CONTEXT AND MACHINE TRANSLATION

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Abstract:

Briefly speaking, the study is intended to state explicit means for a linguist to cooperate with computer programmers in order to state as clear lexical data as possible so as to avoid translation errors and ambiguity. Such data include contextual relations to words surrounding a word in a sentence.

The aim of the study is how to make a computer linguistically understand what we, humans, unconsciously do. This requires an explicit representation of the mental linguistic processes taking place in our own minds.

One step in this direction is to rely upon context. It is to be resorted as a criterion to clarify the particular meaning wanted by SL, that is context is positioned as a judge to determine which of the meanings of a word (which has more than a meaning) to choose in such a context, and to determine which structure fits best as well.

Introduction

It is an acknowledged fact that communication systems are fast increasing in the world today. This actually has its impact on the translator and how to catch up with this speed. For this reason, machine translation has shown up decades ago. And the faster communication systems develop the faster translation systems are needed. However, can a translating machine substitute human translation? Definitely no, but little is better than nothing. Also, can we increase this 'little' to be 'much'? If so, how is that?

In the world of information and communication, language plays a vital role as a means of communication among nations that have become in constant touch through the web. This involves fast and more 'intelligent' means of translation which are characterized with

accuracy and responsibility. Unfortunately, there is no completely reliable electronic dictionary so far. Humanity, thus, needs such a dictionary that takes into account cultural expression, proverbs, idioms and sentence structure of each language aside in an endeavor of more accurate and expressive translation.

A computer has a memory and a processing unit. As far as translation is concerned, we can feed its memory with lexicon of the languages concerned and match their entries such that by determining the source language, the target language and the entry in question the computer gives the wanted word.

This is completely satisfying for those searching word-level meaning, what is really demanded is even further: sentence meaning, and, furthest, whole-text meaning. For a translator, to translate a sentence is to compare the structures of the both languages and render the SL's meaning in terms of the structure of the TL's which might be in turn quite different. Hence translation is not a mere dictionary. It is a linguistic understanding and analysis that is undertaken mentally. Now we are talking about mental processes, this means human mind, the thing only little of which, if ever, has yet been explicitly tackled by scientists.

Firth (Palmer, 1981) suggests two types of context: the linguistic context, that is the words surrounding the concerned word in a sentence. These give many clues about the word in question. For example, the word 'object' can be a verb with the meaning 'disagree', a noun with the meaning 'tangible thing' and a noun with the meaning 'person or thing receiving the action of a verb' in a sentence. How to determine which of these three meanings is the proper one for each of the following sentences?

1. The government's opponents **object** the recent decision.
2. The verb 'sleep' has no **object**.
3. A blind man cannot see **objects**.

The linguistic context (the sentence context) is the resort to interpret the meaning of the word 'object'.

On the other hand, the context of situation (social context) plays such a role which can be said to be more social than linguistic. That is: looking at a word's surroundings is not sufficient to select its proper meaning. Thus it seems a bit more difficult to deal with this kind of

context in comparison with the former one. Since it involves non-linguistic factors.

Scope of the Study

What is focused on here is context and how to be employed in machine translation. A wider study may also involve computer programmers who can help in the pure mathematical side of the issue.

Relevant Disciplines:

In addition to the fields mentioned in the research, including sociolinguistics, pragmatics and computer programming, it is most necessary to cooperate with psycholinguists, neurologists and logicians. Cooperation with the first of these gives information about the relation between language and psychology. Cooperation with neurologists gives even further clues about how the brain encodes and decodes language signs. And, logicians can draw understandable representations of mental linguistic processes. All of these should be benefited by translators and computer programmers to feed computer with such logical statements that represent human languages in such a way that can be understood by the computer with a double face: internal face (of logical signs) and external face, the screen, (of natural languages).

