



Evaluating the Performance of MyMemory: A Case Study of Computer-aided Translation of Hemingway's *Homage to Switzerland*

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Abstract

This paper evaluates the quality of the Translation Memory embedded in *MateCat*, a computer-aided translation tool. *MateCat*'s built-in Translation Memory, MyMemory, is constructed using a crowdsourcing system and is in constant development by the post-edited translations that are uploaded to the server from the huge number of *MateCat*'s users. The current study carries out a translation of a literary text where the translation is implemented in two phases: Initial Translation and Follow-up Translation. Next, a comparison between the outputs of the two phases was drawn to observe the error rate after the two trials. *Homage of Switzerland*, a short story written by Ernest Hemmingway, was imported into *MateCat* to evaluate the Arabic output translation. The study concludes that despite the technological revolution in computer-aided translation tools, there is a considerable sum of linguistic errors on the Arabic language's lexical, grammatical, and morphological levels. The study also asserts that, despite the enormous efforts paid to develop computer programs to facilitate the translation tasks, human intervention is still a must.

Keywords: *Computer-aided translation; crowdsourcing translation; machine translation; MyMemory; MateCat; translation memory.*

1. INTRODUCTION

The technological revolution has re-forged certain professions, one of which is translation. Computer-aided translation (CAT) is the process of translation where a group of tools (programs and applications) are designed/utilized to facilitate the process of translating texts from one language to another. Through the constant development of applications, CAT is offered a variety of tools such as Text Editor, Translation Memories (TM), etc. *MateCat* is a 'client-server' web-based CAT tool that utilizes its technological advancement to facilitate real-time translation by suggesting possible translations to the user (client). The translation suggestions are stored on servers in the form of built-in TM. Based on the number of visiting users, MyMemory, *MateCat's* public TM, is in constant development as it collects the translation from clients and retrieves it from the server. Users use TM to retrieve suggestions from previously translated segments after human post-edits that fix TL errors (Karpińska, 2017; Xu and Li, 2021). That is, the previously translated texts are stored in the TM and then retrieved by the computer to generate translations of similar segments.

1.1 Computer-aided translation is not Machine Translation

Machine Translation (MT) and CAT are mistakenly interchangeable. MT transforms natural language from a source language (SL) to another target Language (TL) without any human intervention (Anastasiou and Gupta, 2011; Karpińska, 2017; Xu and Li, 2021). This involves no human involvement where all SL and TL are processed automatically (Xu and Li, 2021). There are famous applications of MT such as Google Translate Toolkit and Microsoft_Bing Translator that offer online MT that support numerous languages.

CAT, however, relies mainly on the human translator (HT) who is assisted by computer applications (e.g., TM, parsers, and spell checkers). Using CAT tools, the machine does not translate. Rather, with its TM, CAT tools offer suggestions, and the decision is left to the human translator to approve or improve the output (Anastasiou and Gupta, 2011).

TM is one of the most significant functions of CAT. TM is a saved file format fitting the program in which it is installed. MT includes post-edited translated segments which are suggested to the translator if there is an exact segment match in

their current translation task (Garcia, 2011; Karpińska, 2017). The use of TM provides the translators with the opportunity to benefit from the post-edited machine-generated text segments. These already-translated segments can facilitate the translation process and reduce the time needed to accomplish the targeted translations.

1.2 Translation Memories and Crowdsourcing Translation

Crowdsourcing is a neologism adopted by Howe (2006) to refer to a task delegated to a huge network of people and "...outsourcing it to an undefined, generally large group of people in the form of an open call" (Howe, 2006). Anastasiou and Gupta (2011) modified Howe's definition by replacing the phrase 'undefined, generally large group of people' with the noun 'community' which connotes a dedicated crowd with shared interests contributing to the content.

The utilization of crowdsourcing translation in the compilation to TMs takes advantage of the involvement of enormous people (crowd). This crowd performs translation tasks, such as postediting, to benefit from the globalized multilingual and multicultural users. Further, it helps in getting faster, low-budget, knowledgeable satisfactory translation content (Estelles-Arolas and Gonzalez-Ladron-of-Guevara, 2012; Garcia, 2015; Jiménez Crespo, 2019; Pascoal et al., 2017; Ramos; 2021).

2. LITERATURE REVIEW

Various scholarships delved into the examination of the quality of the translation generated by CAT tools. Some compared the quality of CAT with that of MT (Pascoal et al., 2017; Ramos, 2021; XU and Li, 2021). Some others highlighted the language errors of the CAT tools used by drawing comparisons between them (Ben Milad, 2022; Wu, 2021) while others inspected translators' attitudes toward the tools used (Garcia, 2015).

Claiming that CAT is beneficial in translating texts with the help of human translators, XU and Li (2021) asserted that the English language (TL) is settled and maturely used in CAT when translating Japanese texts. In their experiment, XU and Li stressed that CAT is more accurate than MT in terms of the error rate in the two translation contents. The error and match rate were also assessed by Hong (1998) who employed the participants' linguistic knowledge of the Korean language to

analyze multisubject constructions in using computer-aided translation. Hong's study focused on the structural and semantic challenges that CAT and MT face. Studying crowdsourcing translation applications such as CAT, Salam, Akil & Rahman (2017) critically highlighted the kinds of translation errors made by Indonesian-English translators. This is comparable with Shinnou (1998) who identified the challenges in translating the Japanese proper names which entails conjunctive morphological and parts of speech errors.

Researchers expounded MT and various tools of CAT to test their capabilities in producing accurate translations. Wang and Sridhar (2023) compared the translation output of MT and CAT with human translation by observing the retrieval rate of different sentence lengths. In their study, Wang and Sridhar asserted that both techniques, in addition to text editing, are of equal importance through which translators can meet the global demand. In the same vein, Wang and Sridhar (2023) claimed, through the study of English translation technology, that both MT and CAT can produce optimized English translation and overcome the challenge of language differences.

