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Abstract: In his article "Intermediality and Human vs. Machine Translation" Harry J. Huang analyzes translation as a process of transferring meaning and/or information. The process and the translated text represent a new medium. When machine translation originating from human translation is integrated into the world wide web, it becomes part of global media. Accordingly, machine translation may best be studied within the context of intermediality, especially its quality vs. that of human translation. Based upon data generated from an international survey of 300 translators, writers, editors, and translation scholars, Huang analyses the participants' expectations and their acceptance of imperfection in the translated text. Huang postulates the dividing line between the acceptability and unacceptability of the translated text demystifies the concept of "good" translation versus "bad." Huang also proposes a statistical approach toward translation quality assessment intended for machine translation and human translation.

Harry J. HUANG

Intermediality and Human vs. Machine Translation

In translation studies faithfulness in literary translation exists only to some degree. Since unfaithfulness in literary translation is a matter of definition, the acceptance of relatively faithful but imperfect translation acquires new contexts in digital humanities (see, e.g., Scott; Huang). From an intermedial point of view, a translated text may be considered a new or hybrid product that does not have to be evaluated solely against the primary standards of the source language or its author's culture. Instead, such primary standards may be reduced to secondary in quality assessment. In this article, I address the issue of imperfection in machine translation (MT) versus human translation (HT). Both forms of translation involve a process of the transfer of meaning or knowledge including culture and other elements, and are thus treated as equals.

Since its beginning in the 1950s and 1960s, the use of machine translation includes technical documentation (see, e.g., Hutchins, "Computer-based Translation"). Methodologically, research has gone through the beginning a trial-and-error stage followed by corpus based approaches in the late 1980s. There have been the "direct translation" model and the "interlingua" (indirect) model, including a large number of systems many of which have been used by government departments and corporations. The 1980s then saw the growing interest in spoken language translation. After two decades of research and development backed up by fast-speed computers, MT has been available to many individual internet users. However, what may be described at present is that much of online automatic translation is inaccurate. Nonetheless, one is reminded that since authors, such as the Chinese literary icon Lu Xun (see Huang, "The Translatologese Syndrome"), also experience difficulty in expressing their ideas, and that since translators never produce perfect translations, one has no reason to expect flawless translations from the computer. The process of transferring meaning in the translation from one language to another, from print to electronic form, leads to a fundamental change in communication (see, e.g., Sager 256-58) resulting in another medium. Moving electronically translated texts to the internet, including the yet unpopular simultaneous speech translation, presents itself as a third medium. All of these intertwine, interline, depending upon each other (see, e.g., Chapple; Chapple and Kattenbelt; López-Varela and Tötösy de Zepetnek). One bottleneck problem that remains unresolved is the lack of standardized quality assessment. Although MT evaluation has become an important aspect of research, no formula or easy-to-apply model has been created either for MT or HT quality assessment (see Hutchins, "Machine Translation"). By and large, frontline evaluators assess translated texts on a piece-by-piece basis, while scholars attempt to create models and approaches that measure TT against a non-existent perfect product and are unaware of the dividing line between acceptability and unacceptability.

In the present article, the data used in the quantification of the relevant issues come from an international survey where three literary excerpts translated into English from the Chinese were surveyed: about 300 professional translators — including 15 senior United Nations translators — completed the different versions or different parts of the international survey (see Huang, *A Model for Translation*). One question was to find the maximum rate of inaccuracy in HT that can be tolerated by the international community of translators, writers, editors, and translation scholars. This maximum number thus becomes the ceiling under which a TT may not be rejected, but over which a TT is considered a failure. Expressed in numerical terms, this ceiling becomes the dividing line between TT acceptability and unacceptability. Another question was to discover the maximum inaccurate rate in MT which the professionals could tolerate before flatly rejecting it. It should be noted that individuals were asked to answer only questions they felt comfortable with. Thus, not all data would show the same number of participants. The number of participants who were comfortable with MT questions was small, but given the small number of qualified professionals who were willing to participate the data is deemed sufficient.

