a universal and democratic way.
- The citizens, using the public purchases site, will have a tool to see from their houses, offices, companies, and public access terminals the purchase process, knowing what is going to be bought, from whom and for what price.
- Purchase savings that can achieve 25% reduction costs in relation to the reference prices.
- Possible warehouse cost reduction, leading to decrease in the numbers of purchased products and in required area and quantity of warehouses.

- Equal conditions to suppliers so that they can attend to public institutions, regardless of the company size. .
- Savings due to less bureaucracy and to a better performance of the buying process, with the possibility to achieve 70%.
- Digital security, since systems can use the advanced security routines available at the software market, such as: password expiration control, login control, cryptography passwords, user changing password, users' block, SSL compatibilities, digital certificate login, integration to a pre-existent single login, access control using profiles, profiles configuration by users and function.

Good results from innovative experiences such as Brazilian Federal Revenue and Customs Secretariat have stimulated the sector initiatives. Just in the last year, 11 million taxpayers have sent their income tax through the web, unequivocally demonstrating if the system works, people use it. Just on administrative expenses, the Federal Government spends R\$ 11 billions. The Sao Paulo State buys R\$ 1 billion in materials from 85 thousand items list that includes from coffee to the employers to official cars to the governors. The opportunity to the governments buy cheapest is called B2G (business to government).

In this kind of initiative a tool deserves attention: the Dutch Bidding. It works like this: who buys a big volume defines a maximum price, and his possible suppliers aiming at a big selling reduces their profit margins to overcome other competitors.

When public money is involved, this method can contribute, even indirectly, to a better resources application in the social area. Besides, as a transparency process to all participants and to society, the corruption levels are reduced. There is no place anymore to the "friend in the government", who used to help determined suppliers to sell goods for highest prices.

The possible savings on virtual Biddingss for free bidding items it's just one of this technology advantages. In the system developed by the company

called Paradigma, the BEC's heart, the transparency in the purchase process is one of its strengths.

As the supplier as the government have the easiness to monitor all business. Besides, the citizen is able to access the site and see, at anytime, commercialized items, selected companies, and prices.

These samples have show the government is learning to use the communication tolls derived from internet technology. By giving easy access to public information, the purchase virtual system helps the society to control the government expenses and to monitor the public man honesty. If more and more public institutions adopt this system, it will achieve more people credibility. Although, this question depends on more honesty and political determinations of the government than technology.

6.Method

Based on completely revolution that new technologies have been promoting in international scenery, agreeing with new economy tendencies and aiming at prepare people and company competitors to act in the global market, was developed the project to create an "e-transparency".

The proposal to create an e-transparency, comprises:

- The purchase of products and services must be conducted through the Internet with UNL Technology, using the different business modalities prescribed in law and aiming at transparency and society control;
 - o **Direct purchase:** this modality allows companies to buy products and services directly from certified suppliers. Different items are recorded on the site informing prices, payment conditions, and time expiration dates. The order is placed direct to the supplier. The buyer has the opportunity to evaluate tributary credits according to tax and freightage. The supplier is able to configure

many price lists, according to commercial regions and clients groups.

- **Dutch Bidding** : electronic version of this Bidding model (Open Dutch Bidding, Closed Dutch Bidding, Book Build and Traditional), in which the purchase company has better products and services prices using bids placed by certified suppliers. The participants send their electronic bids to the WBC, which defines at the end of the establish period the best bid.
 - **Products and services quotation:** in this case the company asks for products and services quotations, for each purchase or for predefined time contracts, in which each certified supplier will present its operational, commercial, and technical conditions to answer the quotation, according to buyers parameters. The buyer has the possibility to analyze the tributary credits and the transaction financial costs and also to save the information in a database and asks for new quotations.
-
- The strategies and decisions will be supported by a specialized toll, - Business Intelligence, and integrated to internal management solutions (ERP) and clients management (CRM). This allows understand and analyze the information contributing to modern management.
 - The training and competence development are going to use distance learning tools, promoting the employers certification on different IT tolls used in the company. The UFSC/PPGED has international know-how in distance learning and e-learning, by video-conference or by web, including more than 300.000 trained people.
 - The ERP system, using purchase needs generated module, will be internet integrated to process the product/service purchase.
 - The purchase sector sends the quotations to the different certified suppliers on the site and the suppliers answer to them.

- Through the system the best quotation/bid is selected and sends as an order to the supplier. The ERP system integrates the order so that receive the pre-processed invoice, using the WebEDI tool.
- The payment gateway between companies is started (B2B). The payment system is notified as well other modules involved in payment process.
- The finance agent integration will be supported through the Internet, in a safety, quickly, and cost effectiveness way.
- The project intends to buy and sell to internal and external markets, working on UNL platform (Universal Networking Language), allowing its usage in all countries and by different financial institutions. A foundation coordinates the UNL, base in Genebra, called UNDL Foundation, under United Nations supervision.
- The UNDL Foundation has trusted to Production Engineering Pos-Graduation Program of the Federal University of Santa Catarina State, the construction in 2002 and 2003 the first important applicative based on UNL:
- Finally and most important, the creation of a database to be applied in private and public companies, aiming at helping them to access the digital environment, contributing to transparency, society control and their own productivity, through purchase prices reduction, bureaucracy reduction, and purchase process quickness.

6. Conclusion

Nowadays, the information technology allows an easy access to different computational systems and consequently promotes transparency to different communities. No doubts, the Internet is a toll that brings information to people and UNL technology allows people to communicate in different languages.

The progress obtained so far in the development of the UNL language allows us to say, with justified optimism, that the barriers of universal communication

start falling and in a short period of time the linguistic differences should not be anymore the obstacle for an efficient interchange between all the people of all languages and regions of the world.

It is extremely important to have friendly and comprehensive systems for the end users so that they can access worldwide information in their mother languages, allowing them to monitor international financial transactions, mainly that ones related to public administration, which are so important to people's life.

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IV) UNL – LANGUAGE OF THE FUTURE

Gladis de Moraes Maciel

Key words: Language, Human, Machine, Translator, Universal.

1. Overview

A competent human translator will always be superior to both the machine translator and the UNL which, here, is basically analysed more like an almost ideal improved machine translator than a Universal Networking Language. Highlighting the latter's relevant semantic approach is inevitable. However, caution is needed in case one tends to join many researchers' belief that it someday may have a great performance in paragraph and text level as it seems to have in the sentence level .

The human translation is by far the best kind of translation one can use as a means to understand and communicate with foreign people. However, this person must be competent in both languages besides knowing enough about the target language culture. An unskilled translator can do a poor translation job but he/she can at least apply their knowledge of the world (also known as tacit knowledge) to infer meanings that may be taken for granted even though they are not present at the surface structure.

Supporting this view, there is a letter written to the President of the United States, Bill Clinton, by the President of the American Translations Association on January 31, 2000. He starts by saying that the market for language services is booming and that the number of translators and interpreters is increasing every day. Finally, he completely blows up all the president's possible expectations as regards the prospective success of machine translations by respectfully disagreeing with the president's

expectation of the development of a miraculous translator machine.

“After listening to your State of the Union address on Thursday, our members have asked me respectfully to point out to you that while technology has produced many marvels, machines that “translate as fast as you can speak” are still a long way off. As you know from your work with interpreters in high-level meetings and negotiations, it takes experience, knowledge, native ability and training to interpret foreign languages correctly. Despite the increasing compactness and cleverness of all the computing devices now on the market, human speech remains something that can be interpreted correctly only by human beings”.

According to him, machines to translate speech instantaneously have been predicted for over fifty years, and yet nothing can replace the truly accurate, nuanced job that a trained human translator produces. He finishes by requiring the President to tell the American public what a tricky, challenging and high-level task every translator and interpreter engages in when he or she sets to work. Also, he asks him not to build false hopes by talking of “machines that are still, unfortunately, in the realm of fantasy-land – where they will remain for the indefinite future”.

2. The dream of translation

Undoubtedly, the President of the American Translations Association does not share Steve Silberman’s view in an *Awired* Special Report on May, the eighth, 2000, on the future of translation where he predicts that “instantaneous MT will arrive in less than 10 years, as humans coevolve with the technology and adapt to its inherent weaknesses” (Silberman, 2000). He believes a Net that doesn’t speak English as its default language is coming soon, and a machine translation will be one of the best ways to deal with multilingual overload – if we can make it work. Probably he together with the president had a similar insight in predicting the development of something like the UNL.