Language differences and their complexities may stand in the face of CAT in producing human-like translations, especially in specialized texts. For example, the Chinese language is known for its lexical and morphological intricacy (Wu, 2021). Wu (2021) drew a comparison between CAT translation and traditional Chinese medicine translation and highlighted the challenges that CAT faces in terms of correctly processing Chinese sentences and semantic meanings. Also, Arabic, as an inflectional language, causes many issues in terms of MT and CAT (Ben Milad, 2022; Chalabi, 1998). Ben Milad (2022) studied the efficiency of TM in five CAT tools in terms of retrieving some inflectional verb variations 'Awzan' in Arabic-English translation. The study initially tested and compared the outputs of a corpus of texts in Arabic (SL) with the English output TL with a 3-to-7-word segment length. Ben Milad concluded that the translation accuracy is affected by the segment length and the degree of human intervention.

Specialized texts fall within the scope of various CAT and MT studies that investigated the performance of these tools in rendering proper translations. Alkatheer (2023), for instance, carried out a quality assessment of Arabic-English

translation produced by MT. The output of this study proved that MT is incapable of rendering comprehensive legal structures and terminology. Also, Wisemann (2019) performed a quality assessment of legal Italian-to-German translation by comparing the output of the two MT systems without TMs, namely, DeepL Translator and *MateCat*. Wisemann concluded that grammatical and lexical inconsistencies were frequently produced. Translation issues can also be viewed in translating literary texts using MT and CAT. In this genre, CAT faces the challenge of language and style differences which is considered a problematic issue for MT (Toral and Way, 2018). When examining the quality of English to Catalan translation of twelve novels, Toral and Way confirmed that without HT the output texts would be distorted. This is ascribed to the narrative intricacy of the literary texts which is ascribed to the linguistic richness and cultural-specific meanings (Karpíńska, 2017; Toral and Way, 2018).

The current study seeks to fill the gap by evaluating the TM capabilities through the comparison of the output translations of a literary text. Such kinds of studies reflect the efforts paid by linguists to develop translation tools that seek to facilitate the translation process in the era of artificial intelligence.

3. METHODOLOGY

The purpose of this paper is to examine the performance of MyMemory, *MateCat*'s TM, and to assess the error rate of the English-to-Arabic translation of a literary text over two trials (Initial and Follow-up Translation). The intention is to observe the extent to which MyMemory benefits from the post-edited segments in the previously translated texts. MyMemory is a public Translation Memory that is constructed using a crowdsourcing system. MyMemory is the world's largest TM that has been created by collecting TMs from the European Union and the United Nations and aligning the best domain-specific multilingual websites (Lorenza, personal communication, July 18, 2023). *MateCat*, as a CAT tool, enables users to use the post-edited lexical and structural segments in their translations to regularly update their TM. *MateCat* segments both SL and their TL clauses automatically to enable the user to edit the output in a user-friendly manner.

3.1 Procedures

The short story (English Source text) *Homage of Switzerland* by Ernest Hemmingway (1933) was imported into *MateCat* to examine the error rate in the Arabic translation. The translation was performed in two phases: Initial Translation and a follow-up translation (See Figure 1). Observations were made and notes were taken of the initial output suggested by *MateCat* without any human interference. As a next step, *MateCat*'s suggested translation is approved or modified. These post-edited translations are automatically stored in MyMemory and automatically sent to *MateCat*'s server for future retrievals.

In the follow-up translation, the same steps were pursued. The text was imported into *MateCat*, notes of the suggestions were taken, and the approval or modification of the suggested translation was made. As a last step, the researcher drew a comparison between the outputs of the two phases, then, results were represented quantitatively and qualitatively. Although *MateCat* offers MT options, i.e., automatic translation without human intervention, the researcher intended to have the translation performed by using the built-in Translation Memory, for the researcher to observe the quality of the crowdsource-based TM.

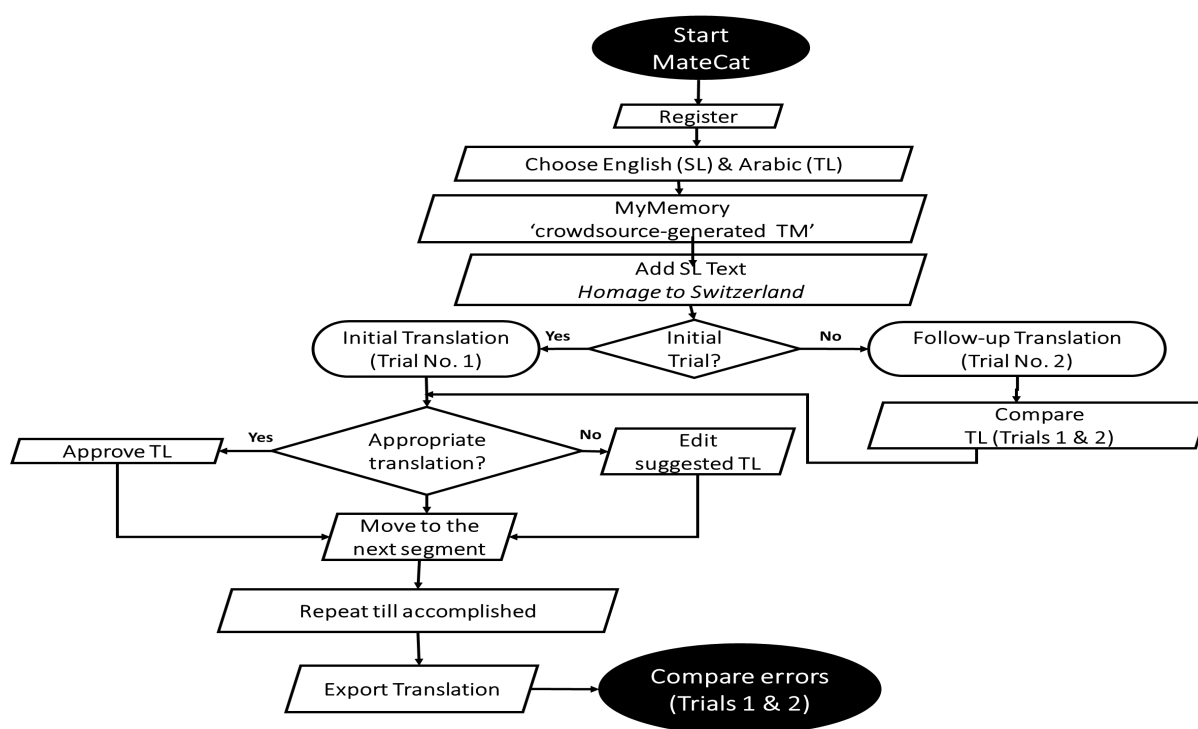


Figure 1- Activity Figure of the Basic Steps Followed

The exported translation is presented in the same segmentation system as *MateCat's* by presenting the two trials opposite to each other to facilitate the process of data comparison. If needed, and to guarantee that the meaning is comprehended, HT translation is proposed if both trials fail to present a proper translation.