CHAPTER ONE
THE ENVIRONMENT OF MEANING

1.1 Context, the social aspect of meaning

As mentioned earlier, to make a computer understand what we humans do we need first to understand our linguistic faculty and state it explicitly so that we can accordingly feed the computer with the linguistic data in analogy with human schema.

One of the most famous notions to state meaning in this respect is that of context. In fact if we ask anybody who is not concerned with linguistics how they grasped the meaning of an ambiguous word, they say that it is clear from context. So it seems that the notion of context is even a postulate for the public.

According to Palmer (1981: 52), the notion of context dates back to Malinowski who used it as a clue to interpret a non-understandable language though meanings of individual words were quite known to him. Still, this is a preliminary statement of context.

The real favor in this regard was done by Firth (1950) who presented his contextual theory (context-of-situation) and suggested the following categories for a context:

1. Relevant features of the participants

A. Their verbal action

B. Their non-verbal action

2. Relevant objects
3. Effects of the verbal action

With verbal action considered as a linguistic context, non-verbal action social context and relevant objects physical context, or setting, let's say, the effects of the verbal action can even exceed towards the pragmatic side of analysis. (the researcher)

Leech (1983: 13) considers context any background common to the speaker and hearer which (the background) interprets the former's utterance in a certain situation. To him, context is one of a set of elements of a situational speech, that is it is situational rather than abstract (the researcher).

For Firth (Palmer, 1981: 53), context is an abstract linguistic apparatus on a semantic level in analogy with grammar which is the apparatus to state meaning on a syntactic level.

In fact the role of context can be clearly seen in many situations like the ambiguity of a sentence which has more than a meaning such that the native speaker themselves do not know how to interpret it. It is also important when teaching the grammar of a language to foreign learners. This is through giving practical or situational examples about how to use a particular word or a grammatical expression. To Robins (1964 : 29), the most noticeable need for context is in translation, particularly when the two languages concerned lie in such cultures that are far from each other. This need highly rises in Arabic-English and English-Arabic translation.

Regarding language as expressive or communicative implies dealing with mental states. Being ignorant of much, if not all, of such states makes it even more mysterious to dig in them. Regarding words as acts, events or habits, on the other hand, restricts them to the very objective edge of the question (Leech, Semantics: 71), that is the pragmatic end of the discussion (the researcher).

To him the attempt to base meaning on context 'contextualism' is a failure according to present-day semantic thought. He maintains that if meaning is discussed in terms of mental states, it is still beyond the scope of scientific observation. Hence, situation, use and context are the tools to study meaning. Contextualismin its crudest from may be summarized as MEANING = OBSERVABLE CONTEXT, while Bloomfield has a weaker formulation of contextualism as: MEANING IS ULTIMATELY DERIVABLE FROM OBSERVABLE CONTEXT. That is we need to resort to the internal mental record of previous contexts all of which share to come out with the meaning of the current context. Broader abstractions, such as British culture, can be included too.

While this weaker form of context has the advantage of approximating context to meaning, it has the disadvantage of rendering context a much more abstract notion such that it is more away from observation. To him, meaning is actually a mental phenomenon.

In turn, Halliday (2003: 79) attacks the speech act theory for detaching meaning from its social context. The point here is that meaning should stay attached to its social context (the researcher).

Lyons indirectly defines meaning as the appropriate contextual functioning. By talking about appropriateness, he is, all in all, dealing with the social aspect of language. He states that being meaningful, or having meaning, is a matter of functioning appropriately in context (Lyons, 1977: 607 or 608).

Every utterance occurs in a culturally determined context of situation, and the meaning of the utterance is the totality of its contribution to the maintenance of life patterns in that society (Lyons, 1977: 608).

Firth contextualizes facts, context within context, towards the context of culture which is the matrix within which social situations occur. Here, as Malinowski had done before, Firth commits himself to the intimate connection between language and culture (ibid).

