

Some Semantic/Syntactic Hurdles in Machine and Student Translation

Adnan Georges*

Mohammed Farghal**

* Language Instructor, Dept. of English, College of Arts, Kuwait University.

** Professor, Dept. of English, College of Arts, Kuwait University.

The present article addresses some subtle English syntactic features that present formidable problems to both Machine Translation (MT) and Student Translation (ST) into Arabic. First, it deals with the recognition of variation in parts of speech, showing that polysemous and/or homonymous syntactic categories may cause serious interpretation problems to both machine and student translators. Next, structural ambiguity at phrase and sentence level is shown to create interpretation difficulties in translation activity. Third, parenthetical structures in English sentences are argued to trigger reference and focus mishaps in MT and ST alike. Finally, the paper offers ample evidence from MT and ST indicating that word order variation affecting the basic English word order SVO may cause fatal damage to both machine and student translations. In particular, marked stylistic inversion and subject deletion prove problematic in this respect.

1. Introduction

Despite the tremendous progress that has been made in the field of Machine Translation (MT), or what is commercially known now as Translation Software (TS), in the past 50 years or so, human aid by professional translators is still required to post-edit and revise poor quality outputs of MT texts that are not suitable for publication (Meijer 1993; Feder 2003). It is well known that computer-aided systems of translation cannot aspire to gain authenticity and universal acceptability without the help of professional human translators (Hutchins 2001); hence the initial skepticism and fear of MT replacing and discarding human translators is misplaced. With the state-of-the-art technology and progress made in the domain of information and computer sciences, it has become a necessity to make use of the available tools to save time and cost by utilizing MT to produce draft assimilated compatible versions of the original texts in the Source Language (SL) that still need the expertise of the human translator to revise and make them ready for publication.

This paper doesn't aim to analyze or evaluate the mechanisms and shortcomings of the existing systems of MT; neither does it try to find answers and solutions to the difficulties faced by such computer-aided systems of translation. Rather, it aims to survey and show the semantic/syntactic complexities and subtleties of natural language that may obstruct the perfection of advanced systems of MT and hinder the performance of student translators trying to find their way into the profession of translation. Therefore, wherever possible, a comparison is made between the machine's output and the student translator's output in English into Arabic translation. The corpus in this study is drawn from MT outputs of some Internet online services that provide immediate translations of miscellaneous short sentences and texts (e.g. www.ajeelb.com, www.akuwait.net), and authentic translations made by senior Arab students in the College of Languages and Translation at King Saud University and the Department of English at Kuwait University.

Despite the fact that computer-aided systems of translation may be able to implement tools to handle difficulties related to compounding, idiomatic expressions and metaphors by treating them as fixed units (Hutchins 1991), some syntactic features are still causing interpretation problems for computers and student translators alike (Lewis 1997). It is interesting to note that the capability of MT can be compared to the developing translational competence of student translators. It will be shown

that subtle syntactic knowledge involving parts of speech, structurally ambiguous phrases and sentences, parenthetical structures and word order variation can pose serious problems to both MT and student translators.

2. Parts of Speech

The successful identification of parts of speech (i.e. N, V, Adj, Adv, etc.) in English discourse is an important aspect of reading comprehension, which is a prerequisite for professional translation activity. Conversion, which is a highly productive word formation process in English, doesn't involve the introduction of affixes when changing the part of speech of a word, e.g. **dirty** (adj) and **dirty** (V), **call** (V) **call** (N), etc. The recognition of the part of speech in English discourse, which is dependent on the accompanying co-text and context, proves impenetrable to MT and some student translators. Consider the example in (1) below, along with its MT in (2) and student translation (ST) in (3):

(1) And H represents Higher Order needs, and covers self-esteem, expectations, ambitions and sense of humour.

(2) وإتش يمثل حاجات الترتيب الأعلى ، واحترام الذات الأغذية ، التوقعات ، الطموحات وروح الدعابة .

(3) و H تمثل ارتفاع طلب الاحتياجات والتغطية لاحترام الذات والتوقعات والطموح وحسن فهمه وإدراكه للدعابة .