3.2 General Information about the Corpus

The short story *Homage of Switzerland* involves narrative structures with various tenses, conversations, and descriptive information. The text, which is 1396 words, is divided by *MateCat* into a sum of $n=210$ segments. Initially, clause segments were tested for complexity, and it was found that the distribution of the clauses is as seen in Table 1.

SL Segments	<i>n</i> (%)
Simple Sentence	44 (22.30%)
Compound Sentence	11(4.20%)
Complex Sentence	155 (73.30%)

Table 1-Statistics of the Segment Complexity

A sample of the clauses is represented in Figure 2 to show the constituents of the clauses. The diagrams were created by jsSyntaxTree and were retrieved from <https://ironcreek.net/syntaxtree/>

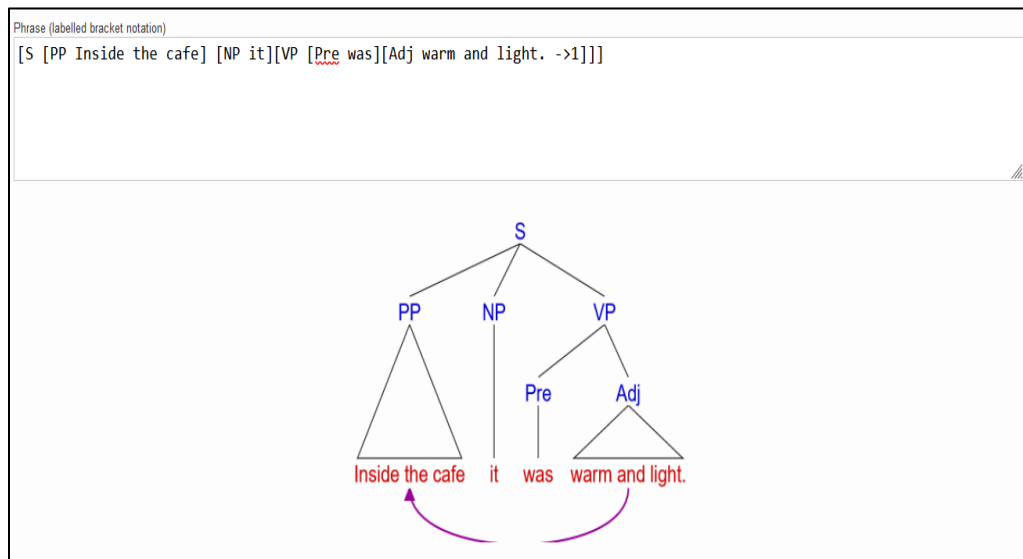


Figure 2 The constituent structure of some of the clauses in the corpus at hand.

Figure 2 shows the formulation of the opening clause (i.e., grammatical inversion) pinpointing the complexity of the text segments (henceforth Seg.) as divided by *MateCat*. So, it is decided to perform a pre-analysis task by representing a sample of the tree diagrams of some of the clauses in an attempt to, later, measure the error rate based on clause structural complexities.

The short story *Homage of Switzerland* progresses with a mixture of compound and complex sentences. This is justified by the narrative structure that is typical of the literary genre. As a narrative opening, several compound sentences introduce the events and the settings of the commencing actions. The following tree diagrams exemplify the clause types of the opening clauses of the short story.