Anyway, *Translating* is not an easy task even for human translators. The human brain which contains 100 billion neurons and 1,000 billion (trillion) glia, is

seriously challenged by the process of translation. To properly connect all these neurons and use the right glia, the human spends years just learning to speak. Then, in school and from his environment, the human learns the vocabulary and grammar of his language and the nuances of meanings. For a person to translate to a foreign language, he must have similar capabilities in the second language. The task is not really an easy one but it can be accomplished with patience and competence whenever the need justifies such effort.

To reduce the load of human translators, machine ones were developed instead, since the formers take a long time doing what unavoidably may be considered a pleasant but very hard task.

In Silberman's words, Clinton isn't the first to be seduced by a vision of *Star Trek's* Universal Translator brought down to Earth.

"The dream of translation by computer is older than the high tech industry itself. Before email, before word processing, before command-line interfaces, **machine translation** – or MT – was one of the first two computer applications designed to act upon words instead of numbers (the other was code breaking). By **1959**, MT had already become a thriving field of commercial and academic research". (Silberman,2000)

Machine translators are said to be of sufficient quality and are generally useful and effective for certain specific applications like technical or scientific texts of restricted subject areas. These texts have a more repetitive, and usually monotonous vocabulary, and need to be so because they are to explain about concepts and procedures which can not be misunderstood. As a matter of clarification, let us imagine someone being misled by the complex content of a manual. This might possibly damage a very expensive machine or render the user with the risk of dying.

The MT same effective performance can not be said about texts of general content where the language is much more elaborated and varied. Therefore, it is subjected to subtle and relevant ambiguities where no grammatical or morphological rules or patterns can solve unless a rich semantic code could be applied as a better attempt to tackle this puzzle. On the other hand, let us not forget to remember that most machine translator systems, as

for instance the one at www.freetranslation.com, often warn their customers that they offer rapid translations where one can get the “gist” of a foreign language text or web page. Others emphasize that they are concerned with a quick way to come to terms with a foreign text rather than committed with literary beauty. The site ‘www.mezzofanti.org’ states very clear their staff’s position and even suggests their users should ask for help. “...we’ll give you the main message of the entered text, commonly with some flaws (when translation accuracy is important, we suggest hiring a professional human translator.”. Another site takes advantage of its machine translator’s severe shortcomings to persuade their users they should spend some more money if they search for a very good translation work. “Have this text further clarified by a professional human translator for: \$31.00USD”(www.worldlingo.com/wl/Translate). The one called Systran seems to be more optimistic as it offers bronze, silver and gold types of translation. The ad for the gold sort says: “Systran Links Gold – Website translation. Translate web content, eCommerce applications, chat forums, email, SMS and WAP services”(www.systranlinks.com).

Associations like (AMTA) Association of Machine Translators of America and (EAMT) The European Association for Machine Translation argue that although there is no question that a human translator should be chosen for an important piece of translation work, machine translators can be useful to get a rough idea of the meaning of a letter or document.

There is no better proof of the limitations of machine translators than the ‘medicine’ they prescribe when dealing with their software. This medicine, disguised as guidelines, is read like ‘Tips for better translations!’. Among some of them we have: keep it simple, no slang and clichés, do not use contractions, check your spelling & grammar not to mention the most crucial one that suggests the user ‘to check with a native’. It goes like that: “Whenever possible (especially when the text is important) check with a native speaker that your translation is correct.” (site unknown). This possibility as well as availability generally seems too remote to be considered a viable way out.

Corporations that offer the service of ‘best human translators’ use the strong argument in their favor that at best, translation software is about equal to

the linguistic abilities of an average 5 year old child . The more complex the topic, the worse the translation will be, guaranteed. Therefore, it is not enough that any popular computerized “web page translator” gets the gist of a text or message when it involves an enterprise’s reputation or the risk of having portrayed a distorted image of your business.

3. Conclusions

In his dissertation, **Why Can’t a Computer Translate More Like a Person?**, *Alan K.Melby* emphasizes that computers don’t think about what they are translating. They only mechanically pick up a translation for each word of the source text without understanding what they are doing and without considering the context. For this reason they may never be compared to Human Translators. He shows great surprise in knowing that “some believe that there is no fundamental difference between humans and machines”. They assume that

“The quality of machine translation will someday rival the quality of human translation in all respects. (...) Furthermore, they take it as obvious that the human brain is ultimately a type of computer. From this basis, they conclude that it is just a matter of time until we have a new kind of computer that will function like the brain, only faster and better, and will surpass the capabilities of humans in the area of language processing”.

Professional human translators can produce excellent translations from various sorts of texts while machine translators can only do a reasonable job when dealing with highly technical texts treating a very narrow topic in a rather dry style.

As a last and strong statement, it may be said that the Universal Networking Language is currently the only device (or tool) that may really, in the long run, help the man in his meticulous task of translating texts but will never be able to replace him. When achieving this goal, it will then, and only then, be considered a real natural language.

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V) OVERCOMING THE BARRIERS OF LINGUISTIC DIFFERENCES

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ABSTRACT

In this paper we analyse the new paradigm represented by the Internet as a global means of communication and the linguistic differences as an obstacle to the increasing demand in international interchange. The Universal Networking Language (UNL) is presented as a highly important initiative within the scope of actions of the United Nations Organisation, representing a solution to overcome the barriers of linguistic differences.

Key-words: Internet, linguistic barriers, automatic translation, UNL system.

INTRODUCTION

Although we know there are so many different ways of communication between living beings, spoken and written language is the most common way and the basic tool used for communication between human beings.

As a result of the geographic dispersion of the origin of people, each one of them has developed its own linguistic code, which later on became an obstacle when they started to move beyond their boundaries seeking integration with other people. The differences between the various linguistic codes, in terms of spoken language as well as written representation, configure a barrier for communication and integration of people from different regions.

Challenging these barriers, it is noticeable an ever more intense movement towards integration. The huge technological progress reached by the human being, especially in air transport and in telecommunications, has accelerated the globalisation process and it is turning more and more frequent the interaction between representatives of different people and different cultures.

The barrier of linguistic differences has an important impact on the efficiency of cultural, scientific, technological and commercial interchange; that is why it has grown so dramatically the demand for learning foreign languages. Otherwise, the great potential of information technology started to be exploited in order to help people to overcome the barrier of linguistic differences and a number of automatic translation tools have come out.

However, the Internet revolution over the last decade of the 20th Century has created a new paradigm in the process of global communication, which gained a new dimension in terms of speed and reach. And what can be realised is that the need of efficiency in Internet communication has maximised the problem of linguistic barriers, leading to research efforts from the scientific world seeking new solutions to overcome those barriers.

LINGUISTIC DIFFERENCES

During the process of developing automatic translation tools, people realised that it is very complicated to apply a systematic approach onto the constitution of a language. Given that there is a clear similarity between the European Languages, it was not difficult to design automatic translation systems for those languages, although their development have taken many years.

However, the task becomes much more difficult when dealing with a pair of languages with different origins, for instance the Chinese language compared to the European languages: in this case, the structure of vocabularies and grammar are significantly different. And these differences have to be carefully analysed during the design phase of the development of automatic translation systems.

Table 1 shows some of the main features of European languages and the Chinese language, according to studies performed at the Tsinghua University⁵, in China.

<i>European Languages</i>	Chinese Language
Thousands of words constructed with a limited alphabet.	Words are constructed with thousands of characters
When forming a sentence, words are separated by spaces	No spaces between words and characters in a sentence
Morphological rules may change words	There are no morphological changes
Nouns are differentiated by gender	There are no gender differences in nouns
In a sentence, an article is used before a noun	Quite few usage of articles before nouns
Time and location adverbial modifiers appear at the end of the sentence	Time and location adverbial modifiers appear at the beginning of the sentence
Few usage of classifiers to modify nouns	It is usual to modify nouns with classifiers
Subject or object modifiers are usually placed after the noun	Subject or object modifiers are usually placed before the noun
Tense and voice are explicitly expressed	Tense and voice are implicit

Table 1 – Main differences between Chinese and European Languages

OVERCOMING THE BARRIERS

The explosive volume of information circulating on the Internet and the consolidation of electronic messages (e-mail) as a communication means between people all around the world are leading to an increasing demand for

⁵ WONG Fai, MAO Yuhang, DONG Qingfu, QI Yihong. In: **Automatic Translation: Overcome Barriers between European and Chinese Languages**. First Conference on Building Global Knowledge, 2001, China.

translation systems to surmount the communication barrier affecting Internet users from different nationalities. A number of such systems have already been developed and each one brings its own representation of a given pair of languages, what makes those systems not being compatible to work in an integrated way.