As can be seen, both renditions fail to recognize the correct part of speech of the word **covers** and, as a result, give an inaccurate translation. The confusion comes from the fact that the word **covers** can potentially function as a plural noun or as a verb in the present tense form. However, the syntax of the sentence in (1) makes it clear that **covers** is used as a verb rather than a noun. Syntactically, there should not have been any sort of confusion since the conjunction **and** precedes the word **covers**, giving rise to the paralleled coordinated verbs '**H represents... and covers.....**' It should be noted that while the ST adopts an erroneous linear/literal rendition of the phrase 'covers self-esteem', the MT takes the second item as the head noun, hence the impossibility of the MT rendition of the said phrase. This may point to a serious need to sensitize MT systems to the '*idaafah* construction in Arabic whereby the impossible MT rendition above would be replaced with a possible, though erroneous, rendition, viz. أغذية احترام الذات .

The failure to identify the correct part of speech resulting from conversion as in (1) above may be further complicated by the existence of English homonyms, which are identical word forms that do not relate to

each other in meaning. The following example in (4), taken from a newspaper political article, along with its identical MT and ST in (5), bears witness to this:

(4) Much lies behind those words.

(5) أكاذيب كثيرة خلف هذه الكلمات .

On the one hand, the word *lies* may function as a verb and a noun (which mean 'not to tell the truth' and 'the plural noun of *lie*', respectively), just like *covers* in example (1) above. However, both interpretations are irrelevant in example (4). On the other hand, the relevant interpretation stems from a homonym of both forms, viz. *lies*, meaning 'is found', which comes from a completely different semantic field. Clearly, this further complicates the task of MT and ST, which were entangled within one of the irrelevant interpretations, being insensitive to the syntax of the sentence. The syntax of (4) calls for three consecutive steps on the part of the interpreter, whether it is a machine or a human analyzer. First, the sentence should be broken down into a Subject and a Predicate. Second, the analyzer should be aware of selectional restrictions rules which require a non-count noun after the quantifier 'much' in order to rule out the interpretation of '*lies*' as a noun. Finally, the verb (head) in the predicate should be assigned the correct sense, i.e. 'is found'. It should be noted that human professional translators have managed to automate such conscious syntactic knowledge in translation activity. However, much work is still needed in both MT and ST in this area.

Further, problems may arise within the same part of speech rather than across parts of speech as in the examples above. For example, capitalization, which is an important layout feature in English, may neutralize the difference between a proper name (which is always written with a capital initial regardless of its position in a sentence) and a common noun (which can be written with a capital initial only at the beginning of a sentence). The example in (6), along with its MT and ST in (7) and (8), illustrates this point:

(6) Bush fires raging around the Australian capital Canberra have killed three people and destroyed hundreds of suburban homes.

(7) حرائق بوش الشديدة حول كانبيرا العاصمة الأسترالية قد قتلت ثلاثة أشخاص ودمرت المئات من البيوت في الضاحية .

(8) غضب الرئيس بوش بشأن المصيبة التي وقعت في العاصمة الأسترالية كانبيرا التي راح ضحاياها ثلاثة أشخاص ودمرت فيها مئات المنازل الواقعة بضواحيها .

As can be noted, the coincidence between the common noun *bush* with a capital initial at the beginning of the sentence and the popular proper name *Bush* (the present President of the United States) creates serious confusion for both the machine and student translators. Both MT and ST in (7) and (8) above base their translations on an irrelevant interpretation of the noun *Bush*, being misguided by the capital letter in the noun. The MT output, accepting things at face value regardless of congruence with word knowledge, suffers solely from that fatal decision. The ST output, however, runs into more serious problems as a result of rejecting a literal rendition of the lexeme *fires* in combination with the erroneously selected proper name interpretation because of its clear oddness insofar as world knowledge is concerned. Consequently, the student translator creatively improvises a far-fetched, but sensical, metaphorical interpretation of the lexeme *fires*, something which is, apparently, inaccessible to the machine translator. Interestingly, when given the sentence with an initial small letter of the noun *bush*, the machine produced a fine output as shown in (9) below:

(9) حرائق الأحراش الشديدة حول كانبيرا العاصمة الأسترالية قد قتلت ثلاثة أشخاص ودمرت المئات من البيوت في الضاحية .

