Gender Issues in Machine Translation

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0. Introduction

Along with the growing need for intercultural and translingual communication in an increasingly globalized world, machine translation (MT) becomes more and more important both in assisting language professionals in their daily work and in helping non-professionals understand and create texts in foreign languages. Based on the frequent assumption that it is machine translation's aim to replace human translators, which it is not – or at least, should not be, machine translation systems are often considered to be inefficient and accused of not living up to the promises they make. However, if you regard these programs as communication aids or translation tools rather than as a substitute for a human translator, you will find that their value is often vastly underestimated.

In order to be as efficient as possible, however, machine translation naturally aims at automatizing the work a human translator does within its given boundaries. This is possible whenever there are reliable rules that can be applied. Gender issues in translation is a subject that serves to point out the limitations of machine translation. Human translators choose the correct wording by using knowledge from various sources many of which derive from a knowledge of the world and cultural differences and implications many of us are not even aware of possessing. Machine translation software's resources for determining whether a translation is appropriate or not, however, are much more limited. But even a software program can identify certain contexts that allow for the correct handling of particular grammatical features, in this case, feminine forms, even if these contexts go beyond sentence level.

Following a general introduction on the gender-related problems translation and machine translation in particular are faced with in different language pairings, we will present

- a comparative evaluation of commercial MT systems
- a discussion of gender-related phenomena like person references, anaphoric references and the handling of definite noun phrases in translation as well as aspects of productivity and lexicalization, the scope and coverage of dictionaries as well as rules in morphology, grammar and transfer
- aspects of usability for cases where the program is not able to decide, but leaves the decision to the user, as in German-French translations

We will discuss our limited knowledge of users' expectations regarding gender issues in translation quality as reflected by purchasing patterns, user feedback and comparative analyses in the media and in consequence touch on the subject of the possibilities for a single company to set new standards in translation software and increase user awareness regarding gender issues in translation.

1. Gender issues in language

Languages vary according to what information about the world they choose to put into words. In German (unlike English) e.g., reference to a person can usually not be made without specifying whether the person is male or female, even if this feature is of minor interest in that specific situation. We do this by expressing the linguistic category gender.

(1) *Ein Angeklagter(masc) / eine Angeklagte(fem) wurde verurteilt. – A defendant was sentenced.*

In French (unlike German and English), most of the times we cannot talk about ourselves without revealing our sex through gender:

(2) *Je suis fière(fem) / Je suis fier(masc) – I am proud(0) - Ich bin stolz(0)*

These examples show, that sex - a quality of the world - coincides with gender – a grammatical category - , when talking about humans. Despite of this coincidence, in linguistics, a very important distinction is made between sex (or natural gender) and grammatical gender, implying that a feature of the (non-linguistic) world i. e. sex is expressed by a linguistic category i. e. gender. As a matter of fact, these two categories do not coincide most of the times: While the German word *die Tasche* (the bag) has no natural gender, its feminine gender is clearly defined as a grammatical category and agreement is enforced accordingly.

As with almost every other linguistic category, languages offer default interpretations of the gender if no details are known. This is known as the economy principle. In German, French and English e. g., the default gender is masculine. This is what applied until the 1970/80ies. Looking at things from another angle, feminist linguistics challenged the default interpretation of gender in those cases where they refer to sex. With regard to the economy principle that makes languages use a masculine default interpretation of the category gender, it was pointed out that the feminine/female interpretation was underrepresented, not seen and the "exception" in language use in those cases where there is a correspondence between sex and gender. In French and German, one man in a group with 99 women made the whole group belong to the category "masculine". Job titles were almost always used in the masculine form regardless of whether they referred to a woman or not, and in spite of the fact that many feminine forms existed. The feminist reasoning was that if women were not present and visible in language, this meant that they were disregarded and depicted as irrelevant. In consequence, women had to be made present in language in order to underline their importance and role in society, and last but not least to achieve another step towards equal female participation in social issues such as money, power, prestige and position.

Language is indeed changing all the time, even if we – the language users – are not always aware of it, sometimes only when we e. g. hear older people comment on new words used by young people. In the case of the sex/gender controversy, the feminist criticism gave rise to a strong form of language policy. Nowadays, every public institution is obliged to use gender-neutral language in their forms and publications. Thus, we have witnessed the establishment of a new linguistic rule rather recently. This rule obliges speakers to either express themselves in a neutral way (e.g. in English use *person* where formerly you would have used *man*) or to name the male and the female referents explicitly as in German *Liebe Bürgerinnen und Bürger*.

