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Adab Al-Rafidayn *Journal*

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in the field of arts and humanities both in Arabic and English**

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Editor-in-chief

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Text Typology and Lexical Problems in Arabic-English Machine Translation

*yasir Najm Abdullah **

*Luqman A. Nasser **

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Abstract

This paper tackles the relationship between text typology and machine translation. In this paper , the study is restricted to only one direction of translation that is from Arabic into English. It aims at clarifying the different results of machine translation renditions due to different text types. In theory, the paper gives a theoretical background on the topic. Then, practically, in order to test the hypothesis of the research which says that text typology affects the degree of appropriates of renditions by machine translation ,six functionally different texts (two of each informative, expressive and vocative texts) have been rendered from Arabic into English by machine translation (Google translate). Then the percentage of errors in these renditions has been calculated for each text by comparing machine translation with professional human one. The study concludes that that text typology affects the percentage of errors in MT in that fewer errors are noticed in vocative types compared with expressive and informative ones.

Keywords: Machine ؛ translation ؛ text ؛ typology؛ English.

1. Introduction

Bassnett (1980:22) says, "Translation involves the transfer of meaning". "The comparison with machine translation also serves to show the full range of complex tasks translators perform which cannot be replaced by computer programs" (sager 1997: 37). Machine translation started as a human dream, but later it turns as a fact and many researchers presented different definitions for MT, such as Garvin (1963: 223) defines it as "a process for translating a

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text from one language to another". Lawson (1982: 5) said that, "MT is automatic translation with or without human assistance". Sippl (1985: 359) defines MT as "the automatic transmission from one representation to another representation. The translation may involve codes, language, or other systems of representation".

Hutchins (1985: 1) points that, "MT is the application of computers to the translation of text from one natural language into another". Lawson (1989: 280) states that, MT is a translation generated by a computer, with or without assistance from human. Sager (1994: 334) defines MT as "any process in which there is an element of automatic analysis of source language text, transformation of this text and production of a target text in another language".

The late 1990s and early 2000s, the corpus-based approach, with its two main types corpus-based approach and example-based approach, was dominant that both types depended on a very big databank of examples of texts, which have been translated by professional human translators. The corpus-based system, in somehow, was specialist, it depended in translating to the data that it was trained with and it required a huge training-corpora of examples since some words may appear only once or twice or not at all, even in a multimillion word corpus, which considered a real challenge to obtain a reliable translation even for widely spoken languages (Bowker and Ciro, 2019: 42-44).

In 2013, a new end-to-end encoder-decoder structure of MT suggested by NalKalchbrenne and Phil Blunsom (Kalchbrenner, N and Blunsom, P, 2013: 413). It is a way depended on deep learning neural networks for mapping natural language (Sudah, Tsukada and Nagata, 2010: 418).

The neural network is a type of information processing system which resembles the working method of biological nervous system, like the brain, in processing information. It includes a big number of extremely interrelated processing elements that work in harmony to solve particular troubles. Neural networks learn through example, neural networks are arranged in strata. The strata consist of a number of interrelated nodes that have a stimulation mission. Texts will be given for network through the way of the insertion strata that connects with one hidden or much strata where the factual

practicability treating completes through a system of weighted links. The hidden strata connect to output strata that the translation will emerge. Neural networks possess some kind of learning rule that adjusts weights of communications according with the input ways that it deals with. So neural networks learn through example (L. Bowker and J.B. Ciro, 2019:44-45).

2. Theoretical framework

2.1. Approaches for Machine Translation Systems

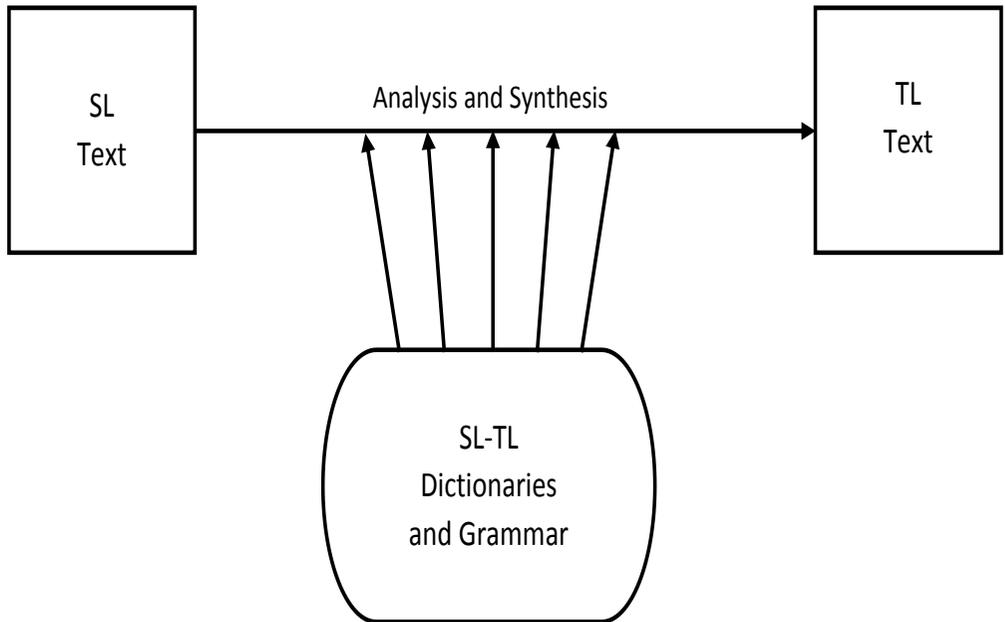
The improvement of MT systems crossed through many stages, each stage is recognized by particular features and standards. Along these stages, certain approaches were used to design the architecture of MT systems, for getting the better goodness for the result text. Systems are divided by two basic components (Linguistic architecture and Computational architecture).The significant and basic Linguistic approaches used are: the Direct Approach, the Interlingua Approach and the Transfer Approach.