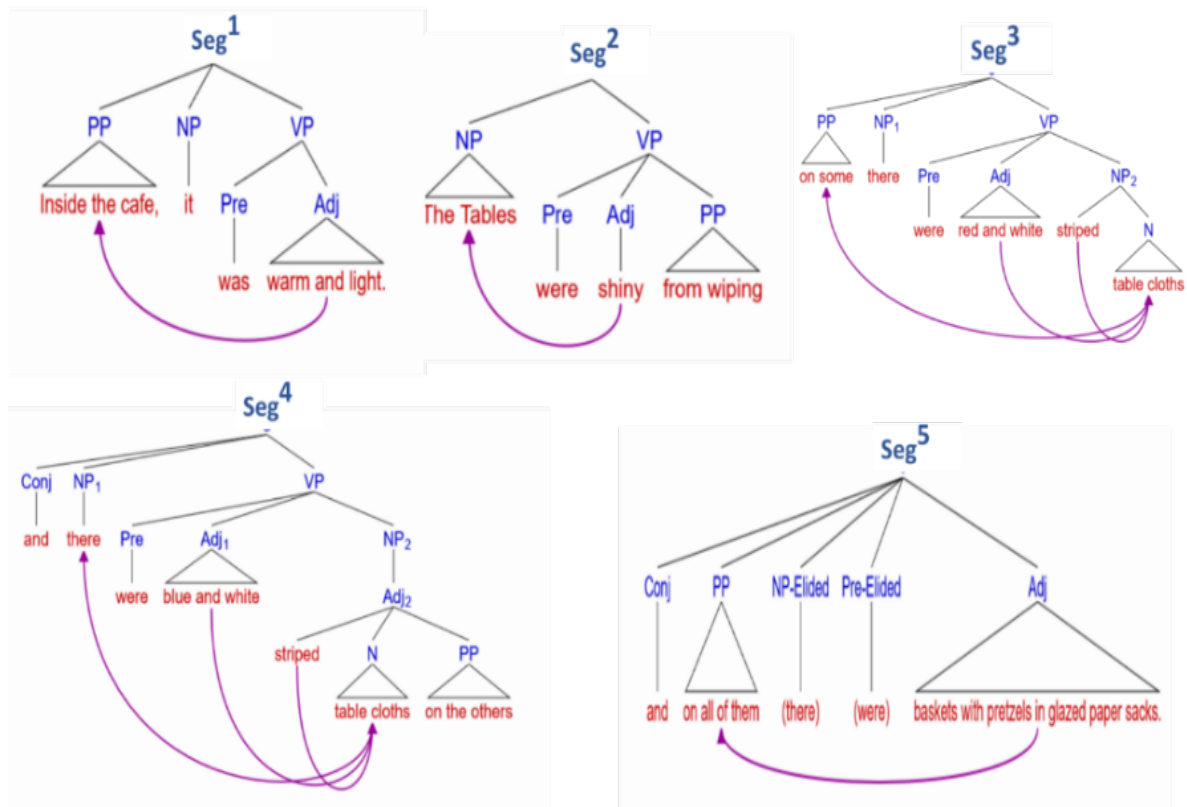


Figure 3 Tree Diagram of the Opening Segments

The story progresses with simple sentences and proceeds with compound sentences to describe the dynamic details of the contextual settings of the story. It is not until Seg²⁴, then later in Seg³⁸, that the first complex sentence appears in the story. It is worth noting that most of the complex clauses were used in reporting speech uttered

by the characters of the story. The whole short story progresses using the same pattern with the percentage of clause type as presented in Table 1.

3.3 Research Questions

The purpose of this study is to evaluate the English-to-Arabic computer-aided translation and to spot the error rate when using *MateCat's* TM.

By adopting the methodological procedures (section 3.1), the study seeks to answer the following research questions (RQs):

RQ 1: What translation errors result from *MateCat's* TM?

RQ 2: In which phase, was the English-Arabic translation fulfilled?

RQ 3: How can MyMemory benefit from crowdsourcing?

To answer the RQs, n=210 segments were examined, and the errors found were highlighted to investigate to what extent the TL contents depart from the accepted norms of the Arabic language.

4. RESULTS

The comparison drawn on two translation trials highlighted several issues on structural and semantic levels. Table 2 summarizes the percentage of the error rate.

Translation errors %	Segment (%)
Lexical	29.9%
Structural	20.9%
Accepted Translation	49%

Table 2-Error Rate

It can be noticed from the table above that 49 % of the translated segments were proper human-like translations. In these segments, no lexical, grammatical, or morphological errors were found. The remaining segments were found to be problematic either on the lexical (29.9%) or structural (20%) levels. The lexical and structural issues were investigated in detail in the following sections.

4.1 Lexical Errors

Dominant kinds of translation errors by *MateCat* were on the lexical level. The built-in TM, MyMemory, is incapable of distinguishing the lexical differences between English (SL) and Arabic (TL). Some of the errors resulted from the cultural

differences and the contextual variations of the (lexical) meanings (Synonyms, idiomatic expressions, proper nouns, homonymy, etc.).

4.1.1 Synonyms

Some of the lexical errors resulted from the absence or variation of the synonymous forms. Both English and Arabic have different lexis which may not have direct equivalence in TL. The opposite can also be true as one word in English can have more than one equivalence in Arabic. It is only the context that allows the HT to identify the correct use. This can be exemplified in the following segments.

SL (Seg.)	1 st Trial	2 nd Trial
Seg¹ [...] there were red and white striped tablecloth . And there were blue and white striped tablecloths on the others and on all of them baskets with pretzels in glazed paper sacks	كان هناك أغطية مائدة مخططة باللونين الاحمر و الابيض . و كانت هناك اغطية مائدة مخططة باللونين الأزرق و الأبيض و على كل منهم سلال مع البسكويت المملح في أكياس ورقية مزججة	كانت هناك مفارش طاولة حمراء و بيضاء مخططة ، و كان هناك مفارش طاولة زرقاء و بيضاء على الآخرين و على جميع هذه السلال مع المعجنات في أكياس ورقية مزججة
Seg³ – There was a clock in the wall, zinc bar at the far end of the room	كانت هناك ساعة على الحائط و قضيب من الزنك في نهاية الغرفة	كانت هناك ساعة على الحائط و حانة من الزنك في نهاية الغرفة
Seg¹⁰ - “Please?”	يُرجى	"من فضلك؟"
Seg¹⁴⁵ - “No,” said the porter .	قال العتال : "لا."	قال الحمال : "لا."

In Seg¹ the adjective ‘stripped’ is misplaced in the Arabic translation in the 2nd trial. Also, the noun ‘cloth’ is synonymously translated as *أغطية* and *مفارش* which are both accepted in Arabic, but the one that suits the context is *مفارش*. Interestingly, the prepositional phrase ‘with pretzels’ is mistakenly translated in the two trials as the preposition ‘with’ is literally translated as *مع*. Rather, it is intended to mean that the pretzels are inside the basket not accompanying it. Also, ‘Pretzels’ does not have a one-word equivalent in Arabic. It denotes ‘crisp biscuit baked in the form of a knot

or stick', so it was translated into المملح in the 1st trial and المعجنات in the 2nd trial. The following is suggested by HT.

و على بعض منها كان هناك مفارش طاولة مخططة باللونين الأحمر و الأبيض، أما باقي الطاولات فكانت عليها مفارش مخططة باللونين الأزرق و الأبيض. و على جميعها سلال من البسكويت المملح في أكياس ورقية لامعة.

In Seg³ the words 'zinc' and 'bar' have been literally translated to either قضيب زنك 'a solid stick of metal or wood' (1st trial) or حانة من الزنك 'a place which sells wine and beer' (2nd trial). The two meanings do not signify the intended meaning which is a 'solid broad partition'. The suggested HT is:

كانت هناك ساعة على الحائط و حائل معدني في نهاية الغرفة

In Seg¹⁰, TM, in the 1st trial, retrieved a distorted translation which was corrected in the 2nd trial. In Seg¹⁴⁵, the noun 'portal' was translated into Arabic as حمال and عتال where both are accepted synonyms in Arabic.

4.1.2 Proper Names

In general, proper names are culture-bound especially when they refer to specific objects, entities, projects, etc. The absence of the equivalence in the TL necessitates cultural as well as linguistic knowledge. This is exemplified in the following segments:

SL (Seg.)	1 st Trial	2 nd Trial
Seg ⁵ – Another portal came in and said Simplon-Orient Express was an hour late at Saint-Maurice	جاء عتال آخر و قال إن قطار Simplon-Orient Express تأخر ساعة عن سان موريس	جاء حمال آخر و قال إن سيمبلون أورينت إكسبريس تأخرت ساعة في سانت موريس
Seg ⁸⁹ - "Make it two Sportsmen.	"اجعله رياضيين.	"اجعلها رياضيين اثنين.