Context plays a disambiguating role at the following levels:

1. It narrows the number of possibilities of interpreting a message, e.g. *Shall I put this on?*

To PUT something ON = to switch it on

to put it on one's body
to put something on something else

2. It indicates the referents as intended by deictics, e.g. this, that, there, here.
3. It gives such information that the speaker omitted from their speech, e.g. *Janet! Donkeys!* This could mean: *Janet, drive the donkeys away*. OR: *Janet, be careful of donkeys*, etc. (Leech, 1974).

While a contextualist is unwilling to accept abstract entities (like concepts) that are not accessible through operational tests, a neomentalist is more flexible especially regarding the theory of semantic competence as acceptable since it conforms to such standards as answerability to intuition and to tests which objectify intuition (ibid: 93).

1.2 Pragmatics

There must be a distinction between sentence meaning and utterance meaning where the first falls within the scope of semantics and the second within pragmatics. According to Chomskyans, the distinction is between competence and performance (Lyons, 1981: 163-164).

The connection between semantics and pragmatics is a connection between meaning and use (Lyons, 1981: 140).

It is generally agreed that the former consists of context-independent abstract entities (Lyons, 1981). This entails that the latter consists of context dependent entities (propositions) (the researcher).
It also entails that every sentence is an utterance but not vice versa, e.g.

- Have you finished your homework?
- Not completely.

The utterance 'not completely' cannot stand by itself as a sentence since it does not conform to the rules of English as a sentence. Still, this answer is meaningful to the asker, and can, thus, be considered an utterance (the researcher).

One can also say that the utterance meaning is the product of sentence meaning, if already exists (the researcher), and context (Lyons, 1981:165). This plays its role in the electronic translation of sentences. A computer may be fed with the potential structures of the

sentences but what about such constructions that have no previously-stated structures as in the example mentioned earlier?

Sentence meaning is dependent upon the notion of utterance meaning and the former cannot be given full account without being related to their contexts of utterance (Lyons, 1981: 140). It seems that the semantic-contextual-pragmatic relation is circular in that semantics sets the underlying structure of meaning, context gives the clues to clarify it and pragmatics analyzes the situational factors that may affect meaning as intended by the addresser and interpreted by the addressee (speech participants).

Formal semantics is complementary with pragmatics which is the study of actual utterances, the study of use rather than meaning, the study of that part of meaning which is not governed by truth conditions, the study of performance rather than competence, etc (Lyons, 1981: 170-171).

To him, a proposition is governed by truth values and a sentence is governed by truth conditions (Lyons, 1981: 171).

On the other hand, grammar is governed by rules and pragmatics is governed by principles (the researcher). A principle is more social and more flexible than a rule is (the researcher).

As much as the cultural differences exist, one can find some universal sociolinguistic principles. According to Hudson (1996: 224) some parts of the communicative competence may be due to the universality of some pragmatic principles with some other parts varying from one community to another. If such universal principles can be explicitly drawn by linguists, they may be represented electronically and benefited in solving many cultural-specific mistakes in electronic translation. (the researcher)

1.3 Sociolinguistics:

There is such a widely-held view that sociolinguistics deals the with the social context of language. This entails that other areas of linguistic study disregard the social aspect of language. On the contrary to structuralism, some students of language argue that since speech is social behavior, it is unreasonable to study it in isolation from society (Hudson, 1996: 3).

Halliday (2003 : 79) attacks the speech act theory for detaching meaning from its social context. To him, the situation (the social

context) is a representation of the semiotic environment in which interaction takes place. Such concepts as interaction, environment and context are of the same theoretical order as knowledge and mind. Knowledge may explain mind in as much as the latter explains the former.

Away from translation, as far as language use is concerned, the choice of a linguistic act is constrained by context, and the meaning of the choice itself is constrained by context too. Robins (1963) states, "the situational level of analysis and situational meaning are distinct from other levels of analysis and meaning in that they involve relations with extra linguistic features of the world at large and non-linguistic parts of the speakers' and hearers' culture."

