

# Guampa: a Toolkit for Collaborative Translation

Alex Rudnick<sup>1</sup>, Taylor Skidmore<sup>1</sup>, Alberto Samaniego<sup>2</sup>, Michael Gasser<sup>1</sup>

<sup>1</sup> School of Informatics and Computing, Indiana University

<sup>2</sup> Universidad Católica “Nuestra Señora de la Asunción”

{alexr,taylskid,gasser}@indiana.edu, alberto\_samaniego@uca.edu.py

## Abstract

Here we present Guampa, a new software package for online collaborative translation. This system grows out of our discussions with Guarani-language activists and educators in Paraguay, and attempts to address problems faced by machine translation researchers and by members of any community speaking an under-represented language. Guampa enables volunteers and students to work together to translate documents into heritage languages, both to make more materials available in those languages, and also to generate bitext suitable for training machine translation systems. While many approaches to crowdsourcing bitext corpora focus on Mechanical Turk and temporarily engaging anonymous workers, Guampa is intended to foster an online community in which discussions can take place, language learners can practice their translation skills, and complete documents can be translated. This approach is appropriate for the Spanish-Guarani language pair as there are many speakers of both languages, and Guarani has a dedicated activist community. Our goal is to make it easy for anyone to set up their own instance of Guampa and populate it with documents – such as automatically imported Wikipedia articles – to be translated for their particular language pair. Guampa is freely available and relatively easy to use.

**Keywords:** under-resourced languages, collaboration, translation, language resources, open source

## 1. Introduction

For most of the world’s language pairs, large bitext corpora are not readily available and would be difficult to construct. However, for some language pairs, not only are there many speakers of both languages, there is a community of activists dedicated to the continued vitality of their heritage language. In many of these cases, these speaker/activists recognize that there is a shortage of written material in their heritage language and that translation from other languages can help to address this problem. Thus they are often aware of the contribution that machine translation (MT) would make to their task and are eager to do their part in creating the bitext corpora that are required for statistical MT (SMT). At the same time, they know that in the absence of MT systems, it is up to the bilingual speakers themselves to perform the required translations. This is a daunting task for a small community, however, and collaborative translation can speed up the process.

In such contexts it thus makes sense to consider a tool that would facilitate collaborative translation as well as the gathering of translation examples for a corpus. We know of no user-friendly FOSS software for collaboratively translating documents on the web, at least not with an eye towards training MT systems. We address this perceived need with Guampa, a free software package for the online collaborative translation of documents. It is meant to help both language activist/learner communities in generating resources for their heritage languages and MT researchers in building bitext corpora. We are especially interested in the common case of language pairs in which one language (normally the source for translation) has substantial resources but the other (normally the target) does not. Guampa includes tools for importing source language articles from Wikipedia as well as exporting bitext suitable for training MT systems.

## 2. Spanish and Guarani in Paraguay

Our group is particularly interested in building a larger bitext corpus for the Spanish-Guarani language pair. Spanish and Guarani are the co-official languages of Paraguay, where most people speak Guarani as their first language and many are bilingual. Guarani suffers not only from a serious lack of written materials but also from a neglect in many aspects of public life in Paraguay. To combat this neglect and save the language from what seems to many its inevitable decline, a small but very active group of bilinguals has come together in various forums. Among other things, these activists produce new written materials in Guarani and bilingual materials in Spanish and Guarani. They are well aware of the importance of language technology and of translation to their mission.

Though we focus on Spanish and Guarani, there are many other comparable language pairs around the world, e.g., English/Telugu (India), French/Wolof (Senegal), Portuguese/Umbundu (Angola), Chinese/Zhuang (China) and Russian/Tatar (Russia). Our goal is for Guampa to be useful for researchers and activists working on any such language pair; anyone can download the Guampa software and run their own instance for their own purposes.

## 3. Related Work

There is a wealth of software, both open-source and proprietary, to assist translators in their work, but we are not aware of any other free online translation systems that are designed specifically for collaboration among non-professional translators.