2.1.1. The Direct Approach

The early beginnings of MT, computers were not sophisticated as today. Hence, researchers could not employ but ‘primitive’ strategies in designing MT systems. The general strategy employed in system design was the direct translation (Hutchins, cited in Lawson, 1982: 22).

This approach was workable only on pair of languages. Mostly at 1950s to the mid-1960s, Russian was the source language and English was the target language. These systems were designed for performing word-for-word translation. They analyzed vocabulary and syntax of the SL text to the range of the solving of vagueness, determination for suitable translation, and specifications of word order for target language texts. Syntactic analysis has been engineered for working slightly more than the knowing of word class (nouns, verbs, adjectives, etc.) for transacting the homographs (Hutchins, cited in Lawson, 1982: 22).

The following figure illustrates the principle on which the direct MT system was built, according to Lawson (1982: 24).



2.1.2. The Interlingua Approach

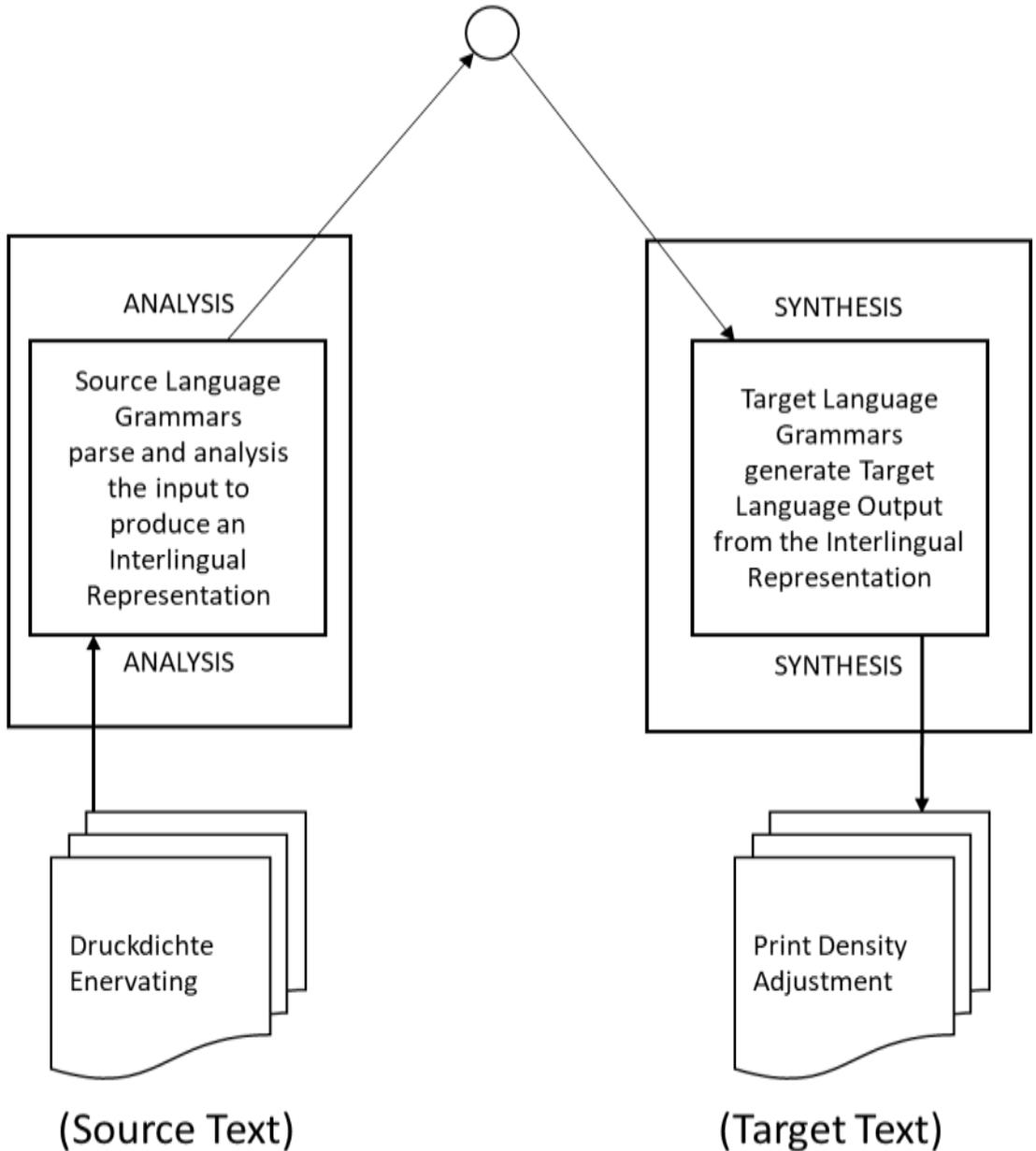
The search after direct translation led to much feasible approach which is called “Interlingua” in the 1960s.