Languages vary in the degree in which social meaning can or must be conveyed in various kinds of sentences (Lyons, 1981: 143). Saying "What's up?" instead of "What is happening?", "Hi" instead of "Hello" and "What's" instead of "What is" has its own social function (Hudson, 1996: 230). For these and many other figurative expressions, proverbs, idioms and phrasal verbs, there must be a pre-determined sub-dictionary such that by typing the Arabic كيف الحال , the English translation would be, according to a ready-made sub-dictionary of social expressions, "How are things?" or "What's up?" for example instead of the non-social, literary, translation "How is the situation?" or even "How is the adverb?"

Such a sub-dictionary itself can be divided into two parts: one for formal expressions and the other for informal ones, avoiding, thus, the need for context. This is fairly satisfying if such expressions were to represent the whole story. The matter is, unfortunately, much more complicated.

CHAPTER TWO
MACHINE TRANSLATION

2.1 A Brief History of Machine Translation

The very original idea of machine translation was put forth in the 17th century when such philosophers as Lebiniz and Discartes proposed codes that relate words between languages. Such proposals stayed theoretical with no actual development on ground at the time (Team Smartling, 2012).

One of the first attempts for "translating machines" was Arstrouni's bilingual using paper tape. This was followed by the Russian Tronyaskii's more advanced translating machine which included a bilingual dictionary and a method for dealing with grammatical rules of both languages under the process of translation (taus.net).

Based on the Information Theory and on the success in code breaking during the World War II, Warren Weaver proposed his TranslationMemorandum in 1949 which is the first computer machine

Held in New York in in 1954, Georgetown IBM experiment, the first public demonstration of machine translation, was and heavily tackled by media. The system was so much in common with today's electronic toys. Containing a lexicon of 250 words and translating no more than 49 Russian sentences into English, this dictionary was devoted mainly to the field of chemistry (globalizationpartners.com).

The two main active countries interested in machine translation throughout its early history are U.S.A and the Soviet Union. With scientific fields as subject matter, research in the 1960s focused on the Russian-English translation. In this period, translation was performed in two stages: firstly, the machine gave rough translation of understandable meaning. If a text proved to be of important content, it would then be transferred to a human translator for a complete translation as a second stage (Hutchins, 2001).

Expanding the 1970s' machine translation to commercial documents was not the whole story. The more important characteristic was the change from bilingual machine dictionaries to multi-lingual ones. This could be due to the raising globalization of the world. (wikipedia.com)

By the 1980s the number of translation systems grew even greater with the growth of the number of personal computers (it should be taken into account that computers in the previous decades were mainly corporation equipment of huge sizes). In this period, Europe, Japan, Korea and China showed up on the scene. Translation research here relied on such linguistic representation of syntactic, morphological and semantic analysis. (Craciunescu et al).

In the late 1980s and early 1990s, development in machine translation was based on the development of the statistical method

which is in turn based on the example-based method. This decade also witnessed successes in the Speech Recognition and Speech Synthesis researches (Meer, multilingual.com).

The most noticeable feature of the 2000s machine translation is the move from specialized to generalized translation. Thus, speeches of politicians, news and movies were covered by the machine translations of such companies as Google, Microsoft and others which adopted the statistical method in general. (wikipedia.com)

2.2 Approaches to Machine Translation

Throughout the history of machine translation, there developed several approaches to carry out the process of translation:

1. The Rule-Based MT: from its name, the most noticeable feature of this approach, which started in the 1950s, is that it adopts grammatical structure as a method of computer translation. One should bear in mind that the lexicon is a must in all methods. That is, this method is based on feeding the computer with the lexicons and syntactic and morphological structures of both languages such that the computer can compare each sentence of the SL with its counterpart in the TL in terms of the vocabulary and structure. Feeding the computer with the structures of both languages takes an exceptionally long time which is considered a negative of this approach. It is very difficult, if not impossible, to update the computer with the ever renewing structure of a language which might result in a kind of conflict between old and new rules.(Forcada, Springer Link)
2. Statistical MT: as mentioned earlier, a lexicon is amust, but structure isn't. Starting in the 1980s, this method neglects structure and depends on a superficially different system: contrasting texts. A computer is fed with a text in a certain language with its humanly translated counterpart. Collecting as many contrastive texts as possible, a computer can invest them in translating newly fed texts. In fact this method is currently the most widely used in so many internet sites like Google and Bing.(Koehn, 2010)
3. Word-Based method: this considers the word as a basic unit, but there are more than a drawback of this method. Morphologically a word in language X may be translated in two or three words in

language Y and vice versa. Syntactically and presumably, translation is not restricted to words only. (Koehn et al, dl.acm.org)

4. The Phrase-Based method came to develop and correct the Word-Based translation method which is restricted to word level translation. In this method, the phrase structure (a phrase is used here in a sense which is a bit more flexible than the grammatical one) being a sequence of words or a part of a sentence, is used by the system to make the SL expressions more acceptable and meaningful. Syntactic differences between languages, particularly those of quite different word order, lessen the quality of this method. (ibid)
5. Hierarchical Phrase-Based method: this is a kind of hybrid that combines the strengths of the Rule-Based (Syntax-Based) translation and the Phrase-Based translation. This is in terms of benefiting the phrases as units of translation and syntactic rules as matrix. (Wikipedia)
6. Context-Based Machine Translation: this is the most recent and most successful system developed in machine translation up to now. It requires a bilingual dictionary and a monolingual text (that is a text of one language). It can make use of the whole internet texts written in the languages under translation. However, the most distinguished feature of this method is that it exceeds the limits of a sentence towards the whole text. Remembering the context of former sentences in a text, the system succeeds in translating the following sentences with the proper pronouns for instance (researcher). According to many specialists in computers, this method is a really promising one. (Berger, 1996)
7. Under current development, there is still a combination of two methods. A hybrid of the Statistical method with some elements of the Rule-Based method is being researched. (ibid)

2.3Establishment of Language Policy

It has been mentioned earlier that machine translation works through lexicon of the languages under translation, their structure, social background if possible and, according to most recent methods, previously fed texts. The more content of the language in question available on the web, the less difficulty and mistakes the computer faces in translating to and from it, and vice versa.

In the light of the history of machine translation as well as the modern history of knowledge as a whole one can find no escape from admitting the absence of the Arab world from acquiring a leading role among other nations and civilizations. As language is the mirror reflecting its nation's thought, then it is the strongest evidence for the position its speakers have in the world. Thus, it is not unexpected that Arabic represents no more than 3% of the internet content (Al Hajj, 2014). If one was even more optimistic and the percentage is a bit higher, it does not coincide with the proportion of the Arabs to the whole population of the globe.

Unfortunately, the main causes of this absence are from the Arabs themselves. Google translator for example is not monopolized for the English language. It offers suggestions and corrections. By counting the rate of the votes for a certain translation as being true, Google takes it into granted. This is superficially satisfying, but its serious drawback is that it is open to everybody. Now, the question can be raised: how many Arabs use Google translator in proportion to the total population of Arabs? How old are they and how can the computer recognize their ages? What education level are they? Are they good at standard Arabic? Do they tend to support their own local dialect on the account of standard Arabic?

As a leading segment in the Arab society, university professors, researchers, poets, writers and the intellectual people in general are not interested in the internet (Al Khalifa). With most professors of Arabic hardly know anything about foreign languages, professors of English being not so much interested in Arabic (Al Qasus, 2013) and both inactive in the web linguistic interaction, this field became vacuum but of the laymen with a noticeable back-drawing of the formal institutions of translation and Arabic language preservation.