With the objective of overcoming that kind of restrictions and obtaining a universal automatic translator on the Internet, the United Nations Organisation (UNO) has been promoting over the last five years studies and research undertaken by scientists from seventeen different research centres around the world. The project was built on the concept of having a common language for all types of computer systems and it was named UNL – Universal Networking Language. The project is co-ordinated world-wide by the UNDL Foundation (www.undl.org), based in Geneva (Switzerland).

The progress obtained so far in the development of the UNL language allows us to say, with justified optimism, that the barriers of universal communication start falling and in a short period of time the linguistic differences should not be anymore the obstacle for an efficient interchange between all the people of all languages and regions of the world.

WHAT IS UNL ?

UNL is an artificial language in the form of a semantic network, allowing computers to express and exchange any kind of information. It is made up by: a vocabulary formed by Universal Words (UW); a set of relations and attributes representing the syntax of UNL; and UNL's knowledge base, which is the semantic of the language.

The representation of information using UNL is done sentence by sentence. The sentence is represented by a hypergraph where the UW are the nodes and the relations and attributes constitute the arcs of the graph. There is at least one binary relation between the UW of a sentence, and the classification of subjects and objects of the sentence is expressed, respectively,

by relations and attributes. In this way, a UNL document assumes the format of a long list of relations between concepts.

It follows an example of a phrase, originally written in Spanish, represented by the UNL language (as a list of UNL concepts).

“Hace tiempo, en la ciudad de Babilonia, la gente comenzo a construir una torre enorme, que parecia alcanzar los cielos.”

```
{org:es}
Hace tiempo, en la ciudad de Babilonia, la gente comenzo a construir
una torre enorme, que parecia alcanzar los cielos.
{/org}
{unl}
tim(begin(icl>do).@entry.@past, long ago(icl>ago))
mod(city(icl>region).@def, Babylon(icl>city))
plc(begin(icl>do).@entry.@past, city (icl>region).@def)
agt(begin(icl>do).@entry.@past, people(icl>person).@def)
obj(begin(icl>do).@entry.@past, build(icl>do))
agt(build(icl>do), people.@def)
obj(build(icl>do), tower(icl>building).@indef)
aoj(huge(icl>big), tower(icl>building).@indef)
aoj(seem(icl>be).@past, tower(icl>building).@indef)
obj(seem(icl>be).@past, reach(icl>come).@begin.@soon)
obj(reach(icl>come).@begin-soon, tower(icl>building).@indef)
gol(reach(icl>come).@begin-soon, heaven(icl>region).@def.@pl)
{/unl}
[/S]
```

The UNL system is made up by the UNL language itself, the language servers, and a number of basic tools for visualisation and edition purposes. A language server consists of two elements: the converter and the deconverter. The deconverter is a translation system for creating a text in a given language

based on a text represented in the UNL language. Are parts of the deconverter system: a software, a set of rules for language generation, and specific dictionaries for that language. The converter is a system for generating information in UNL language from a source in another language; are parts of the converter system the conversion software, a set of rules for analysis and dictionaries.

Anyone having access to the Internet will be able to use the UNL system to convert a text written in his/her own language into UNL; likewise, any text represented in UNL can be deconverted into his/her native language.

CONCLUSION

The infrastructure of the global information network is the Internet and UNL is the way to facilitate the communication throughout this infrastructure.

Assuming as right the statement: “Important people say that the wealth of nations will be determined by the access they have to the digital culture”⁶, the completion of the UNL project and making it universally known is a matter of capital importance within the objectives of the United Nations Organisation, while being the promoter of peace and equilibrium among all the nations around the world.

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VI) SEMIOTIC APPROACH FOR THE DESIGN OF ADAPTIVE GRAPHICAL USER INTERFACES USING UNIVERSAL NETWORKING LANGUAGE

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The growing Internet infrastructures are providing a larger platform for communication among people across the world. The technological advances and the socialization of Internet have challenged web developers to search for new strategies to help the communication among people from different countries. It is a fact that a gap exists between the information and culture in different languages. In order to overcome the language barrier, the Universal Networking Language (UNL) emerges as a new technology that can reduce this problem. Furthermore, the ultimate goal of UNL is to expand education and business opportunities around the world, through out a mutual understanding among different cultures based on the translation of the textual media available on the Internet. Although most of UNL infrastructure and architecture is already designed, it is still at an early stage of development. One of the challenges to be achieved during this development process is how to represent the distribution of the same textual content in different languages, considering all the elements of a graphical user interface (GUI). It is a huge step for those who are used to deal with GUI for standard web pages to start working with adaptive user interfaces for different cultures and languages. A GUI that uses UNL technology request a more organized flow to allow users interacts with the application in a friendly and effective way. The author believe that it is possible to generate a framework to UNL GUIs design, based on semiotic studies for standard GUIs design, besides the requirements for the UNL system. Considering that semiotics covers a diversity of sign-usage like images and texts, it is helpful to the task of interface design. In the case of UNL interfaces, it may contribute to the proper

design of text content, textual menus and labels for the navigational task, representing the best way to identify the interface elements meanings for a universal understanding. This work presents a semiotic approach for UNL interfaces and aims to help designers in the creation of more accessible interfaces for UNL applications.

1 Introduction and Motivation

Semiotics have been helpful in providing theories for the user interface design and therefore, it may be helpful in defining the characteristics properties of the UNL system and situating its special interface issues in the context of HCI-systems. Although impressive research about semiotics approaches to user interface design has been made and analyzed, a few number of articles has been leaded, introducing UNL technology in order to give a briefing of its task performance. A sort of consideration has being established, but no position have already been verified about the design of a GUI application that uses UNL technology. This new technology aims to share information and provide a common communication environment for different language, but how to assure that this communication will cover well the diversity of special signage of all the different languages?

The interface between man and computer works as the interaction media that makes possible this communication. Since this communication is basically visual, the graphics have been playing the most important role to the user-interfaces evolution, which migrated from command-line to desktop metaphor, creating the GUI (graphical user interface). To go further, many people expected that “purely visual communication, without the use of words, could become an international auxiliary language, to whom Horn (apud Jacobson, 2000) calls “Universalits”. However, says Horn, purely iconic languages do not usually catch the meaning of the information. In fact, the use of graphics is extremely important to communicate, but the most of the concrete information can only be communicate by textual media. It means that the main GUI

paradigm still remains on the textual capability and that language is an essential factor to achieve that.

According to Andersen [2], semiotics is an abstraction of individual disciplines such as linguistics, art theory, drama theory and film theory. Since it can be considered a “multimedia” discipline and so computers are, it is useful in designing computer interfaces. However, new technologies such as UNL normally have their own unique interface (or communication) requirements, and it takes time to discover what they are. Therefore, a coherent framework is needed to describe them and semiotics can help to achieve it.

Today, any kind of visual and textual information can be communicated to the world through the Internet, independent of the traditional mass media. However, according to Della Senta (1999), at present, most information materials, scientific, technical and educational, are written in English or in few other languages. While this benefits millions of people, millions more are denied access to these information materials, because they do not speak the required languages.

Considering that a UNL GUI must be adaptive, in order to migrate the information in a specific original language to a requested one, it is necessary to study how to make standard GUIs design principles applicable to them.

This paper emphasis is on sharing ideas about a semiotic approach to the development of UNL GUIs, not only as a try to find a solution for UNL interface systems, but as a way to point up a subject that must be more explored in advanced Interface studies: how to achieve an efficient interface design for adaptive user interfaces. The complexity of Adaptive User Interface (AUI) was considered by Wayne Iba, Haym Hirsh, & Seth Rogers in their AUI definition: “We broadly define adaptive user interfaces as any system that is intended to help a user accomplish some task, and that autonomously modifies its behavior as a result of actions taken by the user.”