In this kind of systems, the translation is done via two-stage process, begins with the original language turns to the interlingua, in turn the interlingua changes to second language (Hutchins, cited by Lawson, 1982: 26). In other words, the concept from original language input to be aimed for characteristic each language, i.e. (neutral), and is created by a representation, that in turn utilized for synthesizing the second language output (Slocum,1985; Bennett et. al. ,1986; Hutchins, 1999/b).

The independency concept of the intermediary representation means that that the analysis schemes and generation are totally autonomous, utilizing split dictionaries and grammars to the original and second language (Hutchins, cited in Lawson, 1982: 26). This means that the interlingua draws its rules from the linguistic universals that the linguists and philosophers discussed about for a long time, which means that the representation of a certain unit

would be the same, it is not important what language or (grammatical structure) that the unit might be expressed in (Slocum, 1985: 73). The figure () illustrated the Interlingua system.

Interlingual Representation



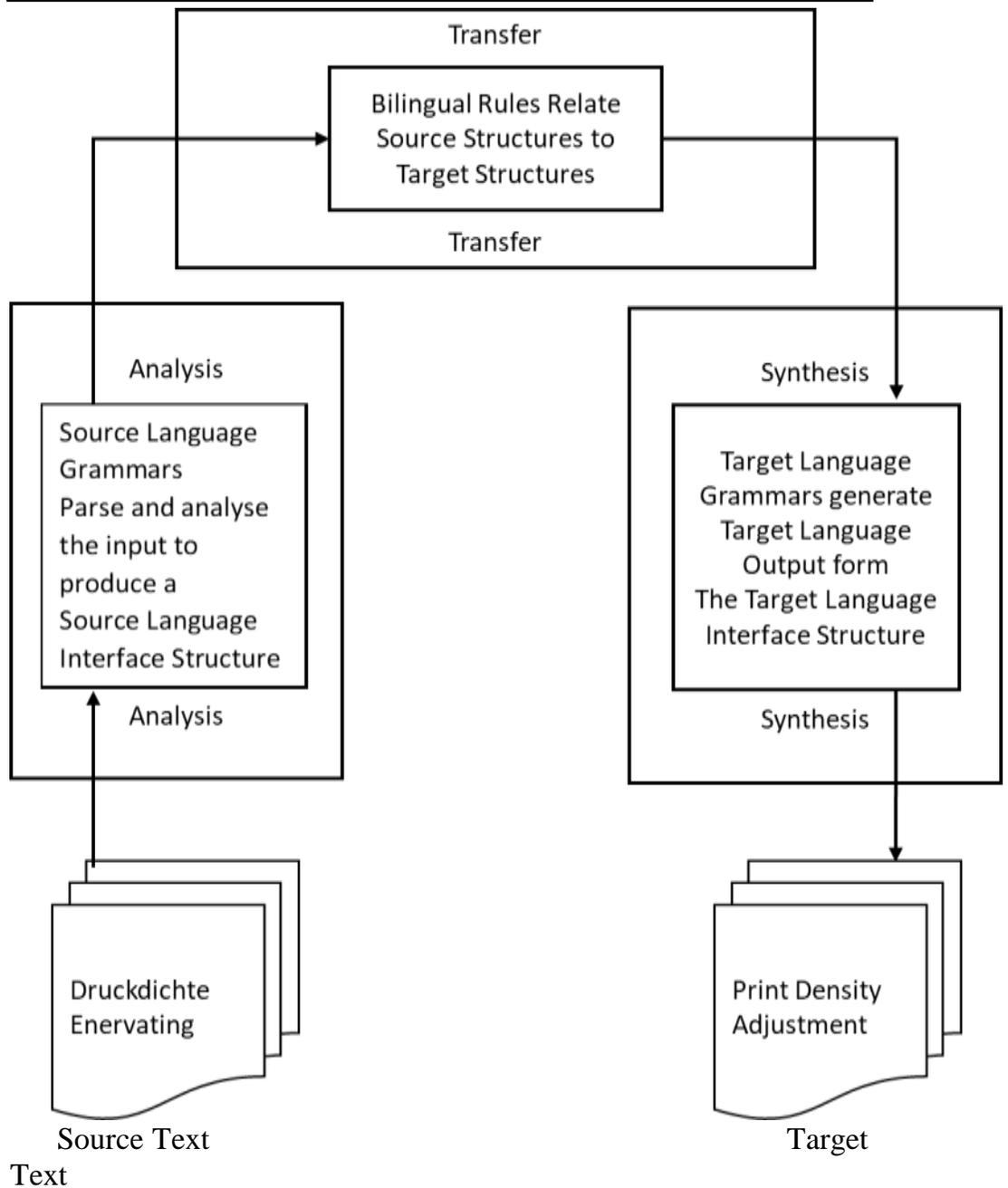
2.1.3. The Transfer Approach

The mid 1960s, witnessed the emerge of the Transfer Approach which concentrated on the concept of “level of representation” that the translation consists of three stages: the analysis stage that switches the SL text to abstract linguistically SL representation through source language dictionary, the transfer stage which occurs at lexical and structural levels between two languages to make corresponding structure in the TL representation by bilingual dictionary, and the generation stage synthesis of text in target language relies on linguistic information of original language by second language dictionary equivalents (Hutchins, cited in Lawson, 1982; Slocum, 1985; Bennett et al., 1986; Hutchins, 1993; 1999/b).