Equalizing between prescriptive and descriptive approaches in grammar, Arab linguists need to take into account new trends in the Arabic literature and accept coining new vocabulary as needed by present-day native speakers of Arabic. This should go side by side with educating people with the grammatical rules of Arabic so that to have a creative generation that is committed to its language and has the ability to innovation. It is hereby strongly recommended that Arab linguists play their role in feeding main internet translation sites such

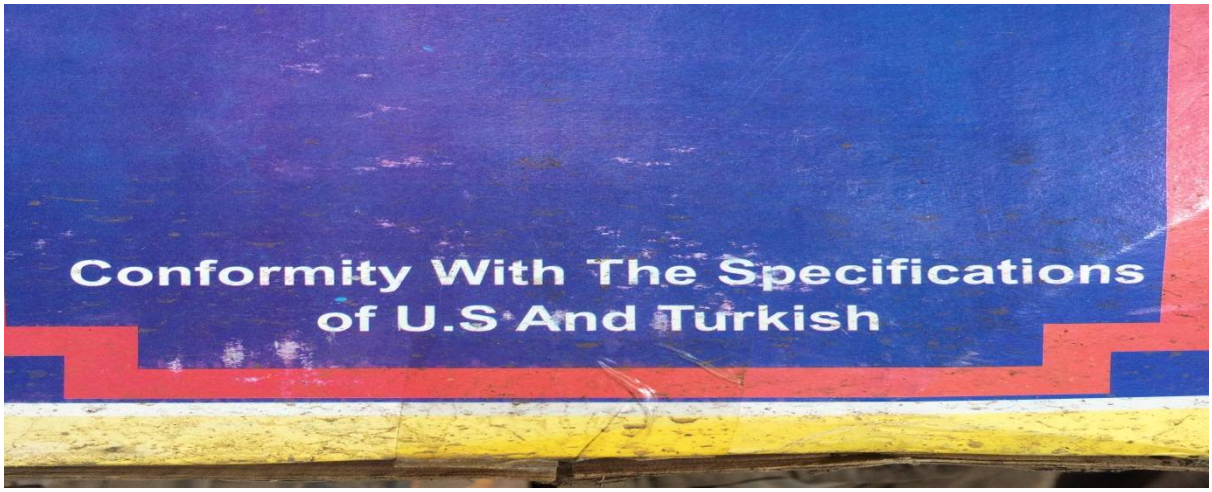
as Google and Bing with correct data about the Arabic language and not to leave their room to non-specialists in the first place.

CHAPTER THREE

Data Analysis

In this chapter several samples of mistakes in electronically translated phrases mainly taken from the internet are analyzed as follows

1.



This note is an Arabic-English translation written on an engine oil can. There are two mistakes in it. The first mistake is that the English "conformity" is the translation of the Arabic noun "مطابَقة" (mutabaqa) while "conforming" is the correct translation of the Arabic "مطابِقة" (mutabiqa) which describes the kind of material packed in this can. The key solution for such cases is the Arabic 'harakat'. Ignoring these particles might strongly lead into such errors.

The other mistake is that the adjectives "U.S" and "Turkish" follow rather than precede the noun "specifications" in accordance with the Arabic structure where the adjective follows the noun under description though the use of "of" is a good evidence for recognizing the rules of the English structure.

A proper translation would, thus, be "Conforming to U.S and Turkish Specifications".

2.

This rather funny sample of Arabic-English translation has two aspects: first is the translation of the Arabic "mushakkala" "cocktail" in English has been taken to be "mushkila" "problem" in English. This is due to the absence of the Arabic 'shadda' (letter doubling mark). It is suggested to translate it as "Nuts Cocktail".

3.

Instead of translating "food court"as قاعة الطعام or البهو , the computer has translated it as الغذاء المحكمة committing hereby two mistakes: the vocabulary level one represented by choosing المحكمة as a translation of "court" in this improper context, and a structural mistake represented by the wrong word order which fits English rather than Arabic.