3. Structural Ambiguity

Structural ambiguity manifests itself at both phrase and sentence levels in natural language. At the phrase level, noun compounds in English may contain head nouns modified by other nouns functioning as quasi-adjectives. Problems may arise from the lack of explicit markers of such relationships, because in many other languages, like Arabic, these relationships are usually expressed by case endings or prepositions. For example, in the English sequence 'adjective-noun-noun' in (10), the adjective can modify either the first noun (11) or the second noun (12).

(10) New computer software

(11) [New computer] [software] [i.e. software for a new computer]

(12) [New [computer software]] (i.e. new software for a computer)

In languages which are highly inflectional like Arabic, such phrases are usually not ambiguous because they are often clearly marked for number and gender as follows:

(13) barāmija	ḥāsūb-in	jadīd-in
software-pl	computer-m-sg-gen	new-m-sg-gen
"Software for a new computer"		

(14) barāmija	ḥāsūb-in	jadīd-at-in
software-pl	computer-m-sg-gen	new-f-pl-gen
"New software for computers"		

As can be seen, the gender agreement on the Arabic adjective disambiguates the phrase above by indicating gender agreement with either the singular noun or the plural noun, hence the two readings.

Another ambiguity-creating sequence in English is the phrase featuring 'Adjective-noun-conjunction-noun', e.g. 'tall boys and girls'. Although it is possible to resolve certain ambiguities in the SL semantic features and roles as well as syntactic information, some cases still require the knowledge about the things and events being referred to. The context and our knowledge of the world around us are extremely important tools for the translator that may help clarify certain rather ambiguous situations. Predictably, basic world knowledge proves accessible to student translators but opaque to machine translators. The example in (15), along with its MT and ST in (16) and (17), illustrates this point:

(15) Pregnant women and men (of course only women can be pregnant)

(16) النساء والرجال الحوامل .

(17) النساء الحوامل والرجال .

However, lack of more sophisticated world knowledge and insensitivity to the context may cause some student translators to produce far-fetched, even ridiculous, translations, as can be illustrated in (18), along with its ST in (19) below:

(18) The occupied West Bank

(19) البنك الغربي المشغول .

In a passage talking about Palestinians and their occupied lands, the denotation of the phrase in (18) above should be crystal clear. Lacking appropriate interlingual socio-political world knowledge in the said context, however, these student translators fell victim to fatal translational mishaps.

At the sentence level, it is a well-known fact in modern linguistic theory that grammaticality is never determined by meaning, yet meaning is highly dependent on grammar. Translation, be it an art, a skill or a science, is mainly concerned with the process of transferring *relevant meaning* (Gutt 1996; Farghal 2004) from a SL into a Target Language (TL). Aside from the mastery of the two languages involved in the process of translation, prior syntactic knowledge constitutes an essential element. Although a given context may illustrate the required meaning, it may, however, fall short of explaining certain types of ambiguity which need a great deal of experience in translation activity.

Structural ambiguity at the sentence level is not always captured by machine and student translators. In many cases, polysemous and/or

homonymous words enter into ambiguous syntactic relations in sentences, as can be illustrated in (20) below:

(20) We can fish.

Both student and machine translators managed to offer a translation congruent with the more common reading of the sentence, i.e. 'We can go fishing; rather than the less common interpretation, i.e. 'We put fish in cans'.

However, MT as well as many student translators could not cope with the relevant interpretation when the sentence was disambiguated, as can be illustrated in (21) below, along with the elicited translation in (22):

(21) We can fish in a small factory.

(22) يمكن أن نصطاد في مصنع صغير .

Despite the fact that the co-text in the sentence in (21) rules out the interpretation 'We can go fishing', the MT and many student translators were not able to grasp the difference between **can** as a modal verb, and **can** as a lexical verb; hence the wrong translation.