The analysis stage aimed at solving syntactic and vocabulary vagueness for source language, and there is no need to present other representations for synonymous expressions. The analysis does not involve the elements that may have more of one identical in second language (e.g. the English word Know and the Arabic words أعرف وأعلم). the transfer component function is changing original language exemplifications which with no vagueness into suitable exemplifications to a certain second language (Hutchins, cited in Lawson, 1982: 29).

This means that the intermediary representations, resulted from the analysis stage are not language independent, but directed for the attributes that the original language possess, whereas the representations resulted from the transfer stage are directed to the features of the target language (Hutchins, 1993: 735).

Transfer approach is much more favorable from Interlingua approach because: (1) the difficulty of deducing language independent representations; and (2) the analysis and generation grammars turn into more intricate when the representation are not so relevant to the basic features of the source and target texts (Hutchins and Somers, 1992:76). So, the intermediate representations in the transfer approach are still language dependent abstractions that minimize the intricately of analysis and generation. The figure below illustrates the components of the transfer systems.



The figure () illustrates the components of the transfer systems

2.1.4. The Triangle Diagram

The fig() illustrates the difference inter the (Interlingua)and (Transfer) approaches for MT systems design. Upper the left part contains the analysis for the source language, while the target language generation is shown in the right down part.

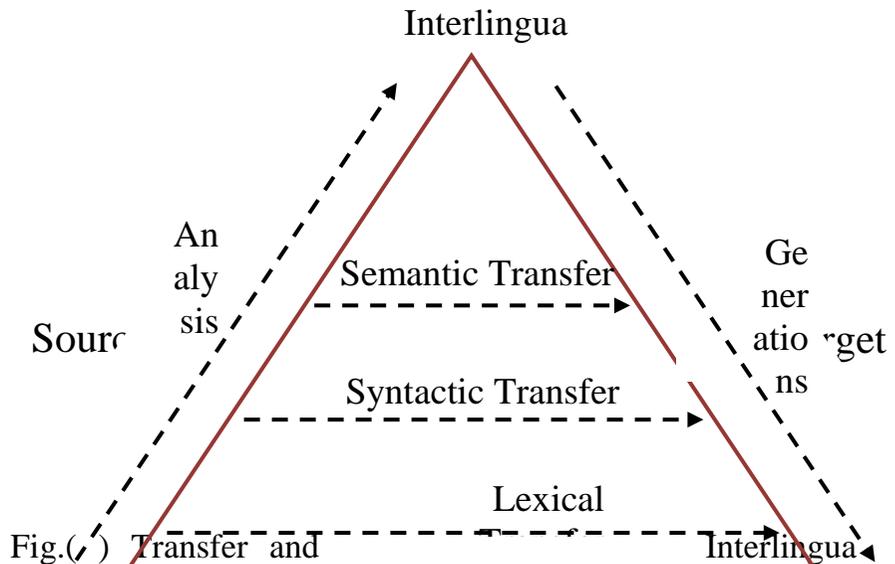


Fig.(✓) Transfer and Interlingua
 'Pyramid' Diagram After Hutchins and Somers (1992: 107)

Hutchins and Somers explain this diagram stating that “the apex of the pyramid represents the theoretical interlingual representation achieved by monolingual analysis and suitable for direct use by generation”. The diagram is suggested to show that the course to the Interlingua is lengthy, and through disconnecting of the monolingual analysis in the same place and initiating a process of bilingual transferring, the problems of a complete analysis may one bypass. Also, the scheme shows when increasing analysis of text, transfer would be easier. In the down, a minimum monolingual analysis happens, and all procedures are almost executed in transfer, like happened in the prior state of direct method systems (Hutchins and Somers, 1992: 107).

3. Arabic Language

Arabic language is spoken by millions, although there is a variety of delicate, Modern Standard Arabic (MSA) is used for

writing in books, magazines ... etc. "MSA is the literary and standard variety of Arabic used in writing and formal speeches today"(Schulz 2010). Arabic language possesses a lot of morphological and syntactic structures ((Al-Sughaiyer and Al-Kharashi 2004). Nouns in Arabic are explicit feminine or masculine, and the gender also has grammatical or natural form. Arabic language does not switch directly from singular to plural form as other languages do, instead it has dual then plural words are the basic parts in language that transmits meaning. However, many words have multiple meanings that not only confusing, but also can produce incorrect translation, faulty information, and cultural gaps.

Arabic language possesses various word orders in which the same sentence can be produced with different expressions. Arabic various word orders can be illustrated as VSO, SVO, VOS, and SOV. Arabic sentence starts with a verb while English sentence starts with a noun. Also Arabic has an inflectional system, for example the Arabic word "عقد" can be a verb like "عقد الاجتماع" or noun like "هذا عقد جميل".

4. Lexical Ambiguity

Lexical ambiguity arises from the use of some word which has more than one interpretation. It results when machine cannot select the suitable equivalent for the terms or words that are existed primarily in the source text. Because machines cannot understand the 'meaning' of what it is translating. Bar-Hillel states that "if in a translation program, some steps has to be taken which directly or indirectly depends upon the machine's ability to understand the text on which it operates, then the machine will simply be unable to make this step, and the whole operation will come to full stop"(Bar-Hillel, 1953: 217).

Hutchins and Somers indicated that "where one word can be interpreted in more than one way". They classify lexical ambiguity in 3 main kinds: category ambiguities, homographs and polysemes, transfer or (translation) ambiguity (Hutchins and Somers, 1992; 1997: 85).