Among it we believe that the UNL system is a good case to be studied as an adaptive interface, because it introduces a new point of view to this case study: it is not a case that the user, developer or administrator has the power to customize the interface, allowing it to be adaptive, but it is a case in which the

one user must receive the information transformed without be aware of it, necessarily. Facing such fact we believe this article can contribute to the creation of a semiotic framework for UNL applications interface design, as one of the main points for Tissiani's thesis research.

Using the Jakobson's communication model to analyze the HCI approach to interface development, we explain how communication aspects have to be considered by designers of UNL user interfaces.

2 UNL Definition and its Interface Aspects

The UNL is still at an early stage of development and has been rarely found in the literature. A few number of documents were published where authors have described or simple investigate UNL issues. The reason we adopted the UNL as the main topic of this paper is because 1) we believe UNL is an emerging technology that will be largely used in the Web and; 2) UNL applications require user interface specific techniques during the design process.

One of the main purposes of UNL concerns on sharing information and providing a common educational environment across different languages. According to Della Senta (1999) "The Universal Networking Language (UNL) is an electronic language for computers to express and exchange every kind of information. The UNL represents information, i.e. meaning, sentence by sentence." Sentence information is represented as a set of directed binary relations, each between two of the concepts present in the sentence. Concepts are represented as character-strings called "Universal Words (UWs)". UWs can be annotated with attributes which provide further information about how the concept is being used in the specific sentence. A UNL document, then, will be a long list of relations between concepts.

It can be said that its main purpose is create documents in UNL format, as a common language to exchange information through computers and generate the conversion to the natural language, with a high degree of precision. "The UNL system allows people to communicate with peoples of different languages in their mother tongue." (Della Senta,1999).

UNL consists on a UN (United Nations) global project of digital and linguistic inclusion. However, its relevance consists not only in the social aspect, but also in the technological one, since it proposes international standards for knowledge representation. In order to achieve a universal standard for UNL content representation, we propose to review some important semiotics theories in order to motivate a user-friendly interface from the technical processes behind the stage of an UNL application.

3 GUIs and its Aspects for UNL Applications

In order to enhance its use and aesthetic, the GUI may be based on solid interface design principles to provide, otherwise, visual consistency, user control and feedback (Apple, 1996). Besides that, an efficient user interface is the one that allows people to work with the application easily and in an intuitive way, increasing the users satisfaction associated to the work performance (Ambler, 1998).

The first step to achieve a successful GUIs is guarantee its main qualities: the functional and aesthetics ones. The aesthetic aspect has to do with the satisfaction of the user and is largely important on his acting. At the same time, the functional aspect can be understood as the usability aspect, which concerns to the main goal of Human Factors discipline.

3.1 Usability

The usability is described as the main quality of a GUI. Shackel (1993) defines usability as the “capacity of the interface to be easily and effectively used by humans, where ‘easiness’ is related to a specific level of subjectivity of the evaluation and ‘effectiveness’ to a specific level of performance.”

However, the Human Factors discipline proposes several usability related goal, including the ones listed by Shneiderman (1998): proper functionality⁷,

⁷ (Proper functionality): “what tasks and subtasks must be carried out”. Shneiderman (1998).

reliability, availability, security, data integrity⁸, standardization, integration⁹, consistency and portability. The most of these goals depends on common issues to be applied for a UNL GUI. For instance, functionality can be assured by usability conditions, since integrity, readability and control depend highly on a consistent visual structure (Mullet, 1996), as well as we can consider that reliability, availability and security depend on the same. But for a UNL GUI, there must be considered special issues regarding to AUI. In this case, standardization, consistency and portability are not only necessary to cause benefits on increasing the learning times and annoying dangerous errors across different formats, software versions, platforms or hardware Shneiderman (1998). For a UNL GUI, these tasks have bigger responsibilities where 1) standardization is needed to assure a common user interface for the multiple languages that a UNL system can display; 2) consistency is the key attribute that may guarantee the visual unit in terms of layouts, color, typography and so on within the multilingual application and 3) portability is the biggest challenge to be achieve in a UNL GUI, since it refers to the potential of converting data and share the same user interface across multiple application environments.

3.2 Standard GUIs design rules applied to the design of UNL GUIs

Shneiderman (1998) give a tip for user interface designers that is very useful in the case of UNL GUIs design: “try to predict subjective satisfaction or emotional reactions”. It makes us to remind that many users do not approve the idea, that had been implemented by some international websites, of recognizing his IP, carrying out a special website in his/her official country language, rather than the original one. In the case of a website that uses UNL technology, we believe that the user may have the option of visualizing the original website in its native language, as well as in any other language, and not only in his official country

⁸ (Reliability, availability, security and data integrity): “(...) commands must function as specified, displayed data must reflect the database contents, and updates must be applied correctly. (...)Protection must be provided from unauthorized access, inadvertent destruction of data, or malicious tampering.” Shneiderman (1998).

⁹ (Integration): “can be considered the integration across application packages and software tools.” Shneiderman (1998).

one. It implies that the user may have control on what he wants to see and that he will be secure of all its contents, since he will be able to check its consistency.

Control and consistency are only two of the eight golden rules, presented by Shneiderman (1998) based on his earlier studies. We consider that these are the rules that can assure a successful interface. They are used as one of the issues and techniques that are helping in the formulation of the proposed framework that may help the construction of the future UNL GUI guidelines (Tissiani, 2002/1): 1) Consistency; 2) Shortcuts; 3) Feedback; 4) Closure; 5) Error; 6) Reversal of actions; 7) Control; 8) Reduce short-term memory load.

4 Semiotics Approaches to UNL GUIs Design

Considering that semiotics covers a diversity of sign-usage like images and texts, it is helpful to the task of interface design. In the case of UNL systems, it may contribute to proper design and represent its user interfaces for a universal understanding.

Our first observation regarding the semiotics contributions to UNL GUIs design is that UNL system's communication is a special kind of communication, which, in some way, can be more similar to computer-computer communication than human-computer interaction. Likewise, we feel the need to study semiotics in order to reach the right concept of communication for this case: the human-computer one.

The processes of communication that are investigated by semiotics methods are both the representation and the interpretation ones. According to Andersen (2000), the computational context can be analyzed by semiotics through the representations (the algorithms and data structures as signifiers) as well as through the user's interpretation of these representations (user representations and domain concepts as signified).

"Thus, only those parts of the computational processes that influence interpretation, and only those parts of the interpretation that are influenced by the computation, can be analyzed by semiotic methods" (Andersen, 2000).

Therefore, we believe that a semiotic study is quite relevant to the conception of UNL application's user interfaces. For instance, depending on the development of the UWs, its dictionaries and the other UNL components of an application, its content representation can generate different kinds of interpretation by the user. Moreover, semiotics theories can help not only to increase communicate in UNL systems by appropriate HCI techniques but also by an adequate study of its programming. To Philip Armour (apud de Souza, 2001) the software is not a product, but a media, where our knowledge is encoded. We believe that in the case of a UNL system this insight is quite applicable and that it is one of the reasons why we need to study semiotics to improve the power of UNL system's communication.

4.1 A model of communication

Ronald Jakobson proposed a model based on his earlier studies on linguistics that has powerfully affected communication related disciplines since its first publication in 1960 (Jakobson apud de Souza, 2001). In his work he identifies six basic constituent elements of natural communication: 1) sender, 2) receiver, 3) message, 4) context, 5) medium and 6) code.

Using the Jakobson communication model, we observe how its communication functions can be well applied in the human-computer interface design and we propose that some of its functionalities may be better studied and evaluated in order to achieve an interface effectiveness to an UNL system. According to De Souza (2001), Jakobson "called our attention to the fact that natural language can be used to achieve specific functions associated to each one of these constituents". For example, we can use language to check if the receiver and the sender are functional, and so on.

We think that all of this communication functions are pertinent in the case of a UNL GUI. However, in agreement to Scalisi (2001) that proposes in her thesis research "A Semiotic Communication Model for Interface Design", based on Jacobson's model, we consider that the function of the sender must be better

studied in a HCI perspective, specially in the case of UNL interface design. Therefore, we will make a sort of consideration about this factor.