In sophisticated machine translation it is essential that the rules of a language be covered to the largest extent possible. Apart from the most basic grammatical rules such as in German

ein schöner Mann versus *eine schöne Frau*, a modern MT system that meets the requirements of its users should also obey recently established rules.

In the following, we will conduct an investigation into several machine translation systems to determine in how far they take into consideration basic, long established and more recently emerged grammatical rules of the languages German, English and French. It is particularly interesting to look at source sentences in which the gender category is not uniquely expressed. Are the systems capable of inferring the correct gender that has to be expressed in the target language?

(3) *Marie est alpiniste. – Marie ist Bergsteigerin. [Marie is a mountain climber]*

Here, the male and the female form of the person referred to is identical in French: *alpiniste/alpiniste*, but not in German *Bergsteiger/Bergsteigerin*. The indication of the subject being a woman implied in the female name "Marie", though, should lead the machine translation system to opt for the feminine form in the German translation.

2. Gender-sensitive phenomena in translation

English does not show grammatical gender, but indicates gender mainly pronominally. When translating from English into German, there are certain contexts which, in our view, require gender-sensitive translations, that is, the transformation of a gender-neutral word into one which is gender-marked. Within sentences these are for example:

Appositions:
(4) *Mary, our manager, arrived today.*
(5) *Our manager, Mary, arrived today.*
Predicate constructions with subjects with a clear marking of their natural gender:
(6) *Mary Miller is a Norwegian.*
(7) *The speaker is Mary.*
(8) *They called Mary a hypocrite.*
Objects and complement constructions with certain verbs:
(9) *They referred to Mary as an expert in software ergonomics.*
(10) *Mary was appointed head of the board.*
Pronominal reference:
(11) *The boss gives her approval.*
(12) *The boss came, she saw and she decided.*
For all these examples, the person references in German require the feminine form *(manager - Managerin, Norwegian - Norwegerin, expert - Expertin, boss - Chefin* etc.*)*. It is nowadays widely accepted that something like a generic masculine does not exist (cf. Pusch 1984 and 1990), and translating into masculine forms would be incorrect in today's German usage. Phenomena like the ones above, where there is a clear indicator toward the feminine form within the sentence, are cases where it is possible even for a software program to choose the correct, feminine target words, i.e. produce a gender-appropriate translation.

The translation of the word *teacher* in
(13) *The teacher became angry.*
by the male form *Lehrer* might seem unavoidable in isolation, but if the previous or the following text clearly identifies the person as female, it is not. An indicator for that could be a pronominal reference like *she*, as in

(14) *They saw a teacher and a child. The teacher was busy and she seemed tired. The child was ill-bred. The teacher became angry*[1].

which allows *teacher* to be a valid referent for the pronoun *she*. This means, textual information above sentence level has to be taken into account as well, in order to produce correct translations. Of course, there are also contexts in which the sex of the referent is not known, as is the case for unknown words or first names that can be either female or male:

(15) *Sam is Italian.*

As a matter of fact, the default translation for these cases is usually the masculine form *Italiener*. For some occupational titles like *nurse* or *secretary* a female interpretation might seem more appropriate, though. This is due to a probabilistic knowledge about the world or, in this case, social gender, which reflects an association like 'generally female' or 'generally male'[2].

In order to produce correct translations, there are certain prerequisites that have to be met in different components of a translation software:

The system's **grammar** has to provide a proper analysis of the texts and has to have knowledge about the referencing relationship between e. g. *Mary* and *expert* in example (9).

The **semantics** must be able to distinguish between female and male human beings[3]. The types of information represented as well as the coverage of the **dictionary** have to be broad enough, i.e. semantic types like e. g. "name of a person" have to be assigned to the respective concepts, and particularly the most frequent first names have to be coded, which can then be used as a source of inference. Person references (like occupational titles, roles, relational expressions) must be linked to transfer rules specifying that there is a gender marked form available for translation, which can be chosen if the context is clear.

A component for **discourse representation** which is able to do the resolution of anaphors and cataphors even above sentence level is a prerequisite for the gender-appropriate translation of sentences like (13) within the specified context of (14).