They referred that "the first kind (category ambiguities), as the most explicit one of lexical ambiguity", a certain item can be

appointed to many grammatical or syntactic category (like noun, verb, or adjective) in accordance with context. Like English item the light that may be a (noun, verb, or adjective) (Ibid).

Hutchins and Somers (1992: 86) pointed that the morphological inflection can help to produce a solution for Category ambiguities, but sometimes it needs to syntactic analysis to solve this category ambiguities.

Homography and polysemy, homography as Palmer (1981: 101) discussed “it is a type of partial homonymy. It occurs when the identify is within the graphic medium”. Homographs are described as two or more distinct lexemes which have the same spelling and different pronunciation but different unrelated meanings. Balkan et al. ;(1994: 150) refer to this problem saying “when a word has more than one meaning, it is said to be lexically ambiguous”.

Hutchins and Somers (1992; 1997: 86-87) said that “linguists distinguish between homophones and polysemes. Homographs are two or more words quite different meanings which have the same spelling. They added that the homograph could be disambiguated according to text-type, so that the unusual usage is simply excluded from the dictionary unless it is appropriate to the subject matter of the text to be translated”. For example the word club means (weapon and social gathering).

Palmer (1981: 101) said that polysemy means one word that has several meanings. Whereas Hutchins and Somers (1992; 1997:86) explained polysemes as they are words that show scope of meanings connected by somehow to each other. Tuggy (1993: 167) refers to polysemy like a linguistic phenomenon, where "two or more meanings associated with a given phonological form are united as non-distinguished subcases of a single, more general meaning".

Like metaphorical expansion or transmission (mouth of a river, flow of idea). They added that when expansion turns into too far of the source as well polysemes turn into efficiently homographs (Ibid).

Warner (1966: 252) pointed out that “one of the most difficult problems of MT is the resolution of homography”

Homography and polysemy in MT analysis they most of times are cured in the same way, because the matter is determining meaning that accompany context for certain written "word". Homographs in various grammatical categories are cured like previous mentioned, but homographs from the same class syntactic only are not enough: semantic reference should utilize (Hutchins and Somers, 1992; 1997: 87).

They also pointed out that transfer ambiguities in MT emerge when a single word can probably be translated by many various TL words or expressions. The SL word itself is unambiguous, or the native speakers of language may not understand that the word itself is vagueness, and in other language conception the word itself is vagueness (Hutchins and Somers, 1992; 1997: 87-88).

Like: The English item "uncle" means (خال أو عم) in Arabic, there is a various kinship relations between Arabic and English.

Finally, there is a difference between ambiguity and vagueness that vagueness as Tuggy (1993: 167) defined it as "two or more meanings associated with a given phonological form are united as non-distinguished subcases of a single, more general meaning", then vagueness includes one word, but indeterminate meaning like "My child came back from school". Since child may be male under 18 or female under 18.

5. Characteristics of Text Typology

"Text types have been recognized as determiners of the global purpose of a text, recent discussions of translation have also included equivalence of text type as one of the major forms of equivalence to be aimed at" (Anna trosborg,1997:25). The translation process depends on text types as Sager (1997: 30) points that each text has distinguish structure attributes and rhetorical features.

Kozlowska (2007: 26) mentions, although the highly importance matter of text typology to a translator; but the particularist literature usually ignored it and interested in translation researches.

There is no typology ranking of texts that practitioners or theoreticians can apply to MT, however, the text types is one of the crucial parameters that help to success or failure in MT generally. Since determining the type of text is important step in translating,

considering the subject field, register, style and purpose that the translation is meant which is the first action for human translator, since "Text types have evolved as patterns of messages for specific communicative situations" (Trosborg, 1997: 30).

Reiss (1977) supposes that the production of translation language is resulting from text kind or communicative attitude because various kinds of written discourse have various kind communicative functions.

Reiss differentiates four text kinds which resulting from text function, the kinds are:

1-Informative texts aim at conveying knowledge.

2-Expressive texts, they concentrated on shape to execute an aesthetic job

3- Operative texts aim at guiding an appeal for text reader.

4-Audiomedial texts supplement the above mentioned functions with visual and audio images (Reiss 1977, as cited in Munday 2016).

The knowledge of text types will help to translate the individual texts with less effort which consider the knowledge of text type as critical importance in communicative in general, "Text types have evolved as patterns of messages for specific communicative situations" (Trosborg, 1997: 30). In this study, three types will be studied: scientific texts, literary texts and legal texts, each type of text has some features (characteristic) that differentiate from other texts.

The definition of Text types is "a conceptual framework which enables us to classify texts in terms of communicative intentions serving an overall rhetorical purpose" (Hatim and Mason 1990: 140).

Werlich's (1976) typology involves 5 exemplified text genres or mods: description, narration, exposition, argumentation, and instruction. The typology has dependent on cognitive features to text kinds: differentiation and correlation of conception in space (description), differentiation and correlation of conception in time (narration), understanding of general notions by distinguishing through analysis or/and synthesis(exposition), judging, i.e. assessment of links between and among notions via the deriving of

similarities, variances, and transformations (argumentation), drawing of future behavior (instruction) (Trosborg,1997: 15-16). For differentiation and further description of these categories.

"Text typology with genre conventions and knowledge of how communicative functions and text types are realized in different languages within and across genres are useful knowledge in translator training and in translation itself" (Trosborg, 1997: 18).