It is a fact that there isn't any communication without a receiver and that the meaning of a message is defined by the receiver's interpretation (Scalisi, 2001). Therefore the receiver plays a central role in our field of research as well as Scalisi (2001) proposes to the field of HCI in general. Since HCI has extensively studied the user as the center of design process, we think we can take their methods for knowing the user and developing his interface in an effective way, like the user observation, usability evaluations, cognitive studies on human understanding, etc.

Semiotic HCI defines interfaces as messages sent by the designers to the users (de Souza, 1993). In the case of an UNL GUI, will the user perceive that the designer is the sender or they will think that the real sender in this communication is the computer? According to Scafisi (2001), "The interface system is a world of signs in which we operate and manipulate, but sometimes computer also "speaks" to us (...) The point is that we should better clarify to the user, through the interface, the characteristics of this special sender (the computer) in order to avoid interaction problems derived from the misunderstanding of the sender's function." Our research aims to point the designer and the computer's function as the sender of the message in a UNL GUI, in order to avoid user's meaning misinterpretation.

4.2 A Propose of an Evaluation Method

According to de Souza (1993), "given the nature of computing machines, we can rightfully expect semiotics to have a word to say not only about HCI, but also about programming and computing as a whole" (de Souza, 1993). Moreover, de Souza (1993) says that the notion of computational communicability is the property of software that efficiently shows to users its underlying design intent and an interactive principle, which means that the designer must efficiently transmit the message to users, allowing then to interpret meanings in a consistent way.

Based on this notion, we believe that the best way to improve our knowledge about the UNL GUIs requirements, in order to achieve a good communication between designers and users, is to propose an evaluation method. This evaluation is based on de Souza's method (2001) and may tell designers how well their message is getting across to users, as well as identify communication breakdowns that may appear during the interaction with an UNL system. "As in most evaluation methods, the test involves a set of tasks, and a digital recording of all users' interactive moves to achieve the goal associated to each task". (de Souza, 2001).

The evaluation may take place within a case study that is to be presented at ICTE 2002 (Tissiani, 2002/2). The case study brings UNL into an application, which has been developed for a Distance Learning course, by both Virtual Reality Laboratory (LRV) and Distance Learning Laboratory (LED) at UFSC.

It has been implemented modules that allow the visualization of the program in three languages: Portuguese, Spanish and Italian. Our future work is to model the evaluation method proposed and apply it to the interface application.

5 Conclusion

By putting in evidence some questions about a semiotic approach to the design of UNL GUIs, this paper aims to reflect on these aspects as the basis for a research project that refers to it. Starting from this questions it is possible to describe a number of issues and techniques that may be considered to help the construction of the proposed guideline. Besides that, the semiotics approach aims to support an effective study of UNL GUI design, in order to guarantee the activeness of usability and the assuredness of the 8 golden rules exposed in section 3. Some of these issues/ techniques that still may be studied are listed bellow:

- **Graphic Design Principles:** Since language can also be considered a graphical media as well as images, the UNL GUI principle may be based on graphical design. Studies on visual communication discipline are essential to assure both the communication from designers to users as well as from the

user interaction back to the system. The theoretical approaches to graphical design include insights on layout, colors, typography, signs and all the specific screen elements common for different languages.

- **Cognitive aspects and Ergonomics:** The study of appropriate colors, fonts, forms, icons and other elements of design that work better as an international standard and that can assure the screen to be easily readable, independently besides helping those who have some visual disability. Visual aspects related to cognition should also be carefully designed in order to obtain a satisfactory rate during the use process.

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VII) VIRTUAL REALITY APPLIED TO LEARNING PROCESS AND ITS ASSOCIATION WITH UNIVERSAL NETWORKING LANGUAGE

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Abstract — The technology employment in education has been an object of study of several researches in this field, mainly because the importance of the utilization of technological resources supports the teaching and learning process. In this context Virtual Reality represents a powerful instrument in the construction of virtual educational environments, in which the way of interaction motivates as well as is familiar to the learner. This research presents a reflection about the availability of the Virtual Reality employment on learning and its association with the Universal Networking Language (UNL), enabling textual communication among students of different languages.

Key words — virtual reality, virtual learning environment, education, UNL.

I. INTRODUCTION

Teaching is not only associated with the transmission and issuing of knowledge. It implies, beyond the knowledge socialization, in the development of the abilities, and the behavior's acquisition, which allows the individuals interaction in the society [1].

The traditional way of teaching - based on the relation teacher-student – does not fulfill the needs imposed by the knowledge era [2]. Nowadays, new abilities have been required on people's formation.

By its specific characteristics, Virtual Reality (VR) contains enormous potentialities that can transform itself in a powerful instrument to be applied on teaching process [3] [4]. It happens because VR presents similar way for those people who learnt how to interact with the material world.

II. VIRTUAL LEARNING ENVIRONMENT

The creation of virtual environment – 3D models from imaginary or real world produced through computers – where the student can move, see, listen, and manipulate objects like in material world, represents an important teaching resource. In these potentially cooperative places, the students are able to discover in an active and entertaining way previous knowledge transmitted only by the teacher [1].

Virtual world can constitute places of discovering and research enabling the experience of new and different realities, in which the rules and the characteristics are outlined according to the objectives aimed by the teacher.

In this way, the teacher takes the responsibility, as agents, making available the information in order to achieve established goals.

The discovery of virtual world provides a creative and interactive adventure where the learning is verified through experiencing. In a virtual learning environment the students are actors.

A. Immersion

The interface's minimization or elimination between the user and the computer – the RV biggest weapon – transforms the user in an intervenient of the actions taken in the virtual environment, evolving her/him in their real world.

Immersed in the environment and having the sensation of real veracity, the students build their knowledge from the virtual reality experienced based on the sensations felt. In this way, the learning process through the student's personal experience becomes richer and at the same time it lasts longer since the personal experiences, which are lived, they are rarely forgotten [1]. The feeling of immersion and inclusion in the educational virtual environment, allows the student the opportunity of interpreting and assimilating the perceptions and paradigms acquired from the experiences, which could not be verified in the traditional teaching environment.

Participating in an exploratory adventure, which calls curiosity, challenge and motivation – main element to the success in any educational context – the student, the student holds inferences, building his/her own, personal and subjective knowledge [5].

B. Interaction

Interacting with the environment, the student can reach answers that are translated into new actions, which can change the state of the

representations in the explored world. From the navigation flexibility and the object's manipulation, the virtual learning environment must have its own dynamic, which allows answering suitably by the movements made by the intervenient. This implies the building of corresponding images to the new points of view, sounds emission and production of touchable sensations that translate the effects of this interaction. The learning process results from the communication, which is established together with the virtual environment.

C. Imagination

In order to accomplish its purpose, the education must stimulate the students' creative potential without limiting or restricting the taken interventions. The VR enables the development of students' imagination immersed in the virtual environment. According to this, the student is able to provoke alterations in the environment and learn from the experience. Similarly the learning also can be achieved by building a new world [3]. In spite of this, the manipulation of virtual environment assumes a natural and intuitive character in so far as some actions can be done as in material world. The VR allows doing what the real environment is not possible, like observing the world from many perspectives, achieving distant or inaccessible places or even controlling time and the material laws, for example.

III. THE CAPACITY OF REPRESENTING VIRTUAL REALITY

The ability of manipulating abstract and multidimensional information is a demand in the academic context. In many areas of human knowledge, such as mathematics, science, engineering and statistics, the student's success widely depends on her/his ability of interpreting abstract thoughts and elaborating mental schemes about previous issues. The disciplines generally

bring invisible factors from untouchable concepts. The inexistence of analogies from the real life obstructs the construction of student's cognitive models making difficult the learning process [4]. Besides, traditional methods of showing and visualizing models and data are bi-dimensional by its nature, though this has been used to describe the three-dimensional reality.

Multiple choices of a virtual environment make easier identification's and relation's patterns from abstract information. The students immerse in VR, who are submitted to learning process, develop their knowledge from the external or internal vision as well as the combination of these two visions that they have from previous phenomenon. In this way, VR does not only enable the students to represent concepts and suitable ideas in the three-dimension, but also, they interact with these representations, out of scale relations, time, distance, and cost, in which they do not have the concepts in any other ways [1] [4]. The visual, auditory, and touchable sensations realized and processed by the student are transformed into information.