Syntactically, the source of ambiguity in (20) can be schematized in (23) and (24) below (Georges & Barakat 2000):

(23) <u>We</u>	<u>can</u>	<u>fish</u>
S	Modal V	Lexical V
(24) <u>We</u>	<u>can</u>	<u>fish</u>
S	Lexical V	NP

These two different structural representations give rise to two different semantic interpretations as well. In (23), **can** (a modal auxiliary verb) and the lexical verb **fish** form the combination meaning 'the ability to go fishing', whereas in (24) **can** is a transitive lexical verb that subcategorizes a direct object **fish**, hence the meaning 'putting fish in tins or cans'. Despite the fact that **fish** in both interpretations occupies the same structural position after **can**, yet it is part of the verbal slot in (23) and outside the verbal slot in (24), occupying the nominal object position. This clearly shows that words occupying similar structural positions do not necessarily have the same grammatical functions. This example indicates that it is in fact possible for homonyms to be disambiguated by syntactic analysis, i.e. without using any semantic information.

Apart from structural ambiguity proper, syntactic operations may render sentences opaque to both machine and student translators. Consider the syntactic operation affecting the English collocation **pay a visit** in (25) below, which proved problematic for MT (26) and many student translators (27) and (28):

(25) This came during a field visit paid by Sheikh Mohammed to the General directorate for patrols and the General Security Sector.....

(26) هذا جاء أثناء زيارة ميدان مدفوعة من قبل شيخ . . .

(27) جاء هذا أثناء زيارة مدفوعة التكاليف من قبل . . .

(28) حصل ذلك خلال زيارة حقل قام بدفع ثمنه الشيخ محمد . . .

However, when an active voice sentence (29) involving the same collocation was administered to the machine and student translators, the output was correct, as can be seen in (30) below:

(29) He paid a visit to his neighbors.

(30) قام بزيارة لجيرانه .

Apparently, the syntactic operations of passivization and relative clause reduction in (25) are to blame for the erroneous renditions in (26)-(28) rather than the collocation *pay a visit* itself, as (29) and (30) clearly show. Once again, syntax interferes with the interpretation of semantic units that are otherwise straightforwardly understood.

4. Parenthetical Structures

The corpus shows that reference interpretation in sentences including parenthetical structures may be problematic to both MT and some student translators.

The example in (31) gives rise to misinterpreting reference relating to a non-defining adjective phrase relating to the subject of the main clause, as is clear in the sample translation (32):

(31) Al Saqqaf, publisher and editor-in-chief of the Yemen Times, which is seen as the vanguard of press freedom in the country ...

(32) الساككاف (السقاف) ، الناشر ورئيس تحرير اليمن تايمز الذي يعتبر طليعة حرية الصحافة في البلد . . .

As can be seen, the relative pronoun *which* is mistakenly interpreted as referring back to the antecedent *Al-Saqqaf*, which lies outside the parenthetical phrase, instead of the correct antecedent *Yemen Times*, which is found within the parenthetical phrase. Also, this reflects lack of semantic knowledge on the part of machine and some student translators that the relative pronoun *which* can only refer to inanimate referents such as *Yemen Times*.

Further confusion may be induced by the erroneous use of the subject of the parenthetical phrase as the subject of the main clause in both MT and ST. Consider the MT in (34) and the STs in (35) and (36) of the sentence in (33) below:

(33) The tea, first discovered in China 5000 years ago, has long been thought to be beneficial to health.

(34) اكتشف الشاي ، أولاً في الصين منذ ٥٠٠٠ سنة ، قد اعتقد أن يكون مفيدة لمدة طويلة إلى الصحة .

(35) الشاي الذي يعتقد أنه مفيد للصحة اكتشف في الصين قبل ٥٠٠٠ سنة .

(36) اكتشف الشاي الذي يعتقد أنه مفيد للصحة لأول مرة في الصين منذ ٥٠٠٠ عام .

Other things being equal, both the MT and the sample STs above twist the focus in the packaging of information by using the non-finite verb in the subordinate phrase, i.e. **discovered** as the verb of the main clause instead of the correct verb **has been thought**. These examples show clearly that both MT and ST still need further work in the area of subordinated structures.

Before closing this section, below is an example in (37), along with its MT in (38) and a sample ST in (39), which shows that subordinate clauses may cause wrong gender agreement in MT, but not in ST:

(37) The baby's father, she said, would soon travel to Brazil to offer scientists proof that the baby's DNA was identical to that of a deceased sibling.

(38) أب الطفل ، قالت ، ستسافر قريباً إلى البرازيل لعرض العلماء الدليل أن دي . إن . إيه الطفل كان متماثلاً إلى ذلك لأخ راحل .