When translating from German into English or French, the **dictionary**[4] must either contain all existing feminine forms, an information which is rarely found in dictionaries for human use, since most of them are produced rule-based by adding the suffix *–in* to the male form, or, as this phenomenon is productive, there have to be **rules in morphology** which allow for an analysis via derivations. That is, a word like *Imkerin* (female beekeeper) can either be coded in the dictionary or its grammatical and semantic features and translation can be derived from the male form *Imker*[5].

Translation also involves the removal of constituents that might become redundant during the process of translation. When translating from a grammatical gender language into a language without this distinction, e.g. from German into English, the use of gender-neutral language in German has to be taken into account, too. Here we have information which is formulated explicitly in the source, but becomes superfluous in the target and has thus to be removed in the **generation** component. A word-by-word translation of e.g. *Lehrerinnen und Lehrer* into *teachers and teachers* is inappropriate, instead the target expression should be reduced to *teachers* or, if both forms remain, they should show distinguishing features.

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[1] We owe some of the examples to K. Eberle.

[2] cf. Nissen (2002) who discusses words like *typist, secretary, Foreign Secretary* and their interpretation depending on societal conditions and time.

[3] Similar problems arise with regard to animals, which are often assigned a specific gender.

[4] Example sentences are often part of a dictionary and are intended for the user's understanding of words in their contexts. It has been noticed by Pusch (1984) that these often show sexist stereotypes. Translate uses examples in its main dictionary and its dictionary of idioms based on Schemann and Knight (1995). In both, much effort is put into reducing the original sexist bias for the Translate product.

[5] In this example, the latter applies to Translate, which is equipped with a vast amount of feminine forms but is also able to derive them.

3. Comparative evaluation of commercial systems

In the following, the most relevant commercial MT systems are evaluated with regard to the gender-related phenomena discussed above. The choice of these systems has been further influenced by (a) the language pairs they offer for translation, as can be gathered from evaluations in relevant media like software magazines, and (b) the availability of online translations. The comparison was done via the versions available on the internet, or, in the case of Translate and T1, the desktop versions were used. The systems concerned are the following[6]:
Promt Online Translator: http://www.translate.ru/?lang=de
Systran: http://babelfish.altavista.com
Langenscheidt T1 Professional 5.0
Lingenio & digital publishing Translate Pro 8.0

In the following, we present a selection of sample translations including gender-sensitive phenomena to illustrate the points made above:

(16) *Mary, our manager, arrived today.*
Translate: *Mary, unsere Managerin, kam heute an.*
T1: **Maria, unser Manager, kam heute an.*
Systran: **Mary, unser Manager, heute angekommen.*
Promt: **Mary, unser Betriebsleiter, kam heute an.*

(17) *Our manager, Mary, arrived today.*
Translate: *Unsere Managerin, Mary, kam heute an.*
T1: **Unser Manager, Maria, kam heute an.*
Systran: **Unser manager, Mary, heute angekommen.*
Promt: **Unser Betriebsleiter, Mary, kam heute an.*

(18) *Mary Miller is a Norwegian.*
Translate: *Mary Miller ist Norwegerin.*
T1: **Maria-Müller ist ein Norweger*[7].
Systran: **Mary Miller ist ein Norweger.*
Promt: **Mary Miller ist ein Norweger.*

(19) *The speaker is Mary.*
Translate: *Die Sprecherin ist Mary.*
T1: **Der Sprecher ist Maria.*
Systran: **Der Lautsprecher ist Mary.*
Promt: **Der Sprecher ist Mary*

(20) *They called Mary a hypocrite.*
Translate: *Sie nannten Mary eine Heuchlerin.*
T1: **Sie nannten Maria einen Scheinheiligen.*
Systran: **Sie riefen Mary einen Heuchler an.*
Promt: **Sie nannten Mary einen Heuchler.*

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[6] Linguatec's 'Personal Translator 2004' was omitted, because it is a predecessor of Translate.
[7] T1 indicates that it produced alternatives to the translation it eventually selected, among them the correct one *Norwegerin*.