IV. EDUCATIONAL POTENCIAL IN VIRTUAL REALITY

The learning process is a dynamic and adaptable process in which the individual's actions can be considerate contextual answers by the interaction with the environment. Consequently, the learning process cannot be conceptualized in terms of acquisition but as knowledge building [6] [7]. The constructivism – pedagogic paradigm that has received special attention from the educators in the last few years and has conquered a huge number of followers – establishes that the learning process results from the building of mental schemes, from the realization of some specified sequence tasks to achieve a specific objective. [8]

The constructivist approach in the learning virtual environment allows the students interaction with objects and spaces provoking creativity and

motivating learning process through an active participation in virtual world. In these constructivist environments the students do not learn a symbol's structure in order to learn the meaning of that structure. They are submitted, if necessary, to the experiment's meaning presented through a symbolic abstraction [9]. The educators, instead of teaching an abstraction, they answer by instructing of how to interact with the environment producing knowledge.

Incursion in a virtual world does not only represent a new experience, but, above all, the beginning of an adventure, which puts together essential ingredients to emotion like the fear by the unknown, the curiosity by the newness, the challenge to the five senses and the intelligence. The grouping of these components associated by the fascination of a world where everything is new, and, nevertheless simultaneously equals to the real world, constitutes the first and determining step to call the student's attention. The immersion of a VR environment means, getting the material contact with the objects, ideas and the concepts, making easier not only the learning process – VR supports the actual learn by doing, based on constructivist theory that points out the human knowledge as an active process [8] – as well as stimulates the development of several capacities and unknown sensations.

It is possible, in a VR environment, to construct a way formed by steps in which barriers are progressively being overtaken, conducting the user to the aimed objective. When the students reach the solution of a set of tasks in a specific subject, they progress to the conceptualization of the world that they were evolved, translating into concepts the concrete experience which they have experienced and the conclusions that they got through after these experiences.

The pedagogic knowledge is also associated by the idea of collaboration [10]. In the constructivist view, the collaborative work gives the opportunity of a collective exploration of a task. This allows appreciation and distinction about the roles performed by the participants in developing the activity and also integrates the students in the society [8]. The VR enables the share of usual

virtual sites, besides of this, it allows the contact among geographically far virtual communities, enabling the change of experiences among student of different cultures.

V. POSITIVE AND NEGATIVE ASPECTS ABOUT VIRTUAL REALITY IN LEARNING PROCESS

What does it make the VR important in the learning environment? What are the implications, in human behavior, in using this technology? And what is the impact about its use in the educational process? [1] [3] [11] [12] [13].

A. Positive Aspects

Virtual learning environment can be completely controlled, in a way that the student will have freedom to navigate through the virtual site, if the application enables it. In case of a limited access in some areas, movements or events, the environment is configured to assure these restrictions. Thus, the student has the contact only with the experience that is aimed to teach, not allowing her /him to take overhasty or out of context conclusions.

Virtual world can be also built with the purpose of being a facilitator mechanism to the knowledge transference through the submission of the training process. In VR simulations do not exist the risk condition observed in real life, which implies the intervenient total security submitted in a possible dangerous situation.

VR gives direct and natural ways to the students interact with the learning environment and the objects immersed in this context. The manipulation in a VR world is based on the reality observation, where the basic rule is that the child submitted through the environment should be able to understand and interact with that world, instead of command lines or clicks on the mouse,

he/she performs simple actions like walking, pointing, taking something or turning. In this way, VR application in education makes sense when what is seen or heard has meaning that does not require explanation. The VR makes use of the phenomenon natural semantics and in general does not make use of representations. Therefore, there is no need of metaphors and the students do not need to transfer what they see or feel in the real world. The world is there, being perceived by them.

The presentation of information in a VR environment admits changes in scale, density, localization, time and distance among the represented objects in the experience. Programmable environments and personalized world adapted to the student's learning characteristics and rhythm can be build by VR's application.

The VR's utilization in an educational context enables total concentration of the student who is evolved by the experience, she/he does not suffer any external factors, enabling the construction of his /her own knowledge.

The interaction with the virtual world motivates the students to participate more actively at the learning process. It is less formal than the traditional classrooms; it is possibly funnier and more realistic. Besides that, each student has unique learning experiences.

The psychological processes in virtual environments are similar to the ones observed in real educational environment.

VR allows the development of multi-sensorial learning environments and the perception of information, which could not be noticed in the real world, like the vision of the invisible and the hearing of the inaudible. In this context, virtual learning environments assume a fundamental role in the integration of disabled people in the society, giving them opportunity of making tasks that were not possible in another way.

The virtual environments also make possible the living of experiences in anytime, not imposing restrictions in the classes' time.

Due the minimization of the symbols used in the virtual world, the student's frustration level is reduced when he/she uses the technology.

B. Negative Aspects

The high cost to the implement of the technology makes impracticable its application in large scale, mainly in primary and high school institutions. In some cases, virtual environments with lower level of interaction are created to get around the shortage of financial resources.

VR can cause psychological damage when it is not well designed or not used properly by people whose experiences were not enough developed.

Several barriers still need to overcome by the virtual environment to get closer to the material world, especially as the ergonomics equipment project and the growth of the world resolution power.

The undistinguishable use of VR can provoke perturbation in student's health like virtual nausea, caused by the stereoscopic vision of the environment.

VI. VIRTUAL REALITY AND THE UNIVERSAL NETWORKING LANGUAGE

Developed in the Advanced Studies Institute of the United Nations University, the Universal Networking Language (UNL) is an artificial formal language based on the semantic nets, designed to allow the multilingual communication through Internet [14] [15].

The UNL represents the information included in the sentences of a document by the construction of an orthography in which the nodes correspond to universal words (UWs) and the relations among these words are represented by the edges.

The UWs' uses and relations express the objectiveness of a sentence; the subjectivity nevertheless is established by associating UWs' different attributions.

One of the biggest UNL applications is to be useful as an inter-language among different natural languages [15], making available several commercial and scientific benefits when it breaks the linguistic barrier that is established among users of computing system linked by Internet.

The VR has been studied for sometime in several countries with educational objectives and, although the reached success, the technological limitations always built an obstacle to its effective application on teaching. Nowadays, by the computing grow, new perspectives come up to VR in education, mainly through Internet where it is observed the presence of virtual multi-users environments.

A virtual multi-user environment corresponds to a virtual place shared by several users who are usually geographically far away and generally, speak different languages. In virtual learning environments, specifically, the user enters in virtual site applications, visualizing and exploring the data proposed by the educator, using her/his five senses. At these virtual environments, each person is represent by an avatar – an object usually in human form – where it reflects its actions. Thus, the use of avatars establishes the communication between teachers and students [16]. Although, in some cases the interaction among participants of a virtual educational application requires textual communication, to exemplify, it can be done through a chat room, the messages exchanged between students or student/teacher, the search of orientation inside a virtual teaching environment.

When the users of different languages will immerse in the environment this communication can be problematic. By this sense, the UNL would be able to eliminate the linguistic gap between students and teachers, enabling an effective learning without communication limits.

VII. FINAL REMARKS

The information technology to be applied in the formal and informal learning processes modifies the education's role in the society, its programs, curriculum and pedagogic performances, changing the strategies and ways of teaching and learning.

The VR allows the student to apprehend the taught subject in a convincing way than if she/he would be only reading or studying about it. Immerse in virtual environment the student participates actively in the experience, enabling her/him to overcome difficulties and changing the way of thinking and learning. In this way, the resulting mistake of the experience, in the traditional teaching system is faced like a stigma, it can be observed like a positive element of personal reflection about the learning process.

The learning process does not mean only transmission and acquiring of information. It also implies the development of several abilities (cognitive, affective and attitudinal) like the oral observation, creativity, respect by other people ideas and opinions, cooperation and solidarity, reached in the virtual teaching environment.

The VR power goes beyond the simple presentation of visual symbols in a way to create concrete metaphors to the evolved representation in the subject approached, which produces the student's environment. It is the sense of immersion and inclusion in a virtual educational environment that allows the student the opportunity of playing a role and decoding his/her perception from the set of experiences deeply than the way it is acquired in a traditional teaching environment.

The learning process in teaching virtual environments developed according to the constructivist approach is the result of the active contexts where the students can construct their own knowledge. A virtual world enables learning in an autonomous way – in the way that the teacher is not the only one who

detains the whole knowledge and the student can be more responsible by his/her progress – and more interactively – occurring from the possibility of a bigger space to talk with the colleagues and the teacher, privileging the collaborative teaching and the construction of the knowledge.