(39) قالت إن أب الطفل سيسافر إلى البرازيل لعرض على العلماء أن «دي أن أيه» الطفل متطابقاً مع قريبه الراحل .

Because of the intervening clause, there was a gender agreement or concord mismatch between the subject and the verb of the main clause in the MT in (38). Being transparent to native speakers of Arabic, however, gender agreement was not affected by the parenthetical clause in the ST in (39).

5. Word Order

English is overwhelmingly a configurational language in which the position of the constituent mainly indicates the grammatical function; hence the major claim in Transformational Grammar that functional labels such as Subject, Predicate, Direct Object, etc. are effectively derivable from categorical labels such as NP, VP, PP, etc. (Chomsky 1965, and his subsequent works). Therefore, any change in the English basic word order, i.e. SVO is the result of transformations that belong to the transformational component which supplements the base component in generating English grammatical sentences. Among these transformations, inversion constitutes one of the more common syntactic operations in English. On

the one hand, inversion is highly standardized and straightforward in Yes/No questions and Wh-questions; hence it poses no challenge to MT and ST. On the other hand, inversion applies less frequently in stylistically marked constructions including conditionals and negative expressions, and consequently creates serious challenges to MT and ST alike. Similarly, informal subject deletion in declaratives and initial gerundive and participial phrases may create serious interpretation problems in both MT and ST.

First, Type II and Type III English conditional sentences may stylistically delete the conditional marker *if* and, as a result, Subject-Auxiliary Inversion (SAI) obligatorily applies. This syntactic operation confuses both MT and ST, as can be illustrated in (40) and (42), along with their MT in (41) and ST in (43), below:

(40) Had it not been too late, I would have accompanied you.

(41) كان لدى هو ليس كان متأخر جداً ، كان يمكن أن أصحابك .

(42) Had the president known this, he wouldn't have given them the permission to do so.

(43) عرف الرئيس هذا ، لم يكن من الممكن أن يعطيهم الإذن لعمل هذا .

As can be seen in (41) and (43), the *if*-deletion and the subsequent SAI confused the machine as well as some student translators, resulting in nonsensical renditions of the first part of the conditional sentences.

Predictably, conditional sentences with the ordinary word order created less serious problems to the machine and student translators. By way of illustration, consider the MT rendering in (45) of the conditional sentence in (44) below:

(44) If he had known this in advance, Kofi Anan wouldn't have agreed to send the fact finding team to Jenin camp.

(45) إذا قد عرف هذا مقدماً ، كوفي عنان لم يكن من الممكن أن يتفق أن يرسل فريق تفصي الحقائق لمعسكر جنين .

Although the MT in (45) suffers many grammatical and lexical errors, it can be readily edited into an acceptable Arabic translation, as the rendition makes it clear that the SL text is a conditional sentence. By contrast, it would be very difficult for the editor to figure out that the translations in (41) and (43) above are conditional sentences. As is clear, the cause is the inversion in (40) and (42).

Second, sentence initial negative expressions obligatorily trigger SAI. This contrasts with the unmarked position of negative expressions which are attracted by the auxiliary verb in the SVO word order. The MT rendering in (47) of the sentence in (46) is only illustrative:

(46) No longer able to sustain her story, she admitted owning two more buildings in working class districts of the capital, acquired over a lifetime of begging in the streets.

(47) قادر لم يعد أن تبقي على قصتها ، اعترفت بامتلاك مبنين آخرين في مقاطعات طبقة العمال للعاصمة ، حصلت أكثر من عمر التسول في الشوارع .

Other things being equal, the gender agreement confusion at the beginning of the Arabic translation is an immediate consequence of the sentence initial negative expression in (46). That is, the negative expression **no longer able to** is not marked for gender in English the way the noun phrase **her story** is, later on in the fronted adverbial phrase **no longer able to sustain her story**. As for the erroneous inversion performed by MT in (47), it may have to do with the presence of the non-finite subordinate clause. This may explain why MT does not operate inversion in (41) above where a finite subordinate clause is employed. However, inversion proves fatal to MT in both cases.