Six decades of MT research and rapid development appear to have made a difference in machine translation studies, but has machine translation lived up to the expectations of translators, writers, editors, including translator scholars? The results of the survey indicate that their expectations are

rather humble. The following data illustrate what the aforementioned professional community expects of both HT and MT. In general, when asked what they expect of a literary human translation, 55% of the 60 participating professionals, say they want the translation to be as good as the original, 10% want it to be better than the original, and 15% accept a translation inferior to the original in some ways. In Figure 1 a summary is presented:

Figure 1: General expectations of a human translation

Choices	N	Percent
Better than the original text	6	10%
As good as the original text	33	55%
Acceptable if it is inferior in some ways	9	15%
Other	4	7%
No response	8	13%
Total	60	100%

The results agree with many published opinions (see, e.g., House; Huang, "FRB Translation Criterion"; Newmark; Nida; Nord). Regarding the style of a human translated literary work, 66% say that it is very important. Figure 2 below shows the results:

Figure 2: The importance of literary style in a human TT

Choices	N	Percent
Very important	38	66%
Somewhat important	12	21%
Not that important	2	3%
Other	0	0%
No response	6	10%
Total	58	100%

The original spirit the participants expect in a human TT starts from 80%, topping out at 98%. The largest group expects 90% (15) of the original and the second largest wants 95% (13). The overall average is rounded down to 90% (see Figure 3):

Figure 3: Original spirit expected in a literary human translation

T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
				Lower	Upper
108.685	40	.000	90.46341	88.7812	92.1457

By contrast, participants expect a much lower rate from machine translation, starting from as low as 30% (1) with the highest being 98% (1). The two larger groups each consisting of 9 participants expect an accuracy rate of 80% and 90%. The average of the responding participants is rounded down to 80% as indicated in Figure 4:

Figure 4: Original spirit expected in a literary machine translation

T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
				Lower	Upper
37.244	39	.000	80.37500	76.0099	84.7401

Whether or not the expectations from MT are realistic remains to be verified, but the message is clear: there is an awareness about the limits of literary machine translation and acceptance of poorer quality of MT than that of human TT appears to be the case.

Participants expect higher percentages of contenphysique (CP), origispirit (OS), and stylappearance (SA) (see Huang, *A Model for Translation* for definitions) from HT than MT. For human translation, the largest group of 14 participants expects 95% of accuracy and the second largest of 10 expects a 90% rate, with one person wanting 100%. The lowest, which could be an error, is 10%, the only response under the 80% rate, but for statistical purposes, all numbers are treated as valid. The overall average is 88% (see Figure 5)

Figure 5: Overall expected accuracy of contenphysique, origispirit, and stylappearance in a HT

T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
				Lower	Upper
45.235	45	.000	88.00000	84.0818	91.9182

If the single participant's 10% were an error and excluded, the overall average would be approximately 90%. By contrast, the expectations from MT range from 30% (1) to 98% (2). The overall average is rounded up to 82% (see Figure 6).

Figure 6: Overall expected accuracy of contenphysique, origispirit, and stylappearance in a MT

T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
				Lower	Upper
41.831	38	.000	81.66667	77.7144	85.6189

Although there is a significant difference in the expectation from HT and MT, while the former is attainable, the latter, again, appears to be uncertain. The 82% MT accuracy rate expected, nevertheless, can be considered as a present goal set for machine translation. Needless to say, be it a 90% or 82% accuracy rate, neither would satisfy the perfectionist. Yet, both expectations may be readily accepted if HT is considered a medium itself and MT another. As both are related to the source text, but independent from it, the original text should only be used as a reference against which an acceptable translation is measured, but not from which an identical TT is expected: a 90% accuracy rate may be considered a fine HT, and an MT with an 82% translated rate may also be considered a good work. Any TT exceeding these rates may be regarded as better translation than the average. The primary difference is that TT is viewed as an independent medium, instead of a copied product of the source text as traditionally expected and is not to be assessed solely by standards of the source text.