(21) *Mary was appointed head of the board.*
Translate: *Mary wurde zur Vorstandschefin ernannt.*
T1: **Maria wurde zu Kopf des Brettes ernannt.*
Systran: **Mary wurde Kopf des Brettes ernannt.*
Promt: **Mary wurde Haupt vom Ausschuss ernannt.*

(22) *They referred to Mary as an expert in software ergonomics.*
Translate: *Sie nannten Mary eine Expertin in Softwareergonomie.*
T1: **Sie bezeichneten Maria als einen Fachmann in Softwareergonomie.*
Systran: **Sie bezogen sich auf Mary als Experte in der Software-Ergonomie.*
Promt: **Sie bezogen sich auf Mary als ein Experte in der Software-Ergonomie.*

(23) *The boss gives her approval.*
Translate: *Die Chefin gibt ihr Einverständnis.*
T1: **Der Chef gibt ihre Zustimmung.*
Systran: **Der Chef gibt ihr Zustimmung.*
Promt: **Der Chef gibt ihre Billigung.*

(24) *The boss came, she saw and she decided.*
Translate: *Die Chefin kam, sie sah, und sie entschied.*
T1: **Der Chef kam, sie sah, und sie entschied sich.*
Systran: **Der Chef kam, sah sie und sie entschied.*
Promt: **Der Chef kam, sie sah, und sie entschied.*

(25) *Sam is Italian.*
Translate: *Sam ist Italiener.*
T1: *Sam ist italienisch.*
Systran: *SAM ist italienisch.*
Promt: *Sam ist italienisch.*

(26) *LehrerInnen*
Translate: *teachers*
T1: ?*LehrerInnen*
Systran: : *teachers*
Promt: : *teachers*

(27) *Lehrer/innen*
Translate: **Teacher/inside*
T1: *?Lehrer/innen*
Systran: **teacher/inside*
Promt: ?*Teachers and teachers*

(28) *Lehrerinnen und Lehrer*
Translate: *teachers*
T1: *?teachers and teachers*
Systran: *?teachers and teachers*
Promt: *?Teachers and female teachers*[8]

[8] Note the change in the order of constituents which might be based on a word ordering rule ‘male before female’.

(29) *die SchlachterInnen und Schlachter.*
Translate: *the butchers.*
T1: **the SchlachterInnen*[9] *and butchers.*
Systran: **butcher inside and butchers*[10].
Promt: **the battle channels and butchers.*

(30) *Imkerinnen und Imker*
Translate: *beekeepers*
T1: **Beekeeper inside*[11] *and beekeeper*
Systran: **beekeeper inside and beekeepers*
Promt: **Beekeepers and female beekeepers*

(31) *Sie ist Imkerin.*
Translate: *She is a beekeeper.*
T1: *?She is Imkerin*[12].
Systran: *?She is Imkerin*[13].
Promt: *She is a beekeeper.*

(32) *Maria Reyl verwaltet ihr Geschäft selber.*
Translate: *Maria Reyl manages her business.*
T1: *?Maria Reyl manages their business itself.*
Systran: *?Maria Reyl administers its business.*
Promt: *Maria Reyl administers her business herself.*

When evaluating the results it has to be kept in mind that inappropriate translations are often due to gaps in the dictionary. In choosing the sentences, we did, however, vary the wording and tried to avoid words unknown to the systems.
Most of the English sentences have simple grammatical constructions and use common terminology. All of them clearly indicate female gender for the referents, which should be expressed in the German translation, provided that the first names are known to the systems. Despite this fact, the male form is chosen by T1, Systran and Promt in all the English-German translations, although T1 offers the correct feminine word in one example, (18), but not as its first choice. That is, three of four software programs don't produce correct, gender-appropriate English-German translations for a sample of common syntactical constructions in which the decision to select the female gender could easily, and should, be made.
As regards German-English, where the samples were intended to show whether and how different gender-neutral wordings and gender-marked feminine forms are treated, the picture is less clear:
Some of the gender-neutral expressions in German are analyzed correctly *(LehrerInnen,* except by T1, but not *SchlachterInnen*, except by Translate) while others are mostly not *(Lehrer/innen*, except for Promt). For T1, Systran and Promt, the correct analysis of the form with *-Innen* seems to be possible only for those feminine words which are contained in the dictionary. The most common of the feminine person references seem to be covered by the dictionaries, though obviously to a lesser extent than their male counterparts. We did not find

