

Development of the Parallel Corpus of Mexican Languages (CPLM)

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Abstract

Mexico has a great language diversity. In addition to Spanish, there are 68 language groups and 364 variants (INALI, 2008), divided into 11 families. However, this wealth has been threatened due to discrimination against speakers. Indeed, Spanish has been imposed from the legislative, political and economic point of view, which has interrupted the intergenerational transmission of original languages and, with it, caused the gradual loss of use spaces and communicative functions. Likewise, few technologies have been developed for these languages, because there are few texts written on the internet. The CPLM is a collaborative parallel corpus that contains texts aligned in Spanish and in six indigenous languages: Mayan, Ch'ol, Mazatec, Mixtec, Otomi and Nahuatl. This article describes the development of the CPLM, as well as the difficulties presented throughout the process.

Keywords: Low-Resources Languages, Parallel Corpus, Indigenous Languages of Mexico

Resumen

México cuenta con una gran diversidad de lenguas, ya que, aparte del español, existen 68 agrupaciones lingüísticas y 364 variantes (INALI, 2008), repartidas en 11 familias. Sin embargo, esta riqueza se ha visto amenazada debido a la discriminación hacia los hablantes. En efecto español se ha impuesto desde el punto de vista legislativo, político y económico, lo que ha interrumpido la transmisión intergeneracional de las lenguas originarias y, con ello, originado la pérdida paulatina de espacios de uso y funciones comunicativas. Así mismo, pocas tecnologías se han desarrollado para estas lenguas, debido a que existen pocos textos escritos en internet. El CPLM es un corpus paralelo colaborativo que presenta textos alineados en español y en seis lenguas indígenas: maya, ch'ol, mazateco, mixteco, otomí y náhuatl. Este artículo describe el desarrollo del CPLM, así como las dificultades presentadas a lo largo del proceso.

Palabras clave: Lenguas de Bajos Recursos, Corpus Paralelo, Lenguas Indígenas de México

1. Introduction

Mexico is one of the most diverse countries linguistically, since it occupies the eighth place worldwide and first in Latin America, followed by Brazil. Despite this, few technological tools have been developed for Mexican languages, which are in danger of extinction, since they have not received the same attention as Spanish, because they have historically been discriminated against. In addition, primary areas for the social welfare of their communities of speakers, such as education and health, have been neglected.

English, French and Spanish, among others, are languages with a large number of speakers, for which numerous linguistic corpus have been built. In contrast, the indigenous languages of Mexico are among the languages of few resources, due to the shortage of written sources to form corpus. To compensate for this, parallel corpus have been constructed in Spanish and in the minority languages of Mexico, since these offer various possibilities that can increase our knowledge about their typological, grammatical and cultural characteristics. In addition, corpora show the differences between genres and their translations.

There are various Natural Language Processing (NLP) tasks that are based on the use of parallel corpora. Some examples are automatic translation, natural language

generation, lexical and terminological extraction, morphological segmentation and analysis, part of speech tagging, spelling correction, optical character recognition (OCR), and language identification.

The original languages of Mexico belong to 11 typologically diverse families, each with characteristic features that present particular challenges. Some of the most significant aspects for the treatment of these languages in NLP are the agglutination of morphemes in the Yuto-Nahua family, where Nahuatl is found; the tone in Oto-Mangue languages, which can express both lexical meaning and grammatical function (Suárez, 1973); as well as the ergativity in the Mayan family (Sánchez, 2008). As can be seen, from the perspective of computational linguistics, Mexican languages present a number of difficulties.

In general, there is limited production in both digital and printed texts, since in most communities a strong oral tradition is observed, while the written form has not been much encouraged, due to political and social factors that have affected the literacy processes. On the other hand, Mexican languages face a lack of spelling normalization, coupled with great dialect variation, as well as diachronic variation of writing, which represents a challenge in the

processing of these texts when you want to work with NLP.

According to Mager et al (2018), it is important to point out the challenges of working on the development of linguistic resources and tools for the NLP for the languages of Mexico. Addressing these challenges contributes to creating more computational linguistic models, as well as developing a deeper look at the understanding of human language. Additionally, the creation of language technologies in Mexican languages can have a positive social impact on language communities, given the scarcity of digital resources in these languages.

The parallel corpus in Mexican languages that we can find online are Axolotl, a parallel Nahuatl-Spanish corpus, which contains documents of classical and modern Nahuatl (Gutiérrez-Vasques, Sierra and Pompa, 2015) and the Tsunkua project, otomí parallel corpus -español, which contains variants from Mezquital and the State of Mexico. Since these efforts are concentrated in two languages, the UNAM Language Engineering Group proposed to create a parallel corpus that would house several Mexican languages. Thus was born the CPLM.