In theory the VR can be applied on teaching and learning in several different subjects and it can make use of many learning styles. Nevertheless, the introduction of innovating educational resources demands a new attitude of all evolved parts in the learning process as well as rethinking the relation that is established between teacher and student. In this way the pedagogic performance requires planning and programming a different type of evaluation to this teaching modality. Presuming a different conception of teaching compared with the traditional, the VR outlines a new paradigm in education.

The association of UNL with VR can be a determining factor to the virtual environment success, making possible the textual communication between students and teachers of different languages.

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VIII) A PROPOSAL OF AN UNL APPLICATION DEVELOPMENT ENVIRONMENT

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Abstract. The development of UNL applications may have a lot of problems. An experience occurred in Federal University of Santa Catarina showed that the occurrence of more problems than were foreseen in the start of the problem, may destroy the project. The construction of tools to help programmers to develop the applications increases the speed of development. Besides, these tools can

popularize the usage of UNL, facilitating the access to the technology and the connection with other languages.

Introduction

The UNL purpose is to “provide a common communication environment for different language.” [1] Since UNL is a language to computers express the knowledge, it is necessary the existence of tools to support the creation of UNL projects and documents. These tools allow people who are interested to publish their documents, papers, and applications in UNL without knowing all the details of the language. In the UNL Project, there is the UNL Editor. The UNL Editor “is linked to a language server equipped with an ‘enconverter’ and a ‘deconverter’ for a natural language. As the author writes a document, e-mail or any other text, in his/her language, UNL editor ‘enconverts’ it into UNL documents. In this process, UNL expressions are produced automatically or interactively with the author.” [1]

Normally, applications work in a specific domain. So, it is possible to use just a smaller set of rules and universal words to represent this domain. It is also possible the inexistence of some words in the Master Dictionary, because this domain have not been included yet. These words must be included. But, the inclusion of new words is preceded by a study to correctly contextualize them, finding the appropriated restrictions and so on.

Also, the application might need specific rules to “enconvert” or “deconvert” special cases. These rules should be applied just in this domain and cannot be included in the rules general dictionary.

This paper suggests an upgrade to the UNL Editor, the UDE. This upgrade allows the management of UNL projects. An UNL project is the construction of an application that uses UNL to represent their knowledge. Using the UDE (*UNL Development Environment*), the developer can create interfaces to link UNL with some other developing tools and programming languages, such as Java or C#. UDE can also manage the creation of transitory UWs and special

rules, as if the creation of smaller word and rules dictionaries specific to a domain.

Motivation

A research team from Federal University of Santa Catarina is implementing a simulation on Environment Audit using UNL and Virtual Reality. This simulation intends to test a student to audit a chemical warehouse. All the textual elements from the simulation, such as signs and speeches, will be represented in UNL, allowing people from different countries to access the simulation and understand it in their own language. Five languages have been chosen: Portuguese, English, Spanish, Italian, and Japanese.

The texts were revised to avoid more complex structures and expressions only used in Portuguese. After that, it was started the conversion of the sentences to UNL. 164 Universal Words were extracted from 61 sentences. More than 80% of these words weren't in the knowledge base or in the UW Gate. So, these UWs needed to be created. But, the creation of new UWs needs a study to correctly contextualize them in the knowledge base, avoiding repetition or ambiguity. This study requires time and able people to do that. Also, the UWs must be shared between all the researchers. These problems delayed the work in 2 weeks.

The construction of the UNL sentences was affected by some other problems. Typing errors, absence of marks (such as periods before the attributes) and parenthesis occurred in almost a half of the sentences. Three revisions were made and errors were found in the next step, the construction of the dictionaries. In the dictionaries, the errors mentioned above were multiplied. Since there is a lot of marks and tags as in the word dictionary as in the rules dictionary, the quantity of errors occurred have increased in the same proportion. Also, the inexperience of the UNL programmers contributed to that.

Because of these problems, the deadline weren't accomplished.

UNL Application Development Environment

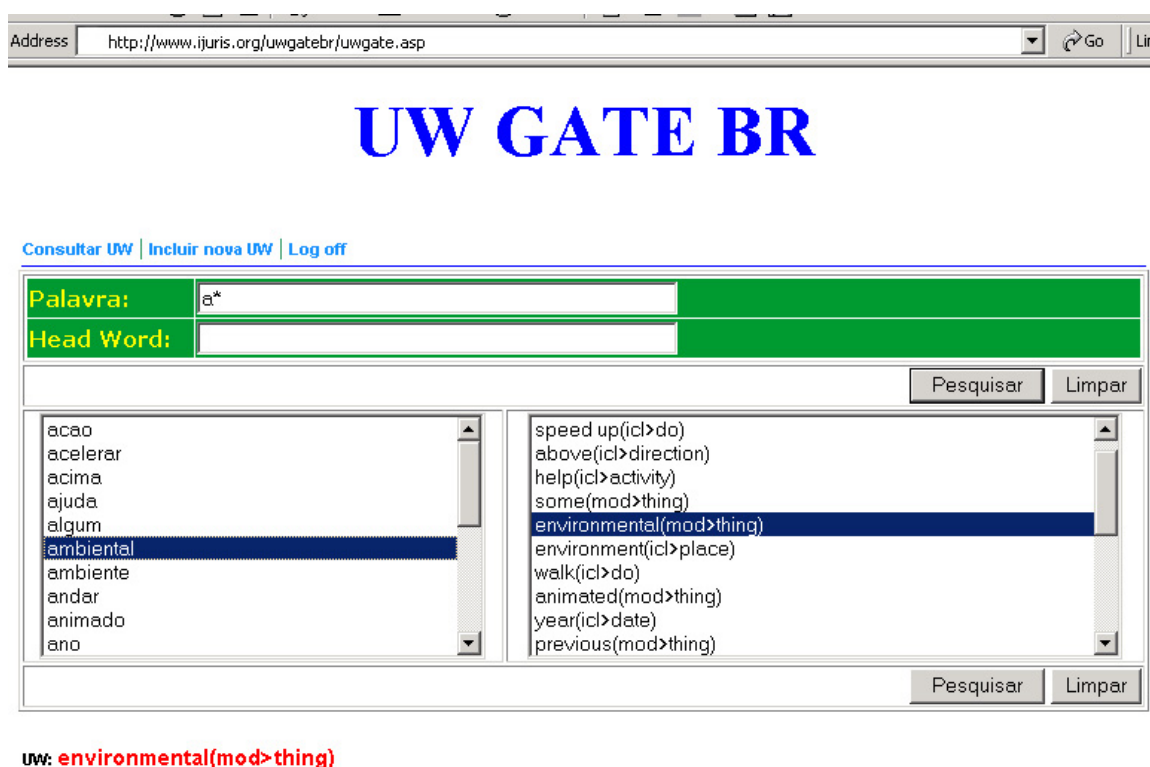
The UNL Center's Universal Word Gate allows users to access the UNL's centralized UW Dictionary system through the Internet. This tool is useful to find UWs that correspond to meaning in many languages like Japanese, Italian, Spanish, Russian, etc. It's only available to UNL Society members. However, this UW Dictionary System is not complete and on UNL Application Project development described in the previous section, a lot of UWs were not found on the UW Gate. It means that this one needs to be requested to UNL Center and then included in UNL Center's UW Dictionary. This procedure could waste more time than create these UWs locally.

So, the UWs had been created locally and restricted the attributes to the general form. To store and retrieve the locally created UWs and to improve and reduce the time of UNL sentences codification, the Brazilian research group of UFSC (*Federal University of Santa Catarina*) developed a tool, based on UNL Center's Universal Word Gate, called UWGATEBR (<http://www.ijuris.org/uwgatebr/>). Also, as verified on the SGA application development, this tool allows a deep study of the existing UWs restricts to improve the best format to be used on application without compromise the whole process because the UW stored in the UWGATEBR database can be edited in any time. This way, the UNL code syntax errors will be minimized before its been used by *DeConverter*, reducing the rework and a consequent UNL application development time.

The UWGATE.BR stands out for the easy way to add new UWs to the UW Dictionary used to codify UNL sentences. Everyone may include a new UW to a UW Dictionary database. In the beginning, this new UW will be in an analyzing stage to be verified and corrected by the responsible administrators and they will decide approve the UW in the search.