[9] *SchlachterInnen* could not be analyzed. The variation *Schlachterinnen* is translated as *slaughtering-gutters*, i.e. analyzed compositionally.
[10] It is not clear why *SchlachterInnen* could not, but *LehrerInnen* could be analyzed by Promt; probably because the more common word *Lehrerin* is contained in the dictionary.
[11] Here, the word *Imkerinnen* is interpreted as a compound, with the parts *Imker* and *innen (inside)*, an analysis which is theoretically possible, but rather improbable.
[12] That is, *Imkerin* remains unanalyzed, but the male form *Imker* is translated correctly as *beekeeper.*
[13] dto.

any evidence for a rule-based treatment of (productive) derivations with *-in* in the case of T1, Systran and Promt. Only Translate shows this capability. If both female and male forms are present in the German source, Promt seems to follow a policy of expressing female gender explicitly in English in opposition to the neutral, non-marked form, thus suggesting e.g. *teacher* to be male in general. In these contexts, Translate removes the explicit opposition in favor of a non-gender-expressing form (cf. examples (28) and (30)). T1 and Systran do not remove any redundancy in the English target sentences, which might be interpreted in such a way that they don't expect gender-neutral wordings to occur in German.
As regards the incorrect treatment of pronominal references, no generalizations can be made since there might be differences in e.g. translation settings between the online and the desktop versions.
The results demonstrate that most of the systems show severe shortcomings in their handling of gender-appropriate translations and in the treatment of gender-neutral language. Translate is the only software which covers gender-sensitive phenomena appropriately.

4. Gender issues in the French language

The French language is characterized by a moderate use of morphology to express syntactic relationships, as far as the marking of number, person and gender is concerned.

The attributive adjective and the predicate adjective agree with the head noun they accompany, as in

(33) *La maison vielle (fem.) est chère (fem.)* [The old house is expensive]
(34) *Le bâtiment vieux (masc.) est cher (masc.)* [The old building is expensive]

In some of the tenses, notably "passé composé", a form of past tense, the participle agrees with the subject when the form is constructed with the auxiliary "être" (to be):

(35) *La fille est venue (fem.) te voir* [The girl came to see you.]
(36) *Antoinette, tu est convaincue (fem.)?* [Antoinette, are you convinced?]

If we have a form of "passé composé" with the auxiliary "avoir" (to have) and the direct object is referred to by a pronoun and as such placed before the auxiliary, the participle agrees with the gender marking of the pronoun:

(37) *J'ai vu les filles. Tu les as vues aussi ?* [I saw the girls. Did you see them also ?]

The marking is clear as long as nouns are present showing a clear membership to a gender category in the lexicon. But often, more information can be deduced from the context than the lexicon will supply. Consider the French sentence

(38) *Marie est alpiniste.* [Mary is a mountain climber.]

The French word *alpiniste* does not show a gender marking as do other French references to persons. In German, however, we have the choice between a male and a female form. If no additional information is given, both the native speaker in daily language and the machine translation system will opt for the masculine form. Just like the human speaker, a high-quality machine translation system is however able to infer from the analysis of the sentence that the person referred to - *Marie* - is female and thus choose the feminine form:

(39) *Marie ist Bergsteigerin.*

Unlike German and English possessive pronouns, French possessive pronouns remain unmarked regarding the gender and number of the **possessor** *Sophie*, but are marked according to the gender and number of the **possessed** *lait* instead

(40) *Sophie (fem.) boit son (masc.) lait (masc.). – Sophie (fem.) drinks her (fem.) milk (0).*

In this example, *son* would usually receive the default translation *his* if nothing else can be inferred. This is what happens in some machine translation systems. A powerful pronoun resolution component will enable automatic machine translation to analyze that the possessive pronoun marks a possession of Sophie's who in turn is female and thus the possessive pronoun in the feminine form (*her*) is chosen. The discourse analysis of the machine translation system will try to find the appropriate referents that the pronouns pick up. This procedure is even applied above sentence level, i. e. the program will make use of information contained in one sentence to draw conclusions on the structure of another:

(41) *Le chat boit son lait. Il l'aime. - Die Katze trinkt ihre Milch. Sie liebt sie.* [The cat drinks its milk. It likes it.]

Without any pronoun resolution above sentence level, in German we would get the default translation of *il* which is *er* and the default translation of *l'/le* which is *ihn*, both of them pronouns in the masculine form. The analysis of a sophisticated machine translation system will resolve, that feminine referents are picked up and in both cases chose the appropriate feminine pronoun(s) *sie*.