The lexical issue in Seg⁵ resulted from the omission of the word 'train' from the SL as it is contextually implied in the proper noun 'Simplon-Orient Express', the proper name of a train. This information is not captured unless the word قطار is added to the TL. Also, the conceptual meaning of the preposition 'at' is not transmitted in the 1st trial but corrected in the 2nd trial. So, the suggested HT would be:

جاء حمال آخر و قال إن قطار سيمبلون أورينت إكسبريس قد تأخر ساعة في سانت موريس

In Seg⁸⁹, the TM failed to translate the proper noun ‘Sportsmen’, a wine brand, in the two trials. A loan form of the proper noun is proposed as suggested in HT:

"اجعلهم زجاجتين من شراب سبور تسمن"

4.1.3 Lexical Ambiguity

Idioms are phrases/clauses that are mainly based on ambiguous figurative use of words. Generally, literal translation distorts the significance of idioms and can cause loss and confusion in meaning. The following segments illustrate how idiomatic expressions need culturally specific human interpretations to convey their implications.

SL (Seg.)	1 st Trial	2 nd Trial
Seg⁴⁵ - I must be here myself in person. "	يجب أن أكون هنا بنفسي . "	يجب أن أكون هنا بنفسي في الشخص ."
Seg⁵² - Did you ever run into Scott Fitzgerald?"	هل صادفت سكوت فيتزجيرالد من قبل؟"	هل قابلت سكوت فيتزجيرالد من قبل؟"
Seg⁹³ - Put yourself here, please."	ضع نفسك هنا من فضلك. "	ضع نفسك هنا ، من فضلك. "
Seg¹¹⁵ - "I myself am somewhat in retard, " Johnson went on.	وتابع جونسون: "أنا نفسي واستطرد جونسون: "أنا نفسي متخلف إلى حد ما."	وتابع جونسون: "أنا نفسي متخلف إلى حد ما."

In Seg⁴⁵, the idiomatic expression ‘in person’ is translated in the 1st Trial and failed to be extracted from the TM in the 2nd Trial. Also, in Seg⁵², the idiomatic expression ‘run into’ connotes an unplanned meeting. Although the meaning is, semantically, conveyed in the two trials, the addition of the TL prepositional phrase *من قبل* results in a stylistically poor TL output.

In Seg⁹³, the two trials failed to retrieve a translation of the idiomatic expression ‘put yourself here’ which implies a request for the hearer to sit down. The suggested HT is:

اجلس هنا من فضلك.

Seg¹¹⁵ includes an idiomatic expression ‘in retard’ which was literally retrieved by the TM as *متخلف* signifying a mentally incompetent person. The intended meaning from the context is that the person is late and not on time. The suggested HT would be:

واستطرد جونسون: "أنا شخصياً متأخراً إلى حد ما".

Lexical ambiguity occurs, also, with homonyms, i.e., words with the same spellings and different meanings. When a word has more than one meaning, the choice, then, must be contextualized with the course of events in the literary text. It must be interpreted and conveyed by exploring pre- and post-text.

SL (Seg.)	1 st Trial	2 nd Trial
<i>Seg</i> ⁴⁹ - "Were the Berlitz undergraduates a wild lot?"	"هل كان طلاب بيرلتز الجامعيين جامحين كثيراً؟"	"هل كان طلاب بيرلitz الجامعيين كثيرين؟"
<i>Seg</i> ¹⁴⁰ - They all raised them.	كلهم ربوهم.	جميعهم قاموا بتربيتهم

In both trials, *Seg*⁴⁹ has been mistakenly translated; MyMemory has retrieved the word 'a lot' instead of the word 'lot' which means 'a group of'. The lexical ambiguity is the reason behind such failure. The suggested HT is as follows:

هل كان طلاب بيرلتز مجموعة من الجامحين؟

The same issue is found in *Seg*¹⁴⁰. The verb 'raised' has two implications 'to lift something' or 'to take care of children till they grow up'. The translation resulting from both both trials ignored the meaning of lifting which, contextually, is intended to be holding the glasses up. The HT would be:

قاموا جميعهم برفع الكؤوس

The previous instances, among others, reflect the performance of the TM in retrieving segments that are ambiguous and have meanings other than their direct denotations.

4.1.4 Borrowed Words

Borrowing is the process of adopting one word or phrase from another language. When translating such words, the translator should be aware of the lexical meaning of the word in its original language. Replacing a borrowed word with a native equivalent in the TL must take place by considering the contexts in both languages. Consider the following instances:

SL (Seg.)	1 st Trial	2 nd Trial
<i>Seg</i> ¹²⁴ - "Please open the wine, mademoiselle."	من فضلك افتحي النبيذ ،	"من فضلك افتحي النبيذ ، يا أنسة".
	مدموزيل	

قال جونسون: "بروسيت" قال جونسون: "الوديعة" قال جونسون: "بروسيت" **Seg¹⁴¹- "Prosit,"** said Johnson.

The word 'mademoiselle' in Seg¹²⁴ is borrowed from French and is used to refer to a woman who has not got married before. The 1st trial rendered the word in transliteration, but in the 2nd Trial, the TM managed to retrieve the equivalent of the word. Also, the word 'prosit' in Seg¹⁴¹ is borrowed from German and is uttered when a group of people are drinking together, and they are wishing good health to each other. The suggested HT:

قال جونسون: "بصحتكم"

Borrowed words, it can be argued, cause problematic issues in CAT and need to be considered when rendering them to a TL.

4.2 Structural Errors: Grammatical & Morphological

Some of the major unresolved issues are structural. Grammatical and morphological issues were found to reach a percentage of 20% of the total segments of the short story (See Table 2). The untranslatability results from the incapability of MyMemory to retrieve the appropriate structure from the availability of Arabic structures. The peculiarities of differences between English as an SL and Arabic as a TL are enormous, e.g., Inversion, passive, number, modality, and gender.

