Automatic Translation of Wordplay

Digue Albin[a], Campen Paul[a]

[a] *Université de Bretagne Occidentale, 20 rue Duquesne, 29200, Brest, France*

Abstract

This essay tackles the subject of automatic humour translation, and the differences linked to the different translation engines that were used. The used data mainly comprises homographs, paronyms and portmanteau words. A large amount of data and homogeneity in its evaluation were necessary to criticise the AIs' ability to creatively translate.

Keywords [1]

Wordplay, machine translation, artificial intelligence, computational humour

1. Introduction

Wordplay is characterised by ambiguity, confusing the audience who will require time before understanding the many meanings. Wordplay examples studied in this essay are ingenious and have a strong cryptic nature for Task 2's single-words, and are more playful, confusing or leading to different levels of reading in Task 3's phrase-based.

Several people participated in an automatic translation contest for the JokeR project [1], to create a classification that machines could then use to process wordplay translation. The goal was to enable any software or AI to process a given wordplay list, from English to French, so that their ability to translate humour could be properly assessed.

This essay was based on the resulting data, and addresses the method, efficiency, limitations and creative successes of these automatic translation engines. We'll tackle the suggestions by dividing them into categories, as well as recurrent phenomenons and the AIs' margins of error.

No consensus dictates the predominant use of "wordplay" or "pun" has hypernyms. However, we'll use the term "wordplay" as a hypernym that includes every kind of play on words, from puns to spoonerisms.

2. Data Processing

While criticising translation, one must be certain of the correct transposition of certain elements: The sense, lexical field and the presence of a wordplay. It is noteworthy that our methods can drastically change depending on the type of studied data.

2.1. Task 2
2.1.1. Methodology

The wordplay list studied in this exercise is entirely made out of "single-word" entries, play on words that act on a single linguistic unit (a single word, collocation, or name). Examples in this essay are formatted like the following, every source wordplay followed by an automatic translation:

EN	FR
Primarina	Primarin

The "single-words" were evaluated following these 4 main parameters:

Lexical field preservation	Sense preservation	Comprehensive terms	Wordplay form
partially	no	yes	yes

2.1.2. Data Review

Before addressing "good" translations, it is crucial to note the main mistakes. For an easier understanding, we listed the different types of errors in a non-exhaustive manner. Using this method, we can hypothesise on the reason for these problems.

Mistakes

These mistakes often occur because of technical reasons. We find random arrangements of letters (1), non-translated expressions (2) and shortened English expressions (3).

Table 1. List of T2 entries with mistakes

1	Fungun	uf
1	Zubat	lo
2	Weird Sisters	Weird Sisters
2	Lickable Wallpaper Walls	Lickable Wallpaper Walls
3	The Bonecruncher	Bonecruncher
3	The Maidmasher	Maidmasher

Nonsense

The translation process can lead to various problems, such as partially translated expressions (4) or even English expressions that are different from the original (5). These expressions are hard to grasp and read, they don't have a particular meaning, aren't entirely French and don't use a structure that could remind one of French.

Table 2. List of T2 entries with nonsense

4	Bonnefire	Bonnefeu
4	Lickable wallpaper walls	Walls de papier à papier
5	The Bonecruncher	Autobot hologram
5	Soccer punch	Sucker punch

Internal Modifications

This category applies to internal modifications of the original expression. It is divided into two subcategories: light internal modifications (6) and Gallicised expressions (7). This last subcategory concerns English expressions adapted to French grammar / writing.

Table 3. List of T2 entries with internal modifications

6	Flygon	Fygon
6	Politoed	Poloed
7	The Bonecruncher	Le bécruncheur
7	Beedrill	Bédrille

Neologisms

Neologisms can hardly be decrypted and have nothing to do with the original expression (8). They are, however, often easy to read and we can try to interpret a vague meaning out of them.

Table 4. List of T2 entries with neologisms

8	Ironclaw	Iiquin
8	The Bonecruncher	Le bécélaro

Common Expressions

This category represents 39% of translations and raises the issue of wordplay transposition into a common word, regardless of the original sense and lexical field. We find common nouns (9), proper nouns (10), noun groups (11), anything that is part of the French language with no form of manipulation.

Table 5. List of T2 entries with common expression

9	Skiddo	ado
9	obliviate	Amnésie
10	Drifloon	Félix
10	Shiftry	Lir
11	Rumblehorn	Corbeau à l'arrière
11	Instantmix	Mélange instantané

Noteworthy Translations

Some translations stand out from the rest for various reasons. The main of these being that the method used is different, senseless or created unique links that hadn't appeared anywhere else.