In order to determine the appropriate antecedent for a pronoun, a machine translation system may consider syntactic and semantic information:

(42) *Die Frau, die Probleme und ihre Lösung. - La femme, les problèmes et leur solution. - The woman, the problems and their solution.*
(43) *Die Frau, die Probleme und ihre Idee. - La femme, les problèmes et son idée. - The woman, the problems and her idea.*

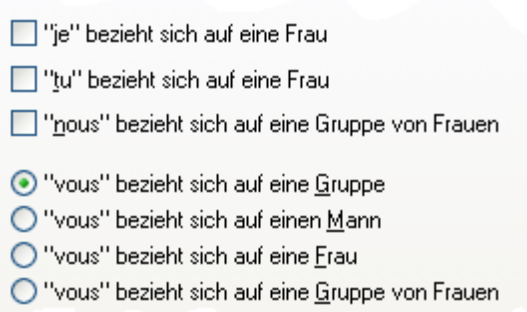
People may have ideas; problems have solutions. Thus in (42) we have to choose the possessive pronoun *son* that picks up its antecedent *femme*. While in (43) we have to opt for the possessive pronoun *leur* that picks up its antecedent *problèmes*.

Evaluation and Discussion

We designed 20 test sentences to determine to what extent popular translation systems cover the linguistic phenomena we discussed with respect to gender-sensitivity. For the translation pair German-French, fewer systems are available. We tested Translate, T1 and Systran. Promt has announced to make this language pair available soon. Whenever it appeared during the test that the system had a problem with the wording of the sentence, we varied the wording in order not to distort the results due to lexicon problems.
It turned out that all systems do a very good job in handling the agreement rules in French that concern e.g. participles (35/36) and predicate adjectives (33/34). The exception to the rule is Systran, which cannot cope with the type of participle agreement shown in (37). As to the gender-sensitive translation of predicate nouns, neither system is able to opt for the feminine job title if a clearly denoted female referent is present. The adjectival predicate works in every system. Possessive pronoun handling is mastered by Translate and to some extent by Systran. Discourse reference that goes beyond sentence level is obviously only interpreted by Translate. In the ranking, it turned out that Translate did the best performance with 13 correct translations out of 20, followed by Systran with 7 out of 20 and T1 with 6 out of 20. But numbers are not very significant in these cases: speaking in terms of the grammatical phenomena covered, T1 and Systran are even. Whereas Translate covers most of the phenomena discussed, except for predicate nouns and appositions, cf (38/39). There is still a need to extend the number of nouns in the dictionary denoting women in occupation, sports, science etc.

5. User Issues

In some circumstances – as e.g. with some types of personal pronouns in the subject position - it is very difficult to infer gender information from the context automatically. In these cases, machine translation can make use of additional information given by the user. This is done in the so-called "translation settings". What follows is an introduction to possible settings for a French target text. It is taken from the machine translation system **Translate** (http://www.lingenio.com).

	je refers to a woman tu refers to a woman nous refers to a group of women vous refers to a group vous refers to a man vous refers to a woman vous refers to a group of women

Some settings for the target text when translating from German to French

***je/tu/nous* (*I, you, we*) refers to a woman/a group of women**
The form of certain French verbs varies according to the gender and number of the speaker (*ich/je or we/nous respectively*) or the adressee (*you/tu*). For certain text types such as letters it is therefore necessary to supply gender information for the speaker or the addressee respectively in order to obtain a correct translation.

Example: *Ich bin überzeugt. – Wir sind überzeugt. – Du bist überzeugt.*
Je [=male speaker] suis convaincu./Je [=female speaker] suis convaincue.
Nous [=male speaker] sommes convaincus./Nous [=female speaker] sommes convaincues.
Tu [=male addressee] es convaincu./Tu [=female addressee] es convaincue.

***vous* refers to a woman/a man/a group of women**
Sie and *ihr* are both translated with *vous*. Here it is essential to know to what gender (male/female) and number of persons the "vous" refers to.
Example: *Sie sind überzeugt. – Ihr seid überzeugt.*
Vous [=male addresse] êtes convaincu./Vous [=female addressee] êtes convaincue.
Vous [= several male and female addressees] êtes convaincus./Vous [=several female addressees] êtes convaincues.

These settings show that even if on the one hand we use a sophisticated machine translation system, there is a need for user interaction to support the translation.