Participants were asked to indicate what they thought the computer could do in translation. Excluding the n/a-s, of the 41 respondents 46% believe the machine could translate drafts, leaving editing and proofreading to human translators, 27% say a machine may assist a human translator in choosing words and sentences to speed up his/her translating process, while 20% expect the machine to translate automatically, although badly owing to its inability to "think" (see Figure 7):

Figure 7: Computer's roles expected in translating

Computer's roles expected	N	Percent
A machine that translates automatically, though badly, due to its inability to think	8	20%
A machine that assists a translator in choosing words and sentences to speed up translation	11	27%
A machine that can translate drafts, leaving editing and proofreading for human translators	19	46%
Other	3	7%
Total	41	100%

A message that may be interpreted from Figure 7 above is that there is a lack of confidence in the computer, but recognizes its assisting role. Participants were asked what the computer may translate best and the answers vary widely. Excluding no responses and n/a-s, participants indicate a total of 106 choices listed as 1rst, 2nd, and 3rd (see Figure 8):

Figure 8: Texts the computer is believed to be able to translate

Texts the computer may best translate	Priority	Number	Item Total
Everything including science and technology	1st	3	3
Literature	1st 2nd	0 1	1
Science and technology	1st 2nd 3rd	6 4 2	12
News	1st 2nd 3rd	3 3 3	9
Law	1st 3rd	1 2	3
Religious documents	1st 3rd	0 1	1
Short pieces of writing up to 1000 words	1st 2nd	1 3	4
Paragraphs of all types	1st 2nd	0 1	1
Paragraphs written based on a certain model	1st 2nd 3rd	4 1 3	8
All types of sentences	1st 3rd	1 1	2
Simple sentences mostly	1st 2nd 3rd	3 9 8	20
Compound sentences mostly	1st	0	0

Sentences with 2 clauses	1st 2nd	0 1	1
Sentences with 3 clauses	1st 2nd	0 1	1
Fragments of sentences	1st 2nd 3rd	0 5 4	9
Idioms	1st 2nd 3rd	1 2 4	7
Individual words	1st 2nd 3rd	12 1 4	17
Other	1st 2nd 3rd	3 2 2	7
Total		106	106

As Figure 8 above indicates, participants do not agree on any particular text the computer can translate, but the two biggest groups believe that it can translate words and simple sentences (see., e.g., Hutchins, "Machine Translation").

The same participants were asked to indicate the specific work the computer should be designed to do in translating. Except two who believe it should replace the human translator, the overwhelming majority believe that it should work as an assistant for the human translator. Note again that some participants give multiple choices (see Figure 9):

Figure 9: What the computer should be designed for in translating

Choices	N	Percent
To replace the human translator	2	2%
To assist the human translator	26	32%
To improve humans' efficiency	28	34%
To reduce the pain of translating	22	27%
Other	4	5%
Total	82	100%

When participants were asked to indicate what the computer could not do, the majority, excluding no responses and n/a-s, again indicate that it could not replace the human translator (see Figure 10):

Figure 10: What the computer cannot do in translating

Choices	N	Percent
Cannot replace the human translator	37	74%
Cannot assist the human translator	4	8%
Cannot improve efficiency	4	8%
Cannot reduce the pain of translating	4	8%
Other	1	2%
Total	50	100%

Although there is no agreement among the survey subjects, the data indicate a limited but realistic degree of confidence in machine translation. When participants were asked to indicate in percentage the importance of translated literary style in human translation, excluding the no responses, 48 expect an accuracy rate from 80% to 98%, the mean of which is 89% (see Figure 11):

Figure 11: The importance of literary style in HT

	T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Human TT	110.086	46	.000	89.21277	87.5815	90.8440

Further, participants' expectation of machine translation indicates a rate of 7% less importance (see Figure 12):

Figure 12: The importance of literary style in MT

	T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Machine TT	46.539	39	.000	82.17500	78.6035	85.7465

One is reminded that owing to self-confidence or other competence reasons, the number of participants may differ from question to question as participants were asked to answer only questions they were comfortable with. Excluding no respondents, 61% (22) of the participants expect a 50%-80% accuracy rate in machine translation while 17% (6) expect a rate over 90% and 22% (8) rate from 81% to 89%. This is a contrast to their expectations of human translation where their lowest starts from 80%. This may be interpreted as an indication that the majority of participants are informed about what the computer can realistically deliver.