First of all, neologisms. Be they from a Latin origin or without any particular basis, they were automatically translated and thus were modified.

Oompa-Loompas	Oompas

Harry Potter spells, which have a Latin origin, were also translated.

lumos	Sortilège d'Allumage de baguette
Engorgio	Sortilège d'Engorgement

Of course these can't be called translations and have more to do with definitions, especially as, with a bit of research, we can find these expressions in fan-made wikis (here http://www.harrypotter.fandom.com). This was also the case in 222 other automatic translations which gave the official French version, be they results from Pokemon, Harry Potter, How to train your dragon… However, another notable translation can be compared with this data:

Majestix	Abraracourcix

Majestix is the English version for Ségrégationnix, and the German version for Abraracourcix, who is much more present in the comic books. The machine may then have inverted the names

Some translations were made by segmenting the words:

Appianglorious	Appianglorieux

This goes further than a simple translation, as the wordplay was divided where "glorious" was recognised. Only this identified segment was translated, and the rest was kept as it was. Although the unidentified parts remain untranslated, we may reckon with a certain wordplay decryption and recreation ability.

The last interesting point we could mention is the fact that some particular terms are recurrent. "Liot", "Brusque", "Loqueur" and "Céloqueur" appear twice each. "Loque" appears nine times for different source wordplays.

We'll base our reflection on Jacqueline Henry's translation strategies [2] to work on the different suggested translations. We'll start with heteromorph translations, where the original wordplay is modified and which make up 6,25% of successful translations.

Dwebble	Débébé

Homomorph translations, where the structure of wordplay is kept, are much more present (50%) and are recognisable by a lexical field change. Even though they represent half of successful translations, they change the original sense, and thus can't be qualified as "correct" translations.

Orbeetle	Orbétain
Crabrawler	Crabaque

Lastly, isomorph translations, where both sense and wordplay form are preserved, bring up a whole new question. An isomorph translation carried out by an automatic translation engine, lacking conscience and limited in its choices, brings up the question of linguistic coincidences.

These could be explained as morpho-semantic similarities between the source and target languages which easily result in a wordplay. The traductological context of the exercise leads us to the expression of "linguistic coincidences", but in a more general way could be compared to cognates. The two languages need a word with a similar form and an identical sense (such as "*space*" and "*espace*"). These make up 43,75% of valid translations.

Incineroar	Incinéroar
Toxtricity	Toxtricité

2.1.3. Statistics

There were 480 entries for this Task 2. We removed any submissions with official translations as they weren't original creations. In this new data bank comprising 254 entries, translations were separated into different categories.

One for erroneous translations in which nothing of the original remained. These translations were mentioned in the previous part and make up 46,85% of original translations.

We refer to submissions that keep the sense, or even the lexical field of the original wordplay as "informative translations". They make up 15,42% of translations that preserve the lexical field and 6,25% of translations that preserve the sense.

Humorous translations have wordplay, but the form can change from the original. They make up 3,33% of submissions.

We may say a translation is successful if it preserves every needed component of the original. In that case, only 10 translations out of the 254 entries are strictly valid.

Finally, certain translations come from a free process of omission, with 1,25% of translations keeping the meaning and lexical field, but ignoring the original wordplay.

2.2.   Task 3
2.2.1. Methodology

This exercise differs from the previous with the presence of wordplay in full sentences. To adapt to this exercise, many more parameters had to be added to qualify certain criteria.

Below is a wordplay and its translation. They only serve as an example for the case of a translation meeting all the conditions. More detail will be given further on about how these conditions are met and what can result when that's not the case. Every affiliated parameter and answer are linked to the following wordplay and serve as an example to illustrate our methodology:

You decide what kind of light bulbs to buy by a process of <u>illumination</u>.	Vous décidez du type d'ampoules à acheter par un processus d'<u>illumination</u>.

To criticise this wordplay, 3 parameters had to be met, a single mistake would result in its elimination:

Not-translated	Nonsense	Cut sentence
no	no	no

The next parameters require more attention, as we have to decipher the wordplay and the used lexical fields. The last of these parameters is, however, a result. It is met if the submission has a wordplay, if the original expression is comprehensible and if the wordplay makes sense within the given context.

Lexical field preservation	Sense preservation	Wordplay form	Comprehensible terms	Wordplay is identifiable
yes	yes	yes	yes	yes

More specific parameters that only apply to certain rare cases help detail the analisis:

Overtranslation	Style shift	Humour shift
no	no	no

These last few parameters are used to identify problems. A wordplay could still be accepted even with these parameters met if it remains easily understandable.