User feedback
As developers of a translation software which has been one of the most successful systems on the market for eight releases we have been keeping track of both user feedback and evaluations of MT systems in the media.
As regards user feedback, it has to be noted that we have neither received complaints about gaps in our coverage of gender issues, nor have we got any feedback appreciating our singular achievements in this area. The latter might be due to the general uncommonness of positive feedback and/or to users generally expecting a poor translation quality from software programs. We have no data on gender-sensitive translation quality playing a role in

purchasing patterns, but we suspect that these issues play only a minor part in general considerations regarding quality. Neither have we received any requests for the introduction of general translation settings like “always translate into feminine forms” or “always use gender-neutral forms”. The general usage of gender-neutral wording could at least be expected to be a compulsory requirement for official documents (by the EU, governments, or local authorities) or in texts regulated by law, like job advertisements.
We have not observed any consciousness for gender-appropriate translations in comparative analyses of translation software in the relevant media. Whether these aspects are considered to be irrelevant or whether they are not known to the general public, is an open question.

6. Conclusion

We have shown that a variety of parameters are involved when a software aims at producing gender-appropriate and thus high-quality translations. As developers, the process of maintaining and improving translation quality is part of our daily work and affects various components of the program. Improving the visibility of women, handling gender-related issues in language technology and trying to keep up with the latest developments of society as reflected in language use is an integral part of this work. In this respect, we are trying to set new standards in translation software and break new ground in fields often considered as rather marginal by our competitors, as has been shown in the comparison, as well as by many of our customers.
In how far it is possible for a single company to influence the demands of the market and/or increase user awareness of these issues is a question not easily answered and left open for discussion.

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Appendix
Test set German French/French-German

Tested for: predicate noun agreement
A1 *Sarah est alpiniste.*
Translate: **Sarah ist Bergsteiger.*
T1: **Sarah ist Bergsteiger.*
Systran: **Sarah ist Bergsteiger.*
Expected: *Sarah ist Bergsteigerin.*

Tested for: predicate noun agreement
A2 *Sophie est touriste.*
Translate: **Sophie ist Tourist.*
T1: **Sophie ist Tourist.*
Systran: **Sophie ist Tourist.*
Expected: *Sophie ist Touristin.*

Tested for: predicate noun agreement
A3 *La femme est alpiniste.*
Translate: **Die Frau ist Bergsteiger.*
T1: **Die Frau ist Bergsteiger.*
Systran: **Die Frau ist Bergsteiger.*
Expected: *Die Frau ist Bergsteigerin.*

Tested for: apposition agreement
A4 *Sophie, l'activiste, est malade.*
Translate: **Sophie, der Aktivist, ist krank.*
T1: **Sophie, der Aktivist, ist krank.*
Systran: **Sophie, der Aktivist, ist krank.*
Expected: *Sophie, die Aktivistin, ist krank.*

Tested for: antecedent gender is resolved by following pronoun
A5 *Les journalistes viennent et elles partent. Les journalistes viennent et ils partent.*
Translate: *Die Journalistinnen kommen und sie gehen. Die Journalisten kommen und sie gehen.*
T1: *Die Journalisten kommen und sie gehen weg. *Die Journalisten kommen und sie gehen weg*.
Systran: *Die Journalisten kommen, und sie gehen weg. *Die Journalisten kommen, und sie gehen weg.*
Expected: *Die Journalistinnen kommen und sie gehen. Die Journalisten kommen und sie gehen.*

Tested for: antecedent gender is resolved by following pronoun
A6 *L'artiste vient, elle voit et elle décide.*
Translate: *Die Künstlerin kommt, sie sieht und sie entscheidet.*
T1: **Der Künstler kommt, sie sieht und sie entscheidet.*
Systran: **Der Künstler kommt, sie sieht und sie entscheidet.*
Expected: *Die Künstlerin kommt, sie sieht und sie entscheidet.*

Tested for: antecedent noun is resolved by nominal predicate
A7 *L'auteur est Sophie.*
Translate: **Der Autor ist Sophie.*
T1: **Der Autor ist Sophie.*
Systran: **Der Autor ist Sophie.*
Expected: *Die Autorin ist Sophie.*

Tested for: one object resolves the gender of the other
A8 *On appelle Anne l'activiste malade.*
Translate: **Man nennt Anne den kranken Aktivisten.*
T1: **Man nennt Anne den Aktivisten krank.*
Systran: **Man nennt Anne den Aktivisten krank.*
Expected: *Man nennt Anne die kranke Aktivistin.*