Tatoeba (Ho and Simon, 2006) is a project dedicated to collecting translations of sentences in many languages. Users may add translations or correct the translations of other users by providing alternate translations. However, genuine collaboration is not facilitated since no history is available, and the focus is on the sentence rather than the document. Traduwiki (Huynh, 2007) comes closer to our goals; while

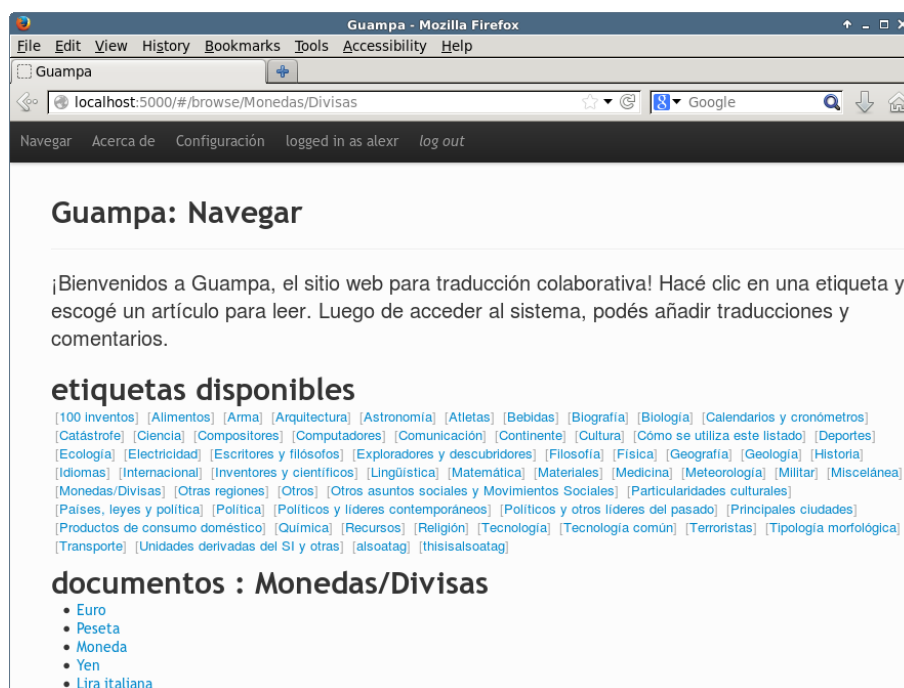


Figure 1: Screen shot of the interface for browsing documents. Here the interface has been set to Paraguayan Spanish and the document database has been populated with Spanish-language Wikipedia articles. Here we can browse articles by tag.

it is intended for the collaborative translation of documents, it is not open-source, and does not offer an easy way to export training data for MT systems. In addition, development appears to have stopped in 2007.

There have been a number of projects focused on using crowdsourcing to produce bitext corpora for training MT systems. Notably, Ambati *et al.* (Ambati and Vogel, 2010; Ambati et al., 2010) have used active learning to construct a corpus for training English-Spanish SMT, automatically creating Mechanical Turk tasks to elicit translations for phrases that their system did not know how to translate, but should. The Joshua team at Johns Hopkins has also successfully used Mechanical Turk to crowdsource the creation of bitext corpora for SMT for many languages of the Indian subcontinent (Post et al., 2012). Both of these projects relied on a populations of MTurk users familiar with the source and target languages.

Ambati *et al.* (Ambati et al., 2012) have also described another crowdsourcing approach that addresses the problem of finding bilingual or nearly-bilingual crowd workers. In this work, they employ a multi-stage process in which many “weak bilinguals” (users somewhat skilled in both source and target language, though not necessarily fluent) translate individual lexical items, other turkers use these lexical items to construct candidate translations, and then finally fluent speakers of the target language synthesize sentences from these elements, without necessarily understanding the source language.

These techniques, while exciting and applicable in many situations, may not be applicable to all languages or language pairs. There are many parts of the world in which Mechanical Turk is currently not broadly used, including most of South America and Africa (Pavlick et al., 2014).

We posit that in these cases, supporting an online community of translators may be more appropriate than relying on one-off Mechanical Turk tasks.

#### 4. Guampa For Community Translation

At its core, Guampa is a tool for translating documents. The central interface of Guampa shows a document’s source language text, segmented by sentence, alongside the current translation for each sentence. For each sentence in the document, users can add a new translation or edit the current translation. This interface is shown in Figure 2. The software stores the complete history of translation edits, along with comments on the translation of a given sentence.

If a bilingual dictionary for the current language pair is present, during editing, Guampa can present users with the relevant dictionary entries, looking up each word in the current sentence and displaying possible lexical translations underneath the editing interface. This process may be improved with language-specific lemmatization to aid in dictionary lookups. Our development version of Guampa includes a small Spanish-Guarani bilingual dictionary and lemmatization for Spanish. This feature is enabled per-user, and may easily be turned off on a settings page.