Third, sentence initial gerundive and participial phrases can cause problems to both MT and ST. The following participial phrase in (48), along with its ST in (49) and MT in (50), bears witness to that:

(48) Given their supernatural powers, it is not surprising that jewels have deep religious significance in India.

(49) على اعتبار قدراتهم الخارقة للطبيعة ، فمن غير المذهل أنهم يملكون جواهر ذات أهمية دينية في الهند .

(50) على اعتبار قدراتهم الخارقة للطبيعة ، إنه غير مذهل أن لدى الجواهر مغزى ديني عميق في الهند .

Both the ST and MT above misinterpreted the cataphor **their** by failing to cater for correct gender agreement with the referent in the main clause, i.e. **jewels**. Even worse, the ST, having committed the said mistake, fell victim to another interpretation problem whereby gender agreement is erroneously created in the main clause, i.e. أنهم يملكون on the basis of the misinterpretation of **their** in the sentence initial participial phrase, thus offering a worse interpretation than the MT. Apparently, the ST was sensitive to congruence in gender agreement in the participial phrase and the main clause, whereas MT was not. This may be explained by the fact that humans can backtrack and subsequently interpret forthcoming segments relevantly, while machines can do things consecutively with little or no backtracking taking place in interpreting pronominals in discourse, hence the incongruence between قدراتهم in the participial phrase and لدى الجواهر in the main clause in (50).

Further, it should be noted that anaphoric reference is more natural and common than cataphoric reference in Arabic discourse. As a result, it would be a good idea to instruct both MT and ST to change cataphoric reference to anaphoric reference when translating from English into Arabic. This discursal mismatch may have caused some, if not most, of the confusion in the reference interpretation in (49) and (50) above.

Finally, informal subject deletion in English declaratives/interrogatives may bewilder both machine and some student translators. The example in (51), along with its MT in (52) and some sample STs in (53), (54) and (55), illustrates this:

(51) Sounds complicated? Actually, it isn't as difficult as it may seem.

(52) بدوت معقدة (عقدت الوقع)؟ في الواقع ، هو ليس كصعب كقد يبدو .

(53) تعقيدات الصوت؟ في الواقع بأنها ليست بصعبة كما يبدو .

(54) رموز معقدة؟ في الواقع هي ليست صعبة كما تظهر .

(55) تعقد الصوت؟ طبعي إنه ليس من الصعب كما يبدو .

Ignoring the second part in the text above, the deletion of the dummy subject *it* in the declarative Yes/No question rendered it incomprehensible to the machine as well as the student translators. Looking at the poor quality of the translations in (52)-(55), the drastic change in the word order seems fatal. In the case of MT, the machine should be sensitized to subjectless declaratives/interrogatives, in addition to the familiar imperatives. As for student translators, their trainers should bring to their attention such marginal structures that can be optimally natural in conversational English. Such informal features, it should be noted, are more relevant to interpreting than translating.

6. Conclusion

This paper has addressed itself to some syntactic areas with which MT and ST may experience difficulties. It has been shown that polysemous and/or homonymous parts of speech, structural ambiguity at phrase and sentence level, reference interpretation in parenthetical structures and word order variation may cause serious translation mishaps in MT and ST alike. In many cases, these problems produce incomprehensible renditions where heavy post-editing is needed.

An important finding of this study is the striking similarity between the syntactic errors committed by the machine and student translators. Apparently, both groups seriously lack sufficient syntactic knowledge relevant to syntactic operations which affect unmarked constructions in English, thus rendering them stylistically marked and, consequently, impenetrable to the interim translational competence in MT and ST.

Whereas future technological development induced by human intervention is expected, in theory at least, to remedy the MT deficiencies in this regard, translator trainers should shoulder the responsibility of bringing such syntactic subtleties to the consciousness of their student translators.

Finally, this study may offer us some insights into the modes of human reasoning and mechanical (machine) reasoning in translation activity. On the one hand, subtle syntactic processes proved fatal to both MT and ST. On the other hand, student translators demonstrated an awareness of basic grammatical and world knowledge, such as gender concord and primitive coherence, which proved opaque to machine translators. Apparently, the human brain's ability to backtrack opens some reasoning avenues that are not yet available to MT. Therefore, any genuine development in future MT must take this important mismatch into consideration.

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