Tested for: agreement of poss. pronoun
A9 *Le chat boit son lait.*
Translate: *Die Katze trinkt ihre Milch.*
T1: **Die Katze trinkt seine<A[seine|ihre]> Milch.*
Systran: *Die Katze trinkt ihre Milch.*
Expected: *Die Katze trinkt ihre Milch.*

Tested for: agreement of poss. pronoun
A10 *Sophie boit son lait.*
Translate: *Sophie trinkt ihre Milch.*
T1: **Sophie trinkt seine<A[seine|ihre]> Milch.*
Systran: *Sophie trinkt ihre Milch.*
Expected: *Sophie trinkt ihre Milch.*

Tested for: agreement of poss. pronoun plus pronoun resolved by previous noun
A11 *Le chat boit son lait et il l'aime.*
Translate: *Die Katze trinkt ihre Milch und sie liebt sie.*
T1: **Die Katze trinkt seine<A[seine|ihre]> Milch und er liebt ihn.*
Systran: **Die Katze trinkt ihre Milch, und er liebt es.*
Expected: *Die Katze trinkt ihre Milch und sie liebt sie.*

Tested for: pronoun resolved by previous noun + above sentence level
A12 *Le chat boit son lait. Il l'aime.*
Translate: *Die Katze trinkt ihre Milch. Sie liebt sie.*
T1: *Die Katze trinkt seine<A[seine|ihre]> Milch. Er liebt ihn.*
Systran: *Die Katze trinkt ihre Milch. Er liebt es.*
Expected: *Die Katze trinkt ihre Milch. Sie liebt sie.*

Tested for: agreement of participles with pron. object in front
A13 *La femme, tu l'as vue aussi ?*
Translate: *Die Frau, hast auch du sie gesehen?*
T1: *Die Frau, hast du sie auch gesehen?*
Systran: **Die Frau, sahst du es auch?*
Expected: *Die Frau, hast du sie auch gesehen?*

Tested for: agreement predicate adjective with the subject
A14 *Sophie ist schön.*
Translate: *Sophie est belle.*
T1: *Sophie est belle.*
Systran: *Maria est belle.*
Expected: *Sophie est belle.*

Tested for: agreement of predicate adjective with the subject
A15 *Die griechischen Tänze sind sehr fröhlich.*
Translate: *Les danses grecques sont très joyeuses.*
T1: *Les danses grecques sont très joyeuses.*
Systran: *Les dances grecques sont très joyeuses.*
Expected: *Les danses grecques sont très joyeuses.*

Tested for: agreement of participles with the subject
A16 *Meine Mutter ist nach Hause gekommen.*
Translate: *Ma mère est rentrée à la maison.*
T1: *Ma mère est venue à la maison.*
Systran: *Ma mère est venue à la maison.*
Expected: *Ma mère est rentrée à la maison.*

Tested for: agreement of participles with the subject
A17 *Die Frau ist gekommen, um das Buch zu holen.*
Translate: *La femme est venue pour aller chercher le livre.*
T1: *La femme est venue pour prendre le livre.*
Systran: *La femme est venue, pour prendre le livre .*
Expected: *La femme est venue pour aller chercher le livre.*

Tested for: agreement of participles
A18 *Sophie ist gekommen, um das Bild zu sehen.*
Translate: *Sophie est venue pour voir l'image.*
T1: *Sophie est venue pour voir l'image<A[image|photo|tableau]>.*
Systran: *Maria est venue, pour voir l'image .*
Expected: *Sophie est venue pour voir l'image.*

Tested for: semantic resolution of poss. relation
A19 *Die Frau, die Probleme und ihre Lösung. Die Frau, die Probleme und ihre Idee.*
Translate: *La femme, les problèmes et leur solution. La femme, les problèmes et son idée.*
T1: **La femme, les problèmes et sa<A[sa|leur]> solution. La femme, les problèmes et son<A[son|leur]> idée.*
Systran: **La femme, les problèmes et leur solution. La femme, les problèmes et leur idée.*
Expected: *La femme, les problèmes et leur solution. La femme, les problèmes et son idée.*

Tested for: productivity
A20 *Imkerinnen und Imker*
Translate: **Apiculteurs et apiculteur*
T1: **Imkerinnen et apicultures*
Systran: **À l'intérieur et imker*
Expected: *Apiculteurs.*