Users can discuss the best way to translate a particular passage and see the history of the proposed translations for a sentence on a “sentence history” page, which is shown in Figure 3. Thus, Guampa is much like a wiki for translations; quality control is performed through community consensus, and newer translators can learn from feedback.

Like the interface of Traduwiki, but in contrast to that of popular internationalization tools like Pootle, our layout is intended to be suitable for reading documents online. We intend it to be helpful for language learners as well – a user

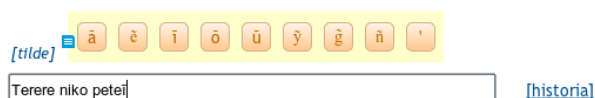


Figure 4: Entering Guarani-language text with nasalized vowels. This screen shot is from an early interface mockup; the deployed software may differ somewhat.

familiar with the source language and learning the target language (or vice-versa) might benefit from reading translations side-by-side, as in dual-language books.

Users will normally select a document to read or translate on the navigation interface, shown in Figure 1. Here one can browse the available documents by tag. Additional sorting criteria, such as recent activity and completeness of translation, will be added soon.

Users must be logged in to add or edit translations, or to add comments. Login is handled with Mozilla’s Persona federated identity system,<sup>1</sup> which allows any user with an email address to log in. Optionally, site operators may allow Guampa-specific accounts protected by passwords.

For easy adaptability to different language pairs, the interface is built with an internationalization package so that its strings can easily be replaced; our development version has interfaces in Spanish and English, with Guarani coming soon. Adding more languages as appropriate is straightforward, requiring very few code changes. Additionally, the sentence segmenter for the source language can easily be changed to locate sentence boundaries in different languages; our development version uses the Punkt segmenter for Spanish from NLTK (Bird et al., 2009).

Guampa also features a simple interface for entering language-specific diacritics, which may be difficult due to differences between available keyboard layouts and the target language of the translations. Users may click on buttons to add the appropriate diacritics, or can use a simple macro language to type required characters; for example, the strings  $\hat{a}$  or  $\tilde{a}$  are automatically replaced with the nasalized ‘a’,  $\tilde{a}$ . These features are currently specific to the Guarani language, but could easily be adapted to other target languages.

#### 4.1. Guampa for Educational Use

We are working in collaboration with Guarani institutions in Paraguay, particularly the Ateneo de la Lengua Cultura Guarani<sup>2</sup> and the Fundación Yvy Marãe’ỹ,<sup>3</sup> and the instructors at those institutions, to adapt the design of Guampa so that it can be used in their translation courses, translation courses. We want to enable collaborative translation and discussions among the students and the instructor, both in the classroom and for homework assignments. This will require allowing students to translate a single document independently, without seeing each other’s translations, a feature not implemented as of this writing, but coming soon.

<sup>1</sup><http://login.persona.org/>

<sup>2</sup><http://www.ateneoguarani.edu.py/>

<sup>3</sup><http://yvymaraey.org/>

The instructor will be assigned a special role in the software, so that they can see and moderate all translations entered by students. In the classroom, the instructor will display the translations made by the students in order to start a discussion on each of them. Instructors will also be able to comment on and rate each student translation and select their preferred translations for each sentence, in order to produce a consensus translation for a given document.

Some moderation and access control features will need to be added to support this use case for Guampa; in general, different communities will have varying norms and goals. Specifically, language style can be contentious, and different communities may prefer different dialects and registers. In Paraguay, for example, the extent to which Spanish loanwords are acceptable in written Guarani is a divisive issue, so the users of a given Guampa installation will need to address this on their own. Analogous considerations will be relevant for many language communities.

#### 4.2. Importing Documents, Exporting Bitext

For populating a new instance of Guampa, we include scripts to extract plain-text versions of Wikipedia articles from Wikipedia database dumps<sup>4</sup>, providing source-language documents for a new installation of Guampa. Our tools build on the Wikipedia Extractor script from the Medialab at the University of Pisa (Attardi and Fuschetto, 2009).

However, for some source languages, such as English or Spanish, importing an entire Wikipedia would overwhelm both the server and the users. Fortunately, many Wikipedias include a list of so-called “vital articles”, subjects for which it is felt that high-quality articles are essential in any encyclopedia. These lists typically contain roughly one thousand articles. We provide scripts to extract and import only these articles, and to tag them with their appropriate subcategories (such as “Science” or “Biography”), which are automatically extracted from the list structure of the document.