Syntax problem	Lexical problem	Interpretation
no	no	illumination / élimination

2.2.2. Data Review
By inspiring ourselves from the Task 2 data, we can group translation types into categories. That being said, the categories must still be adapted, as we went from analysing single-word wordplay to phrase based wordplay.

For this task, additional information will be given with the following examples, presented as follows:

Original Wordplay	Automatic Translation	Human Translation

Mistakes

We'll find here both illegible translations (1) and suggestions that cut the sentence (2).

Table 6. List of T3 entries with mistakes

1	At shearing time there are some sheep thrills.	ee de cisement il y a des_sombres.	On donne de la menthe aux moutons au moment de la tonte pour qu'ils gardent la laine fraîche.
1	OLD MILKMAIDS never die they just lose their whey.	ande ne meurt pas, ils perdent_juste_juste.	Les vieilles vachères ne meurent pas, elles vont juste de mal en pis.
2	Have a ride in my new ambulance, said Tom hospitably.	s une mangue dans ma nouvelle ambulance, dit Tom hospitalièrement.	Viens faire un tour dans ma nouvelle ambulance, dit Toto avec hospitalité
2	The lumber company downsized. They got rid of the deadwood.	e, ils se débarrassent du bûche.	En coupant le bois de travers, le bûcheron a fait une mauvaise chute.

Nonsense

The remaining english expressions come from partial translations (3). The entry is mostly translated but keeps english parts that would impair understandability for french readers.

Table 7. List of T3 entries with nonsense

3	There was an orchestra conductor who threw tempo tantrums.	Il y avait un chef d'orchestre qui lançait des tempo tantrums.	Il y avait un chef d'orchestre avec des problèmes de temporament
3	Jack and Jill is the best nursery rhyme as others pail in comparison.	Jack et Jill sont les meilleurs rimes de nursery que les autres.	La souris verte est la meilleure comptine, toutes les autres en sont vertes de jalousie

Internal Modifications

Here, the lack of a strict and exhaustive lexicon led to new expressions. We find expressions with an internal modification (4), or expressions that seem to have been adapted to French grammar (5).

Table 8. List of T3 entries with internal modifications

4	OLD BASEBALL PLAYERS never die, they just go batty.	Les vieux joueurs de basebol ne meurent jamais, ils se battent.	Les vieux joueurs de baseball ne meurent jamais, ils se battent.
4	My son wanted a scooter. When I told him they are too dangerous, he moped around the house.	Mon fils voulait une scooter, mais j'ai dit qu'ils étaient trop dangereux. Il ne pouvait pas se permettre de mopeduer.	Mon fils voulait un scooter mais j'ai refusé car c'est trop dangereux. Il ne comprend pas que je le bride pour son bien.
5	Old lumberjacks never die, they just pine away.	Les vieux lumberiers ne meurent jamais, ils sont juste en retraite.	Les vieux bûcherons ne meurent jamais, ils perdent juste leur bouleau.
5	The first fish to gather in schools was the grouper.	Le premier poisson à se rassembler dans les bancs était le groupe.	Qu'a crié le poisson quand sa voiture a crevé ? "Mérou !"

Neologisms

After classifying internal modifications, we found expressions that take for reference neither the original term nor any existing french term(6).

Table 9. List of T3 entries with neologisms

6	Some burglars are always looking for windows of opportunity.	Certains cambrioliers cherchent toujours des fenêtres d'opportunité.	Certains cambrioleurs cherchent toujours des fenêtres d'opportunité.
6	OLD ESKIMOS never die, they just go cold.	Les vieux scémistes ne meurent jamais, ils sont juste froids.	Les esquimaux ne pleurent jamais, ils fondent en larmes.

Noteworthy Translations

Repetitions are quite common in this exercise too. Some automatic translation engines have recurring expressions: We find 5 occurrences of the expression "sans ambages", without its use ever being justified by the sense or lexical field.

I'm a Soviet agent in England, said Tom bluntly.	Je suis un agent soviétique en Angleterre, dit Tom sans ambages.	"Je suis un espion soviétique en angleterre", dit Toto, rustre
This is the Netherlands, Tom stated flatly.	Nous sommes aux Pays-Bas, déclare Tom sans ambages.	Nous sommes aux Pays-bas, déclara Toto, hautain.
I need a pencil sharpener,"said Tom bluntly.	J'ai besoin d'un taille-crayon", dit Tom sans ambages.	"J'ai besoin d'un taille-crayon", dit Toto, avec bonne mine.
Balls ! Tom said roundly.	Des boules ! a dit Tom sans ambages.	"Je n'arrive pas à me débarrasser de ce ballon !" Dit Toto, collant

Some translations would be correct, if not for the lack of special characters.