4.

Here, the problem is that both Arabic words "hamam" (pigeon) and "hammam" (bathroom) have the same spelling except that the latter should be infixed with a "shadda" mark which stands for letter doubling. By adding this particle one can even pass up context.

5.

Now the English phrase is correctly structured unlike the Arabic, it can be clearly inferred that the translation is English-Arabic and that the word order of "private parking" should be "موقف خاص" rather than "خاص موقف" or even the worse "مخصوص مواقف". The other notice is the lack of a translation for "for".

6.

Instead of translating it as "butchered chicken sales" the computer literally translates it as "sale of chicken murder" which is identical with the Arabic word order. Moreover, the selection of "murder" rather than "butchered" is clearly improper.

Conclusion

Basically, it should be taken into account that each entry should be fed in the system with some information about it as in Palmer (1981), e.g. the entry *man* should be defined as (+ human, +male, +adult), the verb *go* (-object, means *become* if followed by an adjective, means *go to* if followed by an adverb of place like *go home*) and, most importantly are idioms and phrasal verbs (figurative language and literary language is a step further currently) This is on the English language level.

As for Arabic, the situation is a bit more complex. Being a highly inflected language, Arabic should be treated in terms of the inflecting marks. To distinguish a subject from the object, one should resort to their inflections rather than to word order which is not the judge in the Arabic sentence. So, for a computer system to be fed with an Arabic dictionary, the Arabic 'rajul' (man) is supposed to be defined as follows:

رجلٌ = a man (+subject)

رجلاً = a man (+ object, + subject if preceded by إن ، أن ، كأن ، لكنّ ، لعلّ etc., +subject or object if preceded by such numbers: 11, 12 until 19 and 20, 30 until 90).

جاء ثلاثة عشر رجلا (subject)
رأيت ثلاثة عشر رجلا (object)
مررت بثلاثة عشر رجلا (preposition object)

Thus, the syntactic and morphological levels are interlocked in Arabic which needs much effort to be taken into account when fed into a computer system.

On the other hand, there are still other factors that are no less important than the one above mentioned, such as the word order of the English sentence, the capital letters and punctuation marks which all play their respective roles in interpreting the meaning. One can notice that the punctuation marks and, though partially, the word order are common factors between English and Arabic.

The one notion which is but treated through contextual-based method is the one of semantic field. The English entry man itself has more than an Arabic translation: إنسان ، رجل. So is the case with the overlap between the verbs *say, tell, speak and talk* and their Arabic translations يقول ، يتكلم ، يخبر ، يتحد

One must also never disregard the necessity of institutionalizing the efforts exerted in feeding the web with proper information about Arabic on all linguistic levels.

Institutions should also play their role in feeding the translation programs with ready-made phrases of cultural and social specifics like religious texts, proverbs, idioms, phrasal verbs, and greetings.

All of this can be carried out in terms of international protocols that guarantee limiting the access to web translator's suggestions to authorized institutions of language.

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الخلاصة:

تهدف هذه الدراسة إلى وضع أسس واضحة يعتمدها اللغوي بالتعاون مع مبرمجي الحاسوب للتوصل إلى أوضح بيانات معجمية ممكنة تجنّبنا الخطأ و الغموض في الترجمة. و من بين هذه البيانات العلاقات السياقية بين المفردة و المفردات المحيطة بها في جملة ما.

إن الغرض من هذه الدراسة هو كيفية جعل الحاسوب يفهم ما نفهم نحن البشر من لغتنا في اللاوعي. و هذا يتطلب تمثيلاً صريحاً للعمليات اللغوية الجارية في أذهاننا.

خطوة في هذا الاتجاه هي اعتماد السياق و اللجوء إليه حَكَماً يبّين المعنى المراد في اللغة المصدر عندما يكون للمفردة أكثر من مقابل في اللغة الهدف.