For some language pairs and user communities, it may be appropriate to import an entire Wikipedia into Guampa<sup>5</sup> for translation into another language. This approach is also supported.

Documents from other sources can also be imported into Guampa for translation; PDF, ODF, and Microsoft Word documents can be imported with the use of scripts that rely on Apache Tika<sup>6</sup> to convert them into plain text. Users will have access to this functionality through the web interface in the near future.

Guampa also includes a script for easy export of bitext sentences; since the system keeps an internal representation of sentence boundaries in the original documents, it is easy to export one sentence per line into the output files. To train an MT system, one would then run the appropriate preprocessing and training pipeline on these exported files. In the near

<sup>4</sup>Complete copies of Wikipedias can be downloaded at <http://dumps.wikimedia.org/>

<sup>5</sup> For example, as of this writing there are fewer than three thousand articles in the Guarani Wikipedia.

<sup>6</sup><http://tika.apache.org/>

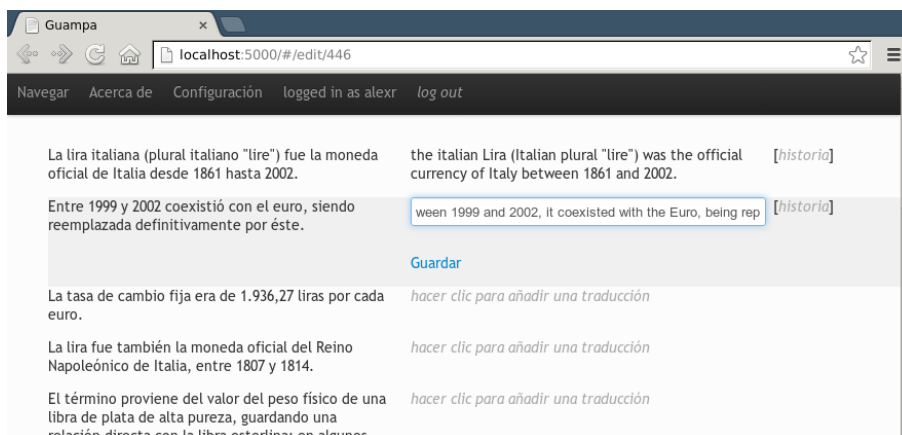


Figure 2: Translating an article from the Spanish Wikipedia. From this screen, we can edit the current translation for a sentence, or by clicking on the history link, see the commentary and translations provided by other users.

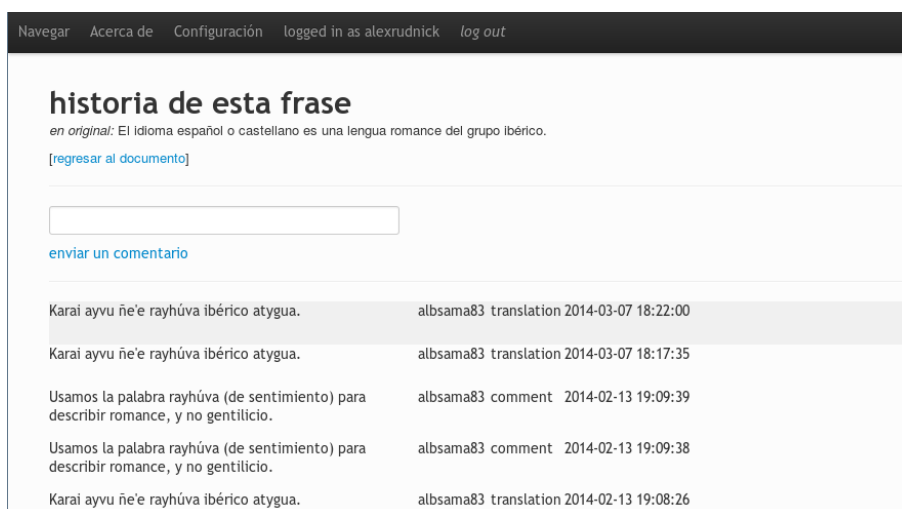


Figure 3: The interface for the detailed history of a sentence; here users may add new comments and see the translations that have been proposed for a given sentence.

term, we also plan to add export features in HTML and MediaWiki markup, for ease of publishing the translated documents and adding them to the target-language Wikipedia.