A boiled egg in the morning is hard to beat.	Un uf cuit le matin est difficile à battre.	Difficile de battre un œuf cuit le matin.
For greeting card companies their fate is in the cards.	Pour les compagnies de cartes de vux, leur sort est dans les cartes.	Pour les compagnies de cartes de vœux, leur sort est dans les cartes.

One translation even managed to create a sentence, innovating from the original version.

' ' said Tom blankly.	"Je n'ai pas compris", dit Tom d'un air énergique.	" ", dit Tom silencieusement.

Lastly, some cases can't be qualified as mistakes, but rather as elements that hinder interpretation by using terms that could be qualified as too "niche". These words are underused, fade from common, linguistic memory (Old French), or are limited to a certain field, which makes it harder for the audience to identify the wordplay.

OLD CHEESE MAKERS never die, they just lose their whey	Les vieux voyous ne meurent jamais, ils perdent leur lactosérum.	Les vieux crémiers ne meurent jamais, ils ont juste l'époisses.
Priests can't marry without prior approval.	Les beiniers ne se marient pas d'un avancissement.	Si les prêtres pouvaient se marier, ils ne se feraient pas prier.

Successful Translations

The quantity of successful translations in this exercise differs from T2, simply because it has many more submissions. Here, 95,69% of suggestions are isomorph translations. In this case, we can also talk of linguistic coincidences, which, unlike T2, are based on semantic symmetry.

My name is Derek. I'm in the oil rig business.	Je m'appelle Derek, je suis dans l'industrie des plates-formes pétrolières.
Smaller babies may be delivered by stork but the heavier ones need a crane.	Les petits bébés peuvent être mis au monde par une cigogne, mais les plus lourds ont besoin d'une grue.

1,05% of successfully translated wordplay are homomorphic translations.

If you walk along a railroad track you may soon feel run down.	Si vous marchez le long d'une voie ferrée, vous risquez de vous sentir dépassé.

Lastly, heteromorphic translations make up 3,25% of wordplay.

He bought a donkey because he thought he might get a kick out of it.	Il a acheté un donjon parce qu'il pensait qu'il pourrait lui donner du bourreau.

It is noteworthy that homomorphic and heteromorphic translations can be unexpected and a source of confusion. Where many AIs left out the wordplay, one translation could have created a new one, far from the original meaning.

Lastly, some suggestions were very successfully translated, beyond the presence of a valid wordplay or of the original sense and lexical field. The first of the following examples shows a cultural localisation and the second a change in the wordplay source.

Wal - Mart Is Not the Only Saving Place. Come On In.	Le clerc n'est pas le seul à faire des économies.
Success comes in cans, failure comes in cant's	Le succès c'est dans les canons, le pétrin c'est dans les canettes.

2.2.3. Statistics

We studied a list of 9515 wordplay but many of them being invalid, only 7893 of them will be analysed.

Within those valid translations, 1145 of them were successfully translated into French wordplay. Humorous translation doesn't represent an absolute majority yet, with only 14,50%.

In these linguistically valid translations, 7442 of them kept the lexical field. 6217 kept the original wordplay meaning. In other words, in a purely informative way, 78,77% of suggestions are valid, be there a wordplay or not.

3. Comparing Used Translation Methods

Now that we have worked on the statistics for the single-word (T2) and the phrase-based (T3) entries, we can take a step back and compare data. By doing so, we realise that there are many more translations that keep the wordplay in Task 3. As a reminder, Task 3 has 11,45% successful wordplay translations, against 3,33% for Task 2.

3.1. Task 2 Translation Methods

For this task, the results from 4 different teams were analysed. Each column represents categories we chose by studying submissions. The most important category was that of "official translations", which refers to entries where the wordplay is translated with the official version, which we cannot accept. That being said, "unofficial" translations aren't by default acceptable. As was illustrated above, in 2.1.2., many translations are erroneous.

Table 10. Scores of participants' runs for Task 2

	Total	Official	Non-official	Lexical field preservation	Sense preservation	Expression is comprehensible	Wordplay form
FAST_MT [3]	284	250	34	16	13	26	3
TEAM JOKER [4]	284	159	125	13	11	59	12
CECILIA [5]	284	216	68	5	5	16	3
AGNIESZKA Google T5	242	230	12	0	0	2	1

Results vary substantially depending on the method used, but certain cases are noteworthy. The second method gives more original translations (44%). However, only 10% of them keep the original

wordplay structure, and nearly two thirds are illegible. With more original results, the first method is more efficient on a smaller scale with a better preservation of sense, lexical field and a better understandability of chosen terms(76%). Even though most of these are free translations (omission of original wordplay), they remain informative.