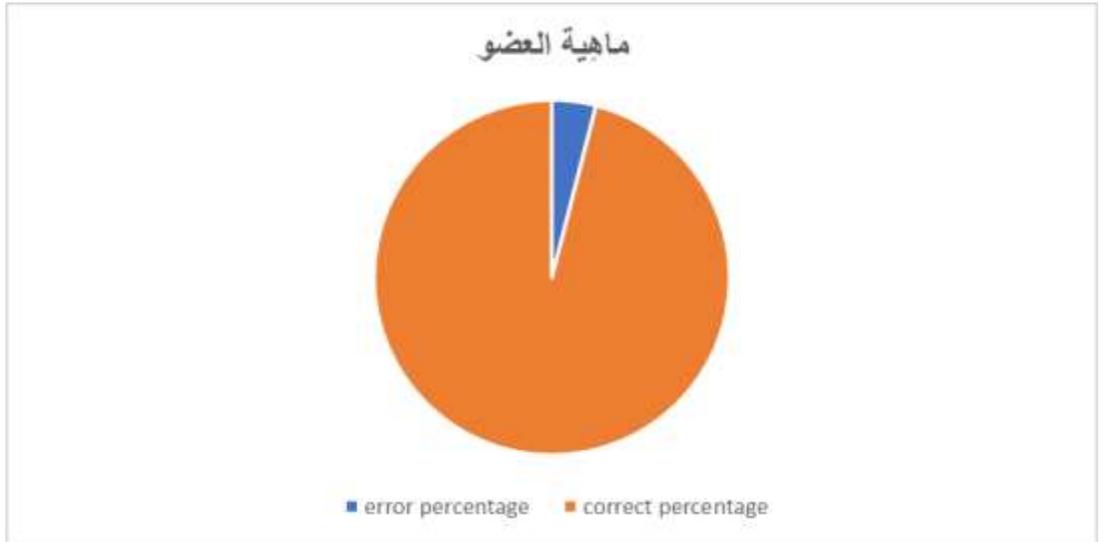
6. Practical Part

6.1. The Method

For testing the hypothesis of research, 2 vocative texts, 2 expressive texts, and 2 informative texts have been selected to form the materiel of practical part. The comparison between the renditions of the selected texts produced by MT (Google Translate) with the original authenticated (published) renditions showed that there are some lexical errors made by the translation of MT (Google Translate) for every kind of texts . The following tables give a summary of these errors whereas the full SL and TL texts are given in the appendix:

1. Informative texts (Medical)

SL item	Lexical incorrect cases	
	HT	MT
والشراسيف	precordia	tibia
أطلاع	ribs	shadows
الحنجري	epiglottis	laryngeal
ثُرُضٌ	torn	compromised



The form (1)

	error percentage	correct percentage
ماهية العضو	4	96

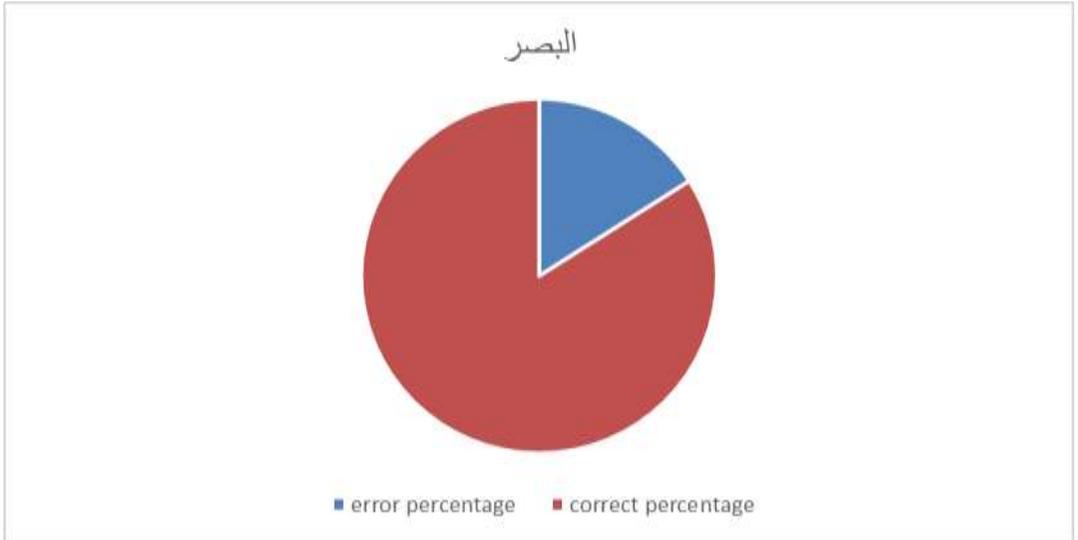
Table (1)

In the informative texts ,MT (Google Translate) deals with words in the texts as isolated items to be translated out of their context, producing one equivalent, (the input words only), for this item. MT (Google translate) failed to produce the correct equivalents, since these equivalents are only the input equivalents in machine program. In other words, the machine provides one meaning for word, only what it is fed with. Machine translation tends to produce a literal rendition or a transliteration without presenting the appropriate equivalence, because MT (Google Translate) does not take into consideration the context or the field or genre of the text.