2. The Parallel Corpus of Mexican Languages (CPLM)

The CPLM is part of an interdisciplinary project whose main objective is to contribute to the development of natural language processing, focused on Mexican languages with limited digital resources -particularly in the task of multilingual lexical extraction- deepening the study of these in terms of models of statistical representation

Among the specific objectives of the project, a methodology for bilingual lexical extraction from parallel corpus of Mexican low-resourced languages is considered. This will allow, for example, to automatically extract bilingual dictionaries and build databases for applications such as machine translation.

Likewise, the project aims to propose one or more types of evaluations that are useful to analyze the effectiveness of the representations and proposed methodology. In addition, we want to explore the development of computational models of various linguistic levels of the treated languages, so that they help in the task of bilingual lexical extraction, mainly morphological segmentation models and syntactic analysis. Finally, it is intended to measure, in quantitative terms, various linguistic phenomena, such as complexity, in order to develop better computational models and contribute from this area to the knowledge and analysis of Mexican languages.

2.1 CPLM Data

The CPLM contains texts in 6 languages belonging to three families: Oto-Manguean, Mayan and Uto-Aztecan. The Oto-Manguean family includes Mixtec, Otomí and Mazatec. Mixtec is spoken in the states of Oaxaca,

Guerrero and Puebla and, according to the INALI catalog (2008), presents a total of 81 variants. The Otomí is spoken in the State of Mexico, Hidalgo, Querétaro, Guanajuato, Puebla, Mexico City, Tlaxcala, Veracruz, Michoacán and San Luis Potosí. According to INALI it has 9 variants. Mazatec, spoken in the north of Oaxaca, Puebla and Veracruz, has 16 variants.

Within the Mayan family there are two languages: on the one hand, Ch'ol, which is spoken in the states of Chiapas, Campeche and Tabasco and has two variants: northwest and southeast. On the other hand, the Maya, in the states of Yucatan, Quintana Roo and Campeche. There are some discrepancies regarding the number of Maya variants.

Finally, Nahuatl is the only language of the Yuto-Nahua family present in the corpus. This has 30 variants (INALI, 2008). It spreads through the states of Puebla, Veracruz, San Luis Potosí, Oaxaca, Guerrero, Hidalgo, Colima, Durango, Jalisco, Michoacán, Morelos, Nayarit, Tabasco, Tlaxcala, State of Mexico.

Table 1, shows the languages of the CPLM and the number of variants reported.

Maya	Otomangue	Yuto-nahua
Yucatec Maya (3 variants)	Mazateco (6 variants)	Nahuatl (5 variants)
Ch'ol (2 variants)	Mixteco (30 Variants)	
	Otomí (5 variants)	

Tabla 1: Families, languages and variants

The textual genres that make up the CPLM are: didactic, expository, narrative, poetic, religious, historical and political.

Teaching texts include writing and reading manuals and topics related to language systems. The expository texts include writings of scientific dissemination, for example those dealing with diseases and crops. The stories, traditional fables and of everyday life tales come together in the narrative category. We consider as poetic those texts written in verse. As regards the religious genre, only the Bible is currently available. Historical writings expose the popular history of communities. Finally, the political genre contains articles of the Constitution, as well as explanatory texts on the political-legal field.

Table 2 shows the number of texts for each genre, according to the language.

	Ch'ol	Maya	Mazatec	Mixtec	Nahuatl	Otomí
Didactic	5	5	15	6	5	20
Expository	7	0	9	12	4	12
Narrative	11	26	28	39	10	66
Poetic	1	5	3	3	11	2
Historic	2	1	1	1	0	1
Politic	2	6	1	5	5	2
Religious	1	1	4	12	10	1

Tabla 2: Genre of the texts

5. Conclusion

This article describes the creation of the Parallel Corpus of Mexican Languages (CPLM). The different stages of elaboration have been succinctly presented, as well as the most relevant information. The CPLM was created using GECO, a corpus manager that allows the inclusion of several collaborators, since the CPLM intends to invite students or researchers to participate in the feeding of the CPLM with the corpus that belong to them, either with books or elicitations. With the dissemination of this interface in different forums, we intend to give visibility to Mexican languages in the area of the NLP, in addition to promoting the use of the corpus as a tool to create language technologies.

In future work two lines of work are considered. First, we plan to make improvements to the interface, that is, adaptations will be made so that the CPLM can include recordings and increase the number of texts, as well as add more languages along with their variants. Secondly, it our second goal is to create dictionaries with the vocabulary that many of the texts included in the CPLM contained. Likewise, we will label the texts in Mexican languages in order to perform the search with POS tags.

Regarding the area of the NLP, it is contemplated to work with the analysis and measurement in quantitative terms of the complexity of various linguistic phenomena for each language. The above, in order to understand how to model different types of bilingual relationships depending on the type of languages. Also, another of the future tasks is the creation of bilingual lexical extraction methods based on the distributional vector representations (word embeddings) of word appearance contexts. These models should be able to find word-level correspondences between a pair of languages, based on different statistical approaches of NLP and machine learning techniques. The investigation of these models will be focused on treating typologically distant languages.

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