4.2.1 Inversion

Inversion is one of the problematic grammatical cases that deviate from the s-v-o norm of sentence structure. The following examples were found untranslated in the short story:

SL (Seg.)	1 st Trial	2 nd Trial
Seg¹- Inside the station café, it was warm and light;	كان الجو دافئاً وخفيفاً داخل مقهى المحطة.	داخل مقهى المحطة كان الجو دافئاً وخفيفاً ؛.
Seg³ -There was a clock on the wall, a zinc bar at the far end of the room, and outside the window it was snowing.	كانت هناك ساعة على الحائط ، وقضيب من الزنك في نهاية الغرفة ، وكان الثلج يتساقط خارج النافذة.	كانت هناك ساعة على الحائط ، وحنة من الزنك في نهاية الغرفة ، وخارج النافذة كانت تتساقط الثلوج.
Seg¹⁹⁰- Outside the snow was falling heavily.	في الخارج كان الثلج يتساقط بكثافة.	خارج الثلج كان يسقط بشدة.

In these examples, the subject is not the grammatical element that is used to begin the sentence with. In the current case of inversion, the prepositional phrases in Seg¹, Seg³, and Seg¹⁹⁰ were translated differently in the two trials. In the 1st trial, a communicative translation was retrieved, and the TL fits the Arabic usual structure of S-V-O. The 2nd trial, however, produced a literal translation. In Seg¹⁹⁰, neither the first nor the second trial returned a correct structure of the TL. The suggested HT is, respectively, as follows:

كان الجو دافئاً مشمساً داخل مقهي المحطة.
وكان الثلج يتساقط خارج النافذة.
كان الثلج يتساقط بكثافة في الخارج.

4.2.2 Passive/past participle

The passive voice and past participle verb forms cause problematic issues in translation which necessitate some consideration when translating into TL. The following instances exemplify this issue:

SL (Seg.)	1 st Trial	2 nd Trial
Seg ² The chairs were carved but the wood seats were worn and comfortable.	تم نحت الكراسي ، لكن المقاعد كانت بالية ومريحة.	كانت الكراسي منحوتة ولكن المقاعد الخشبية كانت بالية ومريحة.
Seg ¹¹⁶ "This is the first time I have been divorced ."	هذه هي المرة الأولى التي أطلق فيها	هذه هي المرة الأولى التي أتطلق فيها
Seg ¹⁵⁷ "You like being married ?"	"هل تحب الزواج؟"	"هل تحب أن تكون متزوجاً؟"

In Seg², the passive verb 'were carved' was literally translated in the 1st trial, with the verb تم ignoring the communicative stylistic significance of the segment. In the 2nd trial, the passive verb was translated into the Arabic derivative of the past participle منحوتة which is derived from the root نحت . In the second clause, the past participle adjective 'worn' was literally translated too but with an appropriate adjectival TL equivalent بالية. Although it was a literal translation, it still signifies the intended meaning. The whole clause was manually translated into a mix of literal and communicative translations as:

كانت الكراسي منحوتة و المقاعد الخشبية متهاكلة و لكنها مريحة.

In Seg¹¹⁶, the passive verb ‘have been divorced’ is mistakenly translated in the 1st trial into the passive verb أَطْلَقَ with the inappropriate vocalization (◌). The 2nd trial, however, distorted the translation even more by adding an inappropriate infix (ت) to become أَتَلَّقَ. In this case, vocalization with (◌) and (◌) is crucial in the derivation of the passive voice out of the root طلق , the proper HT, then, would be:

هذه هي المرة الأولى التي أُطْلِقَ فيها

The present participle form ‘being married’, in Seg¹⁵⁷, is translated in the 1st trial by converting the participle verb (in SL) into the noun الزواج which signifies ‘liking marriage in general’. In the 2nd trial, however, it was translated by adding the Arabic auxiliary verb تكون which provided a proper TL equivalent to the context of the story which is asking the character about his current marital status. The addition of the verb تكون is crucial to deliver the actual intended meaning.

4.2.3 Singular/Plural Forms

Number causes an issue in English to Arabic translation. Unlike English, Arabic has single, plural, and dual forms. Number Suffixation is augmented based on Arabic parsing rules, a grammatical feature that is absent in English. The following instances illustrate how the segments were dealt with using MyMemory.

SL (Seg.)	1 st Trial	2 nd Trial
Seg⁴- Two of the station porters sat drinking new wine at the table under the clock	جلس اثنان من حمال المحطة يشربان النبيذ الجديد على الطاولة تحت الساعة.	جلس اثنان من حمالين المحطة يشربان نبيذاً جديداً على الطاولة تحت الساعة.
Seg¹³- “Thank you.”	شكراً لك.	شكراً لكم.
Seg⁸² “You agree, gentlemen?”	"هل توافق ، أيها السادة؟"	"هل توافقون أيها السادة؟"
Seg¹¹⁹- The other nodded.	أوماً الحمالون الآخرون برأسهم	أوماً الحمالون الآخرون برأسه.

In Seg⁴, MyMemory managed to retrieve the dual form ‘two’ اثنان which has the dual suffix (ان). The dual marker ‘two’ was followed by the prepositional phrase ‘of the station porters’. This, in English, is treated as plural in number, but in Arabic, it must consider the parsing rules of what follows and what precedes. In the 1st trial, the single word حمال is mistakenly retrieved from the TM as a translation of the plural

noun ‘porters’. The 2nd trial, however, returned a plural form by the suffixation of (ين) to become حمالين. The 2nd trial, thus, ignored the parsing of the genitive form حمالين المحطة where, grammatically, the suffix (ن) should be elided and only the suffix (ي) is retained. So, neither the first nor the second trials provided a grammatically well-formed TL. The suggested HT is:

جلس اثنان من حمالي المحطة يشربان زجاجة نبيذ جديدة علي الطاولة التي تعتليها ساعة.