## 5. Implementation

Guampa is a web application, with a user interface made of the AngularJS (AngularJS Team, 2010) and Bootstrap (Otto and Thornton, 2011) toolkits. We internationalize the user interface with the angular-translate package (Precht, 2013). The server side of the application is implemented in Python 3, using the Flask micro-framework (Ronacher, 2011), SQLAlchemy (Bayer, 2011) for object-relational mapping, and SQLite (Hipp, 2000) as a database. SQLite could easily be replaced with a more industrial-scale database, should the need arise.

Guampa is straightforward to install in production and is known to work well with the Apache web server on Ubuntu Linux, though other UNIX-like systems and WSGI-capable servers should also work. For development work, scripts are provided to set up the required environment (with vir-

tualenv) and to run a development server; these are known to work well on both Linux and Mac OS X.

## 6. Conclusions and Future Work

Here we have described Guampa, a free software tool for collaborative online translation. In collaboration with language educators, learners, and activists in Paraguay, we will use Guampa to build bitext corpora for Spanish-Guarani for our continuing MT work with that language pair. These resources will be made publicly available on our website, along with Guampa and our other software. We will also adapt Guampa for educational use in Guarani-language classes.

As we continue development of Guampa, with feedback and suggestions from our users, we plan to add additional features, including recognition for prolific translators, similar to Wikipedia's Barnstars. We would like to develop other features to help users encourage themselves, including a feature to send periodic translation tasks by email, so that users can be reminded to practice daily. Additionally,

we will implement exporting over the web and into formats other than plain text – such as TMX, Mediawiki markup, and HTML – to facilitate reuse of the collected corpora for reading, for MT-related uses, and for integration into the target-language Wikipedias.

More technically ambitious and longer-range future features will include lookup in a translation memory, with pluggable morphological analysis, and integrated suggestions from machine translation. Our long-term goal is for Guampa to become a full-fledged collaborative computer-assisted translation tool.

Guampa is released under the GPLv3 and available on GitHub at:

<http://github.com/hlttdi/guampa>, with a live demo server linked from that site. It is under active development but is already relatively easy to install and adapt to the particularities of different language pairs and the needs of different translation communities. We welcome suggestions, bug reports, questions, doubts, and development collaborators!

## 7. References

- Ambati, V. and Vogel, S. (2010). Can crowds build parallel corpora for machine translation systems? In *Proceedings of the NAACL HLT 2010 Workshop on Creating Speech and Language Data with Amazon's Mechanical Turk*, Stroudsburg, PA, USA. Association for Computational Linguistics.
- Ambati, V., Vogel, S., and Carbonell, J. (2010). Active Learning and Crowd-Sourcing for Machine Translation. In *Proceedings of LREC 2010*, Malta, May.
- Ambati, V., Vogel, S., and Carbonell, J. (2012). Collaborative workflow for crowdsourcing translation. In *Proceedings of the ACM 2012 Conference on Computer Supported Cooperative Work, CSCW '12*, pages 1191–1194, New York, NY, USA. ACM.
- AngularJS Team. (2010). AngularJS. <http://angularjs.org>.
- Attardi, G. and Fuschetto, A. (2009). Wikipedia extractor. [http://medialab.di.unipi.it/wiki/Wikipedia\\_Extractor](http://medialab.di.unipi.it/wiki/Wikipedia_Extractor).
- Bayer, M. (2011). SQLAlchemy. <http://www.sqlalchemy.org/>.
- Bird, S., Klein, E., and Loper, E. (2009). *Natural Language Processing with Python*. O'Reilly Media.
- Hipp, D. R. (2000). SQLite. <http://www.sqlite.org/>.
- Ho, T. and Simon, A. (2006). Tatoeba. <http://www.tatoeba.org/>.
- Huynh, T. (2007). Traduwiki. <http://traduwiki.org/>.
- Otto, M. and Thornton, J. (2011). Bootstrap. <http://getbootstrap.com/>.
- Pavlick, E., Post, M., Irvine, A., Kachaev, D., and Callison-Burch, C. (2014). The language demographics of Amazon Mechanical Turk. *Transactions of the Association for Computational Linguistics*, 2(Feb):79–92.
- Post, M., Callison-Burch, C., and Osborne, M. (2012). Constructing parallel corpora for six indian languages via crowdsourcing. In *Proceedings of the Seventh Workshop on Statistical Machine Translation*, pages 401–409, Montréal, Canada, June. Association for Computational Linguistics.
- Precht, P. (2013). angular-translate. <http://pascalprecht.github.io/angular-translate/>.
- Ronacher, A. (2011). Flask. <http://flask.pocoo.org/>.