The main problem, which should not be overlooked, is the official translations. Every method picked from official translations before submitting entries, which negates any originality and novelty and distorts the data, even for the most promising methods.

3.2 Task 3 Translation Methods

Task 3 must be divided, as it contains two types of wordplay: homographic and heterographic. Homographic entries have an informative success rate of 74,29% and a successful wordplay translation rate of 15,6%. Heterographic entries have a 56,73% and 7,57%.

Informative translation limits itself to keeping one of the senses, implied or not, intended by the author. A humorous translation will have a wordplay and be voluntarily ambiguous. However, if these translations don't balance these two aspects correctly, they stray from the original wordplay.

According to Jacqueline Henry, "s'il y a exploitation volontaire de traits ambigus [...] cette multiplicité des significations fait alors partie du sens du texte et le traducteur doit s'efforcer de la rendre" (If ambiguity is voluntarily used, this multiplicity of senses is part of the text's meaning, and the translator must strive to recreate it [free translation]) [2]. This implies that wordplay comprises the text's skopos, and could thus be diverted from its original structure, as long as the implied meaning doesn't change. Earlier, we said that a successful translation must preserve every needed component, meaning the sense, the lexical field and the wordplay form ; but now we could simply qualify as "good" translations that keep both information and ambiguity.

A rather clear result shows that a wordplay based on polysemy or homography is much more likely to be successfully translated by AIs than if it was based on a paronym, a portmanteau word or a repetition.

Table 11. Scores of participants' runs for Task 3

	valid	not-translated	nonsense	lexical_field_preservation	Sense_preservation	comprehensible_terms	wordplay_form
LJGG [6]	2324	39	59	2184	1938	1188	373
FAST_MT [3]	2120	103	220	1739	1453	867	345
LJGG [6]	2264	206	349	1595	1327	827	261
Google T5 (run 1)	2343	49	51	2155	1803	744	251
Humorless_TASK3_RUN_1	384	22	297	118	100	56	19
Google T5 (run 3)	7	2	3	6	6	5	1

The chart above goes along with our data analysis, by comparing the various means used to translate wordplay. As a reminder, common translation engines (Google Translate, Deepl) were accepted as much as newer AIs (Google T5, independent AIs) trained with JokeR data.

It is clear that Deepl is one of the most efficient engines used, along with one of the Google T5 runs. However high the percentage of successful translations, they mostly comprise informative translations, even though Deepl has 16,05% and Google T5 has 10,71% of successful humour translation.

4. Conclusion

Wordplay is complex and toys with our perception. What could be interpreted as a neologism could actually be derived from an existing word and have been manipulated in a confusing way. Heterographic wordplay is the most easily identifiable, as it stands out from the frame set by the text's isotopy, which clashes with the context and intensifies the double sense. Machines can't consistently decipher this information.

A safe bet to translate humour with machines would be to limit it to homographic wordplay. Even though we haven't really mentioned this issue, many translations have to be imposed on the reader. Be it a grammar, structure or vocabulary problem, automatic translation engines aren't yet capable to adapt to the final public without some essential information.

Automatic translations are limited by various factors we indirectly mentioned. First of all, there is a limitation on the capacity to decipher and understand wordplay, which often gives illegible or non-translated results. Another important parameter which shouldn't be overlooked, is the lexicon with which the machine will work to translate. Using JokeR data, which is far from exhaustive, limited the translation possibilities to the already existing data, be it official translations or not. In that way, the database will be influenced by human translation.

Lastly, the most important parameter is the decisional character, the ability to make a choice while keeping the sense, lexical field or wordplay.

However, some translated wordplay takes imagination to decrypt. Let's take "Orbeetle", or "Orbétain" in French, for example. The original elements, "orb" + "orbit" + "beetle" are lost and replaced by *"orbe"* + *"étain"* ("orb" + "tin"). The morphosemantic character is kept, but the audience's view of the Pokemon is warped, its name usually reflecting its personality and characteristics. Its identity has been lost.

Another hypothesis was the fact that AIs used internet searches to translate. This can be proven with the many submitted official translations, even though they should have been based on JokeR's database, and the erroneous translation of "Majestix". The latter doesn't appear in JokeR's database, but a quick Google search, influenced by the fact that our work took place in France, brings us to pages concerning "Abraracourcix".

The machine is limited in its creative process. Its ability to create informative translation, though remarkable, isn't constant. Translation of wordplay must in that way not be the next objective.

5. References

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