In Seg¹³, the 2nd person pronoun ‘you’ has both singular and plural equivalence in Arabic. Although MyMemory retrieved the correct translation of the singular form ‘you’ لك, the 2nd trial mistakenly returned with the plural form لكم according to the narrative context of the story. The same issue of number can be observed in Seg⁸², where TM ignored the plural form in ‘you agree’ especially when ‘gentlemen’ is a plural vocative form. The 1st trial returned a mistaken translation هل توافق which has a singular conjugation of the verb ‘agree’ as توافق. MyMemory managed, in the second trial, to correct this error by providing the corrected segment “هل توافقون أيها” after adding the plural suffix (ون). (حون).

In Seg¹¹⁹, the issue resulted from the translation of ‘nodded’ which should be translated into Arabic as اوماً برأسه. In the 1st trial, the TM detected the masculine pluralization of برأسهم while the 2nd trial ignored this construction in favor of the singular masculine form برأسه ‘with his head’.

4.2.4 Modality

The grey area between absolute affirmation and negation is attained by using modal verbs. This is expressed in Arabic using auxiliary verbs such as صار, كان, ليس, etc. This is observed to be lost in the following translation.

SL (Seg.)	1st Trial	2nd Trial
Seg ⁸ - “Can I bring you some coffee?”	هل يمكنني أن أحضر لك بعض القهوة؟	"هل أحضر لك بعض القهوة؟"
Seg ¹⁶⁹ - “What can we talk about?”	ما يمكن أن نتحدث عنه؟	ما يمكن أن نتحدث عنه؟

In Seg⁸ clause, the modal verb ‘can’ was literally translated in the 1st trial as يمكنني denoting ‘expressing capability’. This is, contextually, not the intended meaning.

The error is corrected, and TM managed to retrieve the correct translation in the 2nd trial where the modal connotes an offer.

In Seg¹⁶⁹ the modal verb ‘can’ is mistakenly translated in both trials. The retrieved translation ignored the plural affixation. The suggested HT suffixed the plural (نا) to the modal verb يمكن . The proper HT would be:

ما الذي يمكننا التحدث عنه؟

4.2.5 Gender

Unlike English, Arabic distinguishes grammatical forms based on gender. Masculine and feminine nouns and verbs are distinguished based on the affixation system in Arabic. The TM ignored this in some of the examples as seen in the following examples:

SL (Seg.)	1 st Trial	2 nd Trial
<i>Seg</i> ¹¹ asked the waitress.	سأل النادلة.	سألت النادلة.
<i>Seg</i> ¹⁵ “Do you speak other languages besides English?”	هل تتحدث لغات أخرى " بجانب اللغة الإنجليزية؟	هل تتحدث لغات أخرى " بجانب اللغة الإنجليزية؟
<i>Seg</i> ³⁷ You wouldn't like to make up a party and see the night life of Vevey?	ألا ترغب في تكوين حفلة ورؤية الحياة الليلية لـ Vevey؟	ألا تود إقامة حفلة ورؤية حياة (في) الليلية ؟
<i>Seg</i> ⁵⁹ - And you don't want to play with me?”	وأنت لا تريد أن تلعب معي؟	وأنت لا تريد أن تلعب معي ؟
<i>Seg</i> ⁶³ - “Would you bring me the wine list?”	هل تحضر لي قائمة النبيذ؟	هل تحضر لي قائمة النبيذ " ؟
<i>Seg</i> ²¹ “Have a cigar?”	تفضل سيجار	تفضل سيجار

In Seg¹¹, the translator encountered an issue with the subject-verb agreement in terms of gender. The 1st trial returned a literal translation of the verb ‘ask’ as the masculine form سأل while the correct translation should be سألت as the word ‘waitress’ is a feminine noun. This issue was resolved in the 2nd trial.

Seg¹⁵ encountered a subject-verb disagreement in terms of gender. The feminine form of the verb ‘speak’ is translated into the masculine form تتحدث while, contextually, it must be suffixed with the feminine affix (ين). Because of the failure in the two trials, the suggested HT is:

" هل تتحدثين لغات اخرى غير الإنجليزية "

Segments 37, 59, and 63 share the same translation error in the verbs 'like', 'want', and 'bring' which were translated as *تود*, *تريد*, and *تحضر*, respectively. The correct translation must maintain the feminine affix (ين). Thus, the suggested HT will, respectively, be as follows:

ألا تودين إقامة حفلة ورؤية حياة (في) الليلية ؟

وأنت لا تريدين أن تلعبى معي ؟

"هل تحضرين لي قائمة النبيذ ؟"

In Seg²¹, the interrogative clause 'Have a cigar?' has elided interrogative elements, namely, 'Do you want to...'. Although MyMemory has managed to retrieve the TL clause adhering to the stylistic politeness form into 'تفضل', the TM failed to follow the feminine form of the verb *تفضل* in the TL. Thus, the CAT suggested translation after both trials failed to communicate the intended meaning. The suggested HT, thus, would be:

هل تريدين سيجار ؟

These examples, among others, pinpoint the error rate on the lexical and structural levels which reflects the performance of the TM in retrieving a communicative translation that suits the contextual meanings in the story. Although the translation was processed in two trials, MyMemory provided variant qualities which can be indicated in the following section.

5. DISCUSSION

The previous section provided a qualitative description of the linguistic errors resulting from MyMemory. Table 3 summarizes the percentage of the resolved translation errors after performing an initial and then a follow-up translation. It was found that the second trial witnessed an increase in the percentage of corrected errors on both the structural and the lexical levels.

The table also shows that 45.5% of the structural errors and 46.4% of the lexical errors were not resolved after the two trials. This indicates that MyMemory has not managed to retrieve a correct translation from the previously post-edited version of the short story.

Translation errors resolved	Initial	Follow-up	neither
Structural	15.2%	39.3%	45.5%
Lexical	11.1%	42.5%	46.4%

Table 3 – Comparison between Two Phases of Translation

Table 3 also shows that the follow-up translation has managed to reduce the error rate found after the initial translation with 39.3 % for the structural errors and 42.5% for the lexical errors. This, when compared to the initial trial, shows that the TM is incapable of retrieving a human-like translation.

The TM's competence is tested with the clause complexity. Table 4 illustrates the percentage of segments where the *MateCat* managed to fulfill the translation as semantically well-structured segments. It can be noticed that only 54.4 % of the simple sentence segments were translated properly in the first trial and 25.15% were fully translated after the human interference on the generated TM Translation. Only 20.45 % failed to be translated after the two trials. The reason can be ascribed to the simplicity of the grammatical structure of the simple sentences and the direct recognition of the TM of the structure of the simple sentences.