-Informative text (2)

SL item	Lexical incorrect cases	
	HT	MT
البصر	eye	sight
مركب	consists of	complex
مقدم	front	provider
عصبتان	nerves	Asbtan

جوفوان	hollow	Geoffawan
بيتدنان	beginning	Eptdian
جنبتى	two points	Jnepta
ينشان	originating	grow up
فينتهيان	extend	Venthaan
فيصيران	forming	Faisaran
عُصبة	nerve	League
عصبتين	nerves	Asptin
جوافوين	hollow	Jovawain
ملتحم	fastened	fused
شَحمة	grease	lobe
مُقعر	concavity	core



The form (2)

	error percentage	correct percentage
في هيئة البصر	16	84

Table (2)

The second informative text also contains some lexical problems when translated by MT (Google Translate) .When the machine fails to find an equivalent it gives the transliteration of the lexical item despite the fact that there is an equivalent for such items as in the

case of "جوفان", because MT (Google Translate) failed to deal with dual case of Arabic as noticed in many similar cases.

2. Vocative text(1)

SL item	Lexical incorrect cases	
	MT	HT
نالنت	got	inflicted
نفسيات	psyche	Morales
أثارها	mark	scars
الرقيب	watchdog	Sergeant



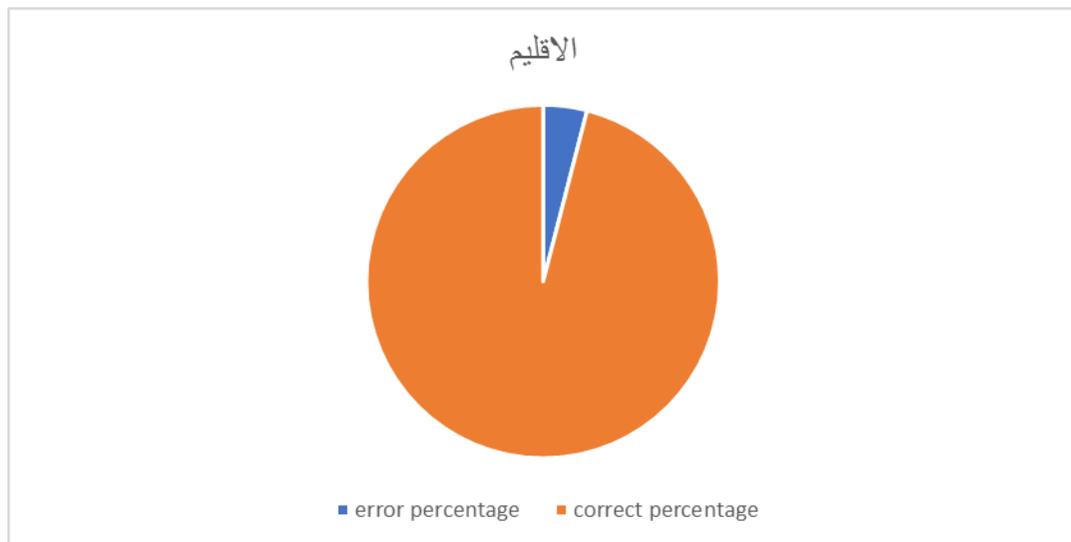
The form (3)

	error percentage	correct percentage
أكتئاب وعدوانية	4	96

Table (3)

In the vocative texts which are translated by MT (Google Translate), the machine produces also one meaning only for each word since it cannot provide the appropriate equivalent simply because it neglects the context in which it used. It translated literally (word-for-word) translation.

-Vocative text(2)



The form (4)

	error percentage	correct percentage
الأقليم	4	96

Table (4)

SL item	Lexical incorrect cases
---------	-------------------------

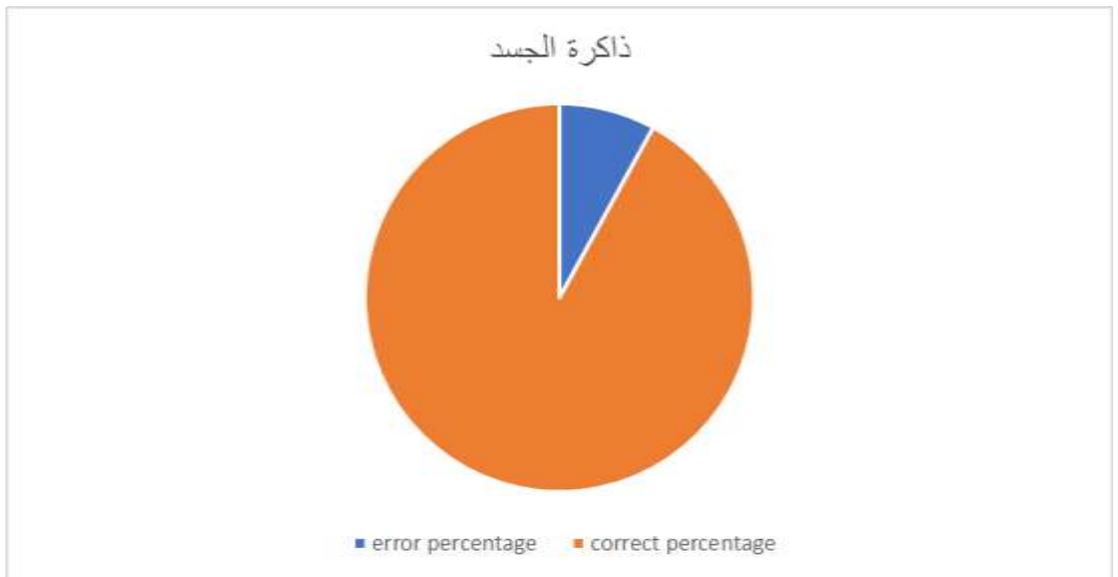
In second vocative text there is also a problem of literal translation produced by MT (Google Translate) . The machine not only neglects the context but also the genre as well as the cohesive devices of the text .