Public module

This module is available to anyone and works in the following way. The user can type all or part of the word (*Palavra*) or/and a Head Word, and clicks on the **Pesquisar** (search) button. If the command is accepted, the UWGATEBR retrieves the desired UW entries from the UW Dictionary data base and shows the results in two columns: On the left columns will appear the matched words (if the user input was a word), and on the right columns the corresponding UW (or the matched UW from the user Head Word input). By clicking in any item on any two columns, automatically the corresponding item on other column will be selected (figure 2).



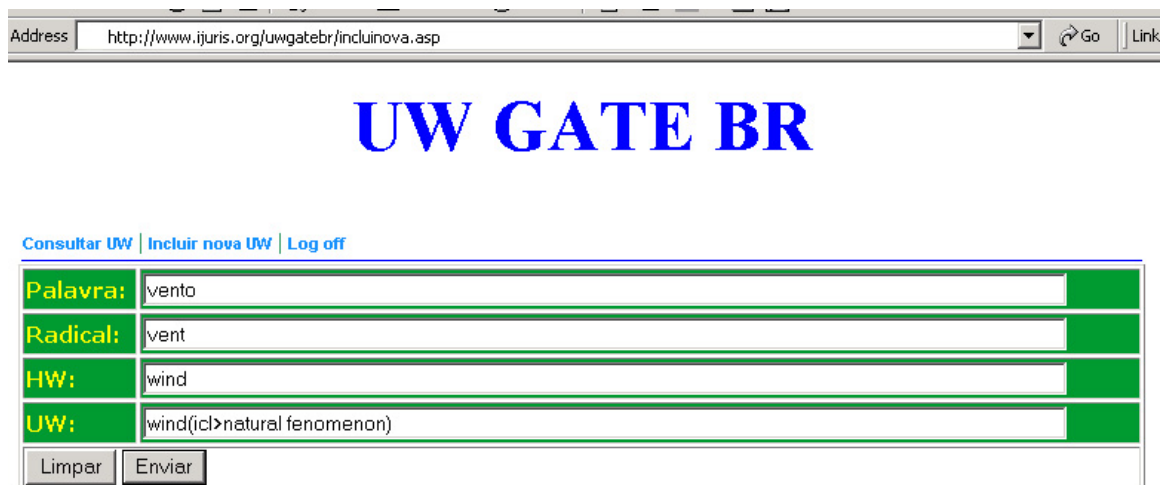
The screenshot shows a web browser window with the address bar displaying `http://www.ijuris.org/uwgatebr/uwgate.asp`. The page title is "UW GATE BR". Below the title, there are links: "Consultar UW", "Incluir nova UW", and "Log off". The main form has two input fields: "Palavra:" with the text "a*" and "Head Word:". Below these fields are two buttons: "Pesquisar" and "Limpar". The search results are displayed in two columns. The left column lists words: "acao", "acelerar", "acima", "ajuda", "algum", "ambial", "ambiente", "andar", "animado", and "ano". The right column lists UW entries: "speed up(icl>do)", "above(icl>direction)", "help(icl>activity)", "some(mod>thing)", "environmental(mod>thing)", "environment(icl>place)", "walk(icl>do)", "animated(mod>thing)", "year(icl>date)", and "previous(mod>thing)". The "environmental(mod>thing)" entry is highlighted in blue. Below the search results, there are two buttons: "Pesquisar" and "Limpar".

UW: **environmental(mod>thing)**

Fig. 1. Search page

To include a new word not found in the search, click the hyperlink ***Incluir nova UW*** (add new UW) on the top of page. Four data fields are required in the inputs text, palavra (word), radical (Stream), HW (Head Word) and UW

(Universal Word). After fill the data in a form, click in **Enviar** (send) button (figure 3).



The screenshot shows a web browser window with the address bar displaying `http://www.ijuris.org/uwgatebr/incluinova.asp`. The page title is "UW GATE BR" in large blue letters. Below the title, there are three links: "Consultar UW", "Incluir nova UW", and "Log off". The main form has four rows, each with a label and a text input field:

Palavra:	vento
Radical:	vent
HW:	wind
UW:	wind(icl>natural phenomenon)

At the bottom of the form, there are two buttons: "Limpar" and "Enviar".

Fig. 2. Inclusion page

Administrative module

The access to this module is restricted to administrators of UWGATEBR. Beyond the public functions like search or add new *UWs*, the administrator module has additional functions like approving new *UWS*, editing, remove and consulting all the *Uws* available on the *UW* dictionary data base, even add or remove administrators users.

To approve a *UW*, just select the words and click in **homologar** (approve), the page is showed on figure 4. To remove a *UW*, just select the words and click in **remover** (remove). If is necessary to correct the word, click on the *UW* and will be loaded a page to edit the word, stream, *HW* and *UW*. After editing click on **Salvar** (save) link (figure 5).

Address http://www.ijuris.org/uwgatebr/homologar.asp Go Link				
UW GATE BR				
Consultar UW Incluir nova UW Homologar UWs Listar UW Usuários Log off				
Palavra	Radical	Head word	Universal word	Todos
data	data	date	date(icl>time{>abstract thing})	☐
decimal	decima	decimal	decimal(icl>quantity)	☐
enviar	envi	send	send(icl>do)	☐
inicial	inicia	initial	initial(aoj	☐
melhor	melhor	best	best(aoj>abstract thing)	☐
ponto	pont	dot	dot(icl>simbol)	☐
valor	valor	value	value(icl>abstract thing)	☐
vento	vent	wind	wind(icl>natural fenomenon)	☐
Homologar	Remover			

Fig. 3. List page

The UWAGATEBR is a effort to create the **UNL Application Development Environment** capable to organize, manage and create the UW Dictionary data base, the UNL rules dictionary, the word dictionary and the UNL sentences by application project, applying all the UNL conventions, syntax and rules described in the UNL Specifications. The importance to build knowledge base libraries specific to each application project is the high performance and precision of the conversion from UNL code to the target language. This modularity of knowledge can be improved individually, and then gradually will reach the entire.

UNL Application Development Environment will works like a Visual Studio. Each project created on UNL Application Development Environment will be associated to a data base, that contain all the information necessary to build and manage the UNL rules dictionary files and word dictionary files grouped by language. Even aid on application sentences files and UNL sentences files creation.

Address

UW GATE BR

[Consultar UW](#) | [Incluir nova UW](#) | [Homologar UWs](#) | [Listar UW](#) | [Usuários](#) | [Log off](#)

Palavra:	enviar
Radical:	envi
HW:	send
UW:	send(icl>do)
Limpar Gravar	

Fig. 4. Edition page

The UW Dictionary structure table will store the UW and the respective meanings grouped by language. This UW will be detected from the application sentences files by the users or by a UW search algorithm. Once identified the UW, the user will complete the UW with a list of attributes. The Uws of each sentence will be displayed in the screen as a hyper graph with nodes and edge. So, the according to the node selected by user, all the relations, attributes set to this node will be displayed, permitting to user alter in any time.

The tools interface will provide more agility on UNL Ruled Dictionary, Word Dictionary and UNL code building because the users, that must have a basic knowledge of programming concepts, will not worry about the UNL syntax. All the information, explanation, and fields of the syntax will be displayed on screen. To add a new word on word dictionary, the users just have to set the rule priority, describe the UW, stream and add how many attributes necessities, then save all this information on project data base, as showed below.

As the same way used to create words on word dictionary, that can be applied to create rules.

The interface will display a list of rules types (":", "R", "L", ...), then the user must indicates if the action of rule is a insert node to left or right, or simply a

attributes change. To complete the rule is necessary set the conditions, actions, relations and roles of the nodes on the Left and Right Generation Window.

Conclusion

The construction of tools to facilitate the integration of UNL with other applications and the creation of UNL documents can help the dissemination and the popularization of UNL. Allowing people quickly create and develop small applications using UNL, even in specific domains, will generate a lot of new words and the continuous increasing of rules to solve the deconversion. This process has already happened with other languages, such as Java. Collecting the best sets of words, the most efficient rules, will generate better and better dictionaries. Also, the easy access to the mechanisms of UNL can motivate people from countries that don't still have UNL Centers to produce the dictionaries to enconvert and deconvert.

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