Translation fulfilled in %	Initial	Follow-up	neither
Simple Sentence	54.4%	25.15%	20.45%
Complex Sentence	55.5%	15.8%	28.7%
Compound Sentence	36.3%	27.4%	36.3%
compound complex sentence	0	0	100%

Table 4 – Correction of the Translation according to Clause complexity

It can be observed that MyMemory did not recognize the grammatical structure of S-V-O. However, the human translator managed to identify the mistakes and corrected them in the second trial, then, in the final output, the TM authenticated the translation of this simple sentence.

Overall, MyMemory retrieved more than half of the simple and complex sentences in the first trial and 36 % of the compound sentences were translated properly in the first trial. In the follow-up translation, the compound sentences are likely to be modified after the human interference on the first trial and the 2nd trial's translation becomes more readable. As for the compound sentences, though few, the statistics show the TM's failure of retrieving the translation of the compound

sentences with a percentage of failure reaching more than 36 %, then the complex sentences with 28.7%.

6. CONCLUSION

MateCat is a translation platform with a public TM named MyMemory. MyMemory is constructed using a crowdsourcing system and featured to be in a continuous development of its content benefiting from the huge amount of post-edited translated documents stored on *MateCat*'s server. Despite these attributes, it was observed that structural and lexical retrieval errors still occur in the English-to-Arabic translation of *Homage to Switzerland*. The results highlighted that *MateCat*'s TM did not suggest proper translations and the reason was ascribed to lexical ambiguity, culturally specific idiomatic expressions, and grammatical complexities.

Answering RQ1, the study pinpointed that Arabic peculiarities on the lexical and structural levels necessitate not only linguistic awareness but also contextual knowledge of the pre-and-post segments which may be absent in the system of segmental translation. *MateCat*, like other CAT tools, divides the text into segments according to a system of algorithms not according to the contextual meaning of the text. This causes the segments to be translated without reference to the previous and following segments in the project. This leads to potential errors in translation choices and meanings because they are not linguistically based on previous and following segments.

Furthermore, the grammatical and lexical structures of Arabic stand as an obstacle in the face of TM. The intricate grammatical and morphological structure of Arabic (i.e., word order, number, gender, etc.) in addition to the lexical ambiguities made it a challenge for TM to provide accepted human-like translations. These translation errors were noticed not to have been resolved even when duplicating the modification phases (i.e., performing translation in two trials).

RQ2 raises the question of initial translation and follow-up translation phases and their influence on providing an appropriate translation. The two phases were not enough to provide human-like translations. It can be claimed, thus, that MyMemory did not benefit from the pre-existing and post-edited translations of the same text.

Nevertheless, it is argued that, despite translation challenges, MyMemory can still, with the interference of HT, be helpful in translating literary texts from English

into Arabic in several aspects: 1) maintaining consistency across the document, and 2) reducing the time by getting a pre-edited text and enabling the HT to edit and revise the translation. To overcome the previous challenges, it can be recommended that the developer enact several developments on *MateCat's* MyMemory as posed in RQ3.

To answer RQ3, we argue that crowdsourcing can be advantageous for MyMemory. We suggest making use of Term Bases and continuously enriching them with Arabic lexis. Adding other built-in resources such as dictionaries and grammar guides for the users can also be beneficial for both SL and TL translators. The challenges can also be resolved by improving the segmentation algorithms used in MyMemory and making a call for a crowdsourcing task to upgrade the TM's capabilities on the standard and vernacular language varieties. This crowdsourcing translation calls must be in conjunction with attaining quality assurance mechanisms by recruiting experts in Arabic linguistics. In all cases, the study asserts that human intervention is and will still be a must. The need to apply context-specific modifications to maintain cultural appropriateness is a target that will never be reached by a machine.

Future Research

Scholars can carry out similar studies to evaluate other CAT tools such as text editors, machine translation, etc. Different genres can, also, be explored in terms of the success/failure of CAT to provide human-like translations. These efforts are expected to provide suggestions for computational linguists to develop a variety of applications that facilitate translators' tasks.

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تقييم أداء لذاكرة الترجمة MyMemory: دراسة حالة للترجمة المدعومة بالحاسوب لقصة تحية لسويسرا للكاتب إرنست همنغواي

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المستخلص:

تقوم هذه الدراسة بتقييم أداء ذاكرة الترجمة المضمنة في MateCat و التي تسمى MyMemory وهي أداة ترجمة مدعومة بالحاسوب . تم تصميم ذاكرة الترجمة MyMemory باستخدام نظام التعهيد الجماعي وتتميز بأنها قيد التطوير المستمر من خلال الترجمات التي يتم تحريرها ثم يتم تحميلها إلى الخادم server من خلال عدد كبير من مستخدمي تطبيق MateCat. تقوم الدراسة بترجمة نص أدبي على مرحلتين: الترجمة الأولية، والترجمة اللاحقة، حيث تم إجراء مقارنة بين مخرجات المرحلتين لملاحظة معدل الخطأ في الترجمات المخرجة بعد ادخال قصة "تحية لسويسرا" - و التي كتبها إرنست همنغواي- إلى MateCat لتقييم النص المترجم إلى اللغة العربية. وتخلص هذه الدراسة إلى أنه على الرغم من الثورة التكنولوجية في أدوات الترجمة بمساعدة الحاسوب، إلا أن هناك قدرًا كبيراً من الأخطاء اللغوية على مستويات اللغة العربية سواء النحوية والصرفية و غيرها. كما تؤكد الدراسة على أنه بالرغم من الجهود الهائلة المبذولة لتطوير برامج لتسهيل مهام الترجمة إلا أن التدخل البشري لا يزال أمراً لا بُد منه. وتختتم الدراسة بمقترحات لتطوير التطبيقات الخاصة بالترجمة المدعومة بالحاسوب.

الكلمات المفتاحية: ذاكرة الترجمة ؛ ترجمة الآلة؛ ترجمة مدعومة بالحاسوب، الترجمة الجماعية.