Expressive text(1)

SL item	Lexical incorrect cases	
	MT	HT
الإقليم	Region 45	FEDERATION
صراحة	stipulated	explicitly
الواقعة	fact	incident
علماً	science	Knowledge

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	MT	HT
رعشة	tremor	_____
المرة	once	bitter
اعثر	stumbling	found
الصينية	Chinese	tray
طقسنا	rituals	storms
وطقوسنا	rituals	norms
تقلباتنا	events	changing
الجوية	weather	moods



The form (5)

	error percentage	correct percentage
ذاكرة الجسد	8	92

Table (5)

In expressive text, although the denotation refers for literal meaning for item whereas connotation depends on an inexplicit or indirect sense, the human translator relying on his world knowledge to translate the meaning to other language. also contain some lexical problems when translate by MT (Google Translate) include the literal translation and the wrong translation such as " المرة ", because MT (Google Translate) has no World Knowledge.

-Expressive text (2)

SL item	Lexical incorrect cases	
	MT	HT
المتقطعة	intermittent	babble
سमार المقاهي	Samar of the cafes	coffeehouses
احساسها الباطن	subconscious sense	intuition
عصاه	disobeyed	stick
سلمه	peace	staircase
تستأثر	monopolizes	stayed
بكهولتها	caliber	matured
سهرته	evening	entertainment



The form (6)

	error percentage	correct percentage
بين القصرين	8	92

Table (6)

Again in second expressive text MT (Google Translate) failed to give an appropriate equivalent for some words since it translates

literally because it ignores the context; also it produces a wrong equivalent such as "همسات الإحساس". However, MT (Google Translate) has been improved by using neural systems which "builds on an encoder-decoder framework: the encoder transforms a source-language sentence into continuous-space representations through a recurrent neural network (RNN), from which the decoder generates a target-language sentence using another RNN" (Yong Cheng, 2019: 1-2).

Findings

Text type	T-1 Percentage	T-2 Percentage	Total Percentage
Expressive	8%	8%	8%
Vocative	4%	4%	4%
Informative	4%	16%	10%

Conclusion

“Google Translate” can be utilized as a helper to translators. However, the findings show that text typology affects the percentage of errors in MT in that fewer errors are noticed in vocative types compared with expressive and informative ones. This is due to the fact that Arabic vocative texts are more frequent in the web which facilitates the rendition of such text into English more than other types. While in expressive types the lexical errors are more because Arabic is an inflectional language which is difficult to MT (Google Translate) to deal with it. In addition, expressive texts are usually figurative ones with different connotations. It is shown that lexical errors in Machine Translation (Google Translate) occur because machine cannot give alternatives or the appropriate equivalent according to the context or to the subject field with almost no additional connotative meanings and context plays less role for defining the intentional meaning from referential item.

Rendering Arabic informative texts is a difficult task for MT because they contain a lot of expressions for which the machine does not have an appropriate equivalent, so it produces a transliteration. But generally the lexical errors are less than those in

expressive texts taking into consideration that the latter are full of connotative meanings and figurative language which is difficult for the machine due to indirectness of reference. However, because the programs of MT have been developed over years, the renditions are to a certain extent accepted. Still, it needs to develop to be more accurate. In addition to that Machine Translation Software, whose concern is the Arabic-English pair, is still lagging to some extent. Therefore, the interest in machine translation in the Arab World needs more concern taking into consideration that Arabic grammar is considered difficult for designers of this software.

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نوع النص والمشاكل المعجمية في الترجمة الآلية من العربية إلى الإنكليزية

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المستخلص :

يتناول هذه البحث العلاقة بين نوع النص والترجمة الآلية للترجمة من العربية إلى الإنكليزية، ويهدف إلى توضيح النتائج المختلفة لعمليات الترجمة بواسطة الترجمة الآلية بسبب أنواع النص المختلفة، من الناحية النظرية، ويقدم البحث خلفية نظرية حول الموضوع، ثم عملياً من أجل اختبار فرضية البحث التي تقول أن تصنيف النص يؤثر على درجة ملاءمة عمليات الترجمة بواسطة الترجمة الآلية، وتمت ترجمة ٦ نصوص (٢ إعلامي، ٢ تعبيرية، ٢ علمي) بواسطة الترجمة الآلية: (Google Translate) ثم تم حساب نسبة الخطأ لكل نص في الترجمة الآلية والترجمة البشرية، وقد توصل البحث الى استنتاج أنّ معدل الأخطاء في ترجمة النصوص الخطابية أقل منه في ترجمة النصوص العلمية والأدبية ويعزى ذلك إلى أنّ هكذا نصوص ترد بكثرة في الشبكة الدولية ممّا يسهل عملية ترجمتها بصورة آلية.

الكلمات المفتاحية : الترجمة، الآلية، العربية، الإنكليزية، نوع.

طالب ماجستير/قسم الترجمة/كلية الآداب/جامعة الموصل.

أستاذ/قسم الترجمة/كلية الآداب/جامعة الموصل.