Although machine translation may be significantly inferior to human translation and although human translation may never be as good as the source text, the process constitutes a specific medium and therefore should be treated independently. Different criteria should be set and appropriate standardized quality evaluation models, schemes, or formulas be designed for HT and MT. It is similar to a patient's blood pressure in which case the acceptable level of an infant may differ from that of a teenager, while the teenager's may differ from that of a senior. Likewise, one's temperature may not have to remain the same at all times to be considered healthy. Thirty-six point five degrees Celsius may be acceptable and so is thirty-six point six. The problem lies in that translation scholars and practitioners have never freed themselves from the source text. An intermedial approach, however, may effectively liberate them from the millennia-old shackles, providing them the necessary theoretical frame to study each more independently, including assessment of its quality: standards differ and, accordingly, acceptability of MT starts at a lower point than that of HT and than what has been expected of a translation traditionally — the nonexistent perfect translated text. Accepting HT, MT, and ST as three inde-

pendent identities or products, researchers may investigate into the issues of how to meet the minimum criteria set by the international community of professional translators, writers, editors, and translatologists, and how to narrow the gap between minimum acceptability and unacceptability and between the minimum acceptability and the nonexistent perfect TT.

What follows is an attempt to quantify a number of concepts essential for a statistical or formula approach to quality assessment of HT and MT in recognition of the gap between nonexistent perfect translation and the minimum acceptability for MT and HT and that between HT and MT, proposed for user-friendly standardized evaluation. In terms of hypothetical percentage participants were asked to indicate the maximum tolerance of inaccuracy in a translation, with the answers from the shortened questionnaire, 100 professionals responded: their expectations range from perfection to 10% of inaccuracy (see Figure 13):

Figure 13: Breakdown of maximum tolerance of overall inaccuracy in a translation

Maximum inaccuracy tolerance in percentage	Responses: 100%
.0	1
.1	4
.5	8
1.0	10
1.5	1
2.0	7
3.0	1
4.0	3
5.0	33
6.0	7
7.0	1
8.0	3
10.0	21

As above Figure 13 shows, one participant accepts zero inaccuracy in a translation, while 21% could tolerate up to 10% overall inaccuracy. The average tolerance rate, however, is 4.929%, as indicated in Figure 14:

Figure 14: Maximum tolerance of inaccuracy in HT in percentage

T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
				Lower	Upper
14.870	99	.000	4.9290	4.271	5.587

Thus, a maximum 4.9% inaccuracy rate means a minimum accuracy rate of 95.1%. In other words, a TT with an accuracy rate lower than 95% will be rejected by the average translator, writer, editor, and translation scholar (on this, see in more detail Huang, "The World's Dividing Line"). The participants' maximum MT inaccuracy rates, however, range from 1% (2) to 40% (1). The second biggest percentage of inaccuracy is 25% (4), while the second smallest is 4% (2). The overall average is a 12% inaccuracy rate (see Figure 15):

Figure 15: Maximum inaccuracy rate that can be tolerated in MT

T	Df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
				Lower	Upper
8.818	36	.000	12.10811	9.3232	14.8930

Maximum inaccuracy is defined as the dividing line between acceptability and unacceptability. In other words, participants were looking for an MT that has an accuracy rate of almost 88%. This is only about 7% less than the expectation of HT. To meet such high expectations, the machine obviously can only handle certain types of texts or all types of text to a limited degree of accuracy.

The unit of translation (UT) is no less important in translation studies than the human cell in medical studies. Its numerous identifications have caused confusion and even misled frontline translators, especially MT professionals including translation programmers. Clarifying UT has various important implications: the samples of the 23000-page translations and bilingual or multilingual texts confirm the sentence-in-context as the UT. Regardless of the ST syntax features, UT or TT sentence is found with the following features: 1) An ST complete sentence translated into a complete TT sentence, 2) An ST sentence split and translated into more than one TT sentence, 3) Two or more ST sentences combined into a TT sentence, and 4) A number of ST components combined and translated into a TT sentence. Over 99% of the TT sentences examined contain a clear component called the "subject-verb" unit. After the initial discovery of UT, I also uncover the unit of translation quality assessment — again, the sentence-in-context designation and this paves the way to standardized TQA (see, e.g., Huang, *A Model for Translation*; Huang and Wu). In the conceptualization of balance in numerical terms, a hypothetical full balance or flawlessness, albeit nonexistent, is used as the highest standard for any type of translation. The concept of absolute accuracy and total fidelity simply means that the ST ought to be fully reproduced in TT. In this context, nonexistent perfection means fullness, 100% or 1: in mixed terms: ST (100%) = TT (100% of ST [1]), in numerical terms: 100% = 100%, Or: 1 (ST) = 1 (TT). The numerical absolute faithfulness or accuracy that may not exist in translating serves as an unreachable goal for all translations to measure against. In practice, however, the goal is not to achieve perfection, but to minimize imperfectness.

Drawing on previous studies on TQA as a theoretical basis and the translation evaluation criteria of the international community of translators the dividing line between acceptability and unacceptability rests on the TQA scale in numerical terms. At the word level, the line lies between one undeniable mistake per ten sentences and less than one mistake. How many is less than one mistake? That could be 0.99 and up to the reader to interpret. The bottom line is that it must not be one or more than one (see Huang, *A Model for Translation*, "Dissonant TQA Practice"). This one mistake alone suffices to cause failure. For application/illustration purposes, the dividing line referred to below is at the word level, which is conveniently translated into percentage points.

A different degree of loss, addition, or alteration of meaning or content in translating results in a degree of imperfection in all translation. Loss, addition, or alteration of ST meaning in TT is considered unfaithfulness to the original text, based upon which an error index (EI) may be created, while the percentage of acceptable accuracy may form an accuracy index (AI). In this and other studies I completed (e.g., "Imperfectness Is Translation," *A Model for Translation*) both are derived from the mean tolerability of the international community of translators, writers, editors, and scholars who teach translation.

In the case of a TT where the translator adds or loses 0.1 of content, the absolute value of 0.1 is taken, and there is no negative. The result of both is the same: 1 – (1 – 0.9) = 0.9 (90%) and 1 – |1 – 1.1| = 0.9 (90%). Suppose the standard acceptable inaccuracy rate is 5%, which means the acceptable accuracy is 95%; then TT with a 90% accuracy rate (AR) is deemed unacceptable and is rejected as a failure. The procedure for the calculation is ARTT: AI Standard. If the answer is equal to or larger than zero, the TT is satisfactory. If the answer is less than 0, the TT is below the acceptable line and therefore rejected: ARTT: AI Standard ≥ 0 (Acceptable) and ARTT: AI Standard < 0 (Rejected). In practice, the OG (overall grade) is always smaller than 100%. The calculation of the grades of individ-

ual units requires another procedure that involves error deduction schemes (see Huang, "Scandals in Translation").

Numerous translatologists and practicing translators have discussed and defined the concepts of "good" translation versus "bad" translation. Contemporary translation scholars have also addressed the concepts of translated text acceptability and unacceptability, but the majority of published theories are knowledge-based opinions, educational hypotheses, and guidelines that are usually too general to guide practice or to be called a tested theory. I identify the unit of translation, clarify the concept of balance between CP, OS, and SA, and determine the dividing line between acceptability and unacceptability. Translation is an approximate product and any form of evaluation of an approximate product will result in similar products. Expecting perfect results or 100% consistency is illogical, but imperfect or approximate standardized TQA can well be a worthy substitute for qualitative TQA — the millennia-old qualitative approach that is costly and well known for its high degree of subjectivity, inconsistency, and inefficiency. By identifying in numerical terms the dividing line between a "good" translation and a "bad" one and the unit of translation and therefore the unit of TQA, I illustrate that linguistic concepts can be quantified as long as there is willingness to base studies on practice statistics.

Now that I have quantified TQA concepts thus completing the first step for standardization, what remains to be created is an internationally acceptable standardized formula or a set of formulas for intermedial standardized TQA. Given that the international community has different expectations for human translation and machine translation and that both are used for different purposes, criteria set for HT and MT should differ. Both human translation (literary or nonliterary) and machine translation (fully automated or human assisted) are twins that transfer not only language, information, and knowledge including culture, history, politics, religions, as well as science and technology. Given that machine translation is assessed by professionals who depend upon human translation theories, MT appears to be the latter born twin of the two. Thus, successful MT evaluation seems to be conditional upon testable or tested human TQA formulas. Although the two types of translation may be similar in various aspects, they should be treated as different forms of communication in intermedial practice and whose production involves different processes. What is clear is that HT and MT are distinctly different from the source text and have to be treated accordingly as intermedial products, although they may also be considered as interlingual, intertextual, intercultural, interregional, interracial, and interreligious medial products that bond the global community together through communication.

In conclusion, I hope this study provides new knowledge for human and machine translation study within an intermedial context and that new formulas, frameworks, criteria, and the like would be developed to standardize machine translation and human translation quality evaluation.

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