Sign Language Learning Material for Undergraduate Students: Brazilian Sign Language Glossary

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Abstract

In 2005, the teaching of Brazilian Sign Language (Libras) became compulsory in Brazilian public universities for undergraduate courses that include a teacher preparation program (Federal Decree 5626). After the decree, the Brazilian universities had to adapt to the new reality. During the process of implementing Libras disciplines, a number of educational and pedagogical challenges emerged. One of the challenges was to provide easily accessible video material for the students since Libras is a visuospatial language. This project arose with the purpose of facing this challenge. The main objective of the project is the implementation of an online searchable video glossary of Libras – the Brazilian Sign Language Glossary. To facilitate the learning of the language the signs are searchable in two ways: by sign name or by semantic category. Currently, the glossary is composed of about 2,000 signs. The Brazilian Sign Language Glossary is publicly available on the Internet (http://libras.fee.unicamp.br/) and provides a meaningful platform for those who may teach deaf students after graduation and furthermore can be useful for research in the area of deafness.

Keywords: *Sign Language, Libras, Glossary, Material, E-Learning.*

1. Introduction

The Brazilian deaf community has fought hard for the recognition of their language in the country and since the Brazilian Sign Language (Libras) was recognized as a legal means of communication [14], new public education policies related to deaf people have been implemented in the last decade, among them, the inclusion of Libras as a compulsory discipline in teacher education undergraduate courses [13]. Due to the new legislation, Brazilian Universities had to adapt to comply with the law and offer the Libras discipline in the curriculum of their courses. Many challenges were faced in the process of change, from hiring Libras instructors to finding the best way to offer the discipline be it in face-to-face, online or mixed mode, and the legislation is also not descriptive about it. As it is a sign language, a visuospatial language, regardless of offering mode, the didactic material for studies is an issue to be resolved. The purpose of this project in the short term is to overcome the shortage of free, quality, hands-on learning material for students to use as a reference.

At first, the Brazilian Sign Language Glossary was developed and targeted for university students, but soon became clear that its use is not limited to the discipline at the university, but to any hearing person who speaks portuguese and wants to learn Libras. Therefore, the Brazilian Sign Language Glossary is publicly available, meaning that anyone can access its content on the Internet. Face-to-face teaching with material that enables subsequent distance learning (Sign Language Learning Material for Undergraduate Students) was a viable solution to complement students' education, since the student can access the practical content of the Glossary by computer, tablet or mobile phones, even after the end of the course.

The Brazilian Sign Language Glossary includes 2,000 signs covering general themes, such as daily communication, and also from specific areas related to school subjects.

The material helps consolidate the learning of Libras for hearing students in the teacher education undergraduate courses at university, a valuable tool that contributes to their formation and, by knowing sign language, will better prepare them to teach and include deaf students in school activities respecting their cultural and linguistic differences.

The Glossary development was divided into two steps, the first step is comprised of the linguistic research of signs, while the second step consists of the information system development and publishing on the Internet, both of which will be described in Section 2.

2. Method

2.1 Linguistic research to select signs to include in glossary

The linguistic research for the selection of the signs for the Glossary consisted of a search in the main dictionaries and manuals about Libras available in printed [2][3][4] or digital [8][15] media in Brazil, especially the publication [4], which relates the use of signs in each region of the country. This step was essential for defining the linguistic scope of signs to compose the Glossary's corpus, and for organizational purposes the signs were separated by alphabetical order and by semantic category.

Finally, to legitimize the Glossary it was essential to find a native speaker of the language, that is, a deaf fluent signer that had Libras as their first language to record it.

The recording of the signs occurred at the video studio of the School of Medical Sciences (FCM) at the University of Campinas (Unicamp), and was supported by the FCM Didactic Support and Technical Scientific Disclosure Team. The process was carried out in stages and over several days, since signing for a long time is an exhausting task for the signer, and each day a semantic category was recorded. During the recording process the signs were presented to the deaf signer by slides on a monitor to facilitate and expedite the process. At the end of the recordings, we proceeded to the video editing process in which the signs were separated in specific videos and individually edited, which consisted of: image treatment, portuguese subtitle insertion, and inclusion of the university's logo (Unicamp). After editing, the signs were added to the Glossary platform so they could be queried. Since all the remaining work required the proper execution of this step, a lot of care had to be taken to assure the signs were correctly recorded.

2.2 Brazilian sign language glossary development

The development of the Brazilian Sign Language Glossary platform was carried out by the research group Assistive Technologies for the Deaf (TAS) from the Department of Computer Engineering and Industrial Automation (DCA) at the School of Computing and Electrical Engineering (FEEC). It consisted of the following steps: requirement analysis, system design, technology selection, system implementation, system evaluation and publishing on the Internet.

The functional requirements consisted of the following features: administrator user authentication (log in and log out), management of users, semantic categories and signs (create, read, update and delete), and finally, the searchability of signs by name, first letter of name, or semantic category. The non functional requirements consisted of: capability to support a large number of student accesses throughout the semester (availability), restricted access to administrators for content management on the platform (security), responsive interface capable of adapting to screens of different devices such as computers, tablets or mobile phones, and facility to search signs or semantic categories (usability).

The technologies used in frontend development, that is, the graphical user interface were: Hypertext Markup Language (HTML) [9] responsible for defining the elements present in the interface, Cascading Style Sheets (CSS) [12] whose function is to control the appearance of elements, and React.js [1], which is a library of the JavaScript Programming Language [17] and is intended to include dynamic interface behavior. The technologies used in backend development, that is, the logic for data manipulation were: Node.js [10] and Express.js [7]. Node.js is a JavaScript language interpreter used to execute code on the server, while Express.js is a JavaScript library for developing Web Application Programming Interfaces (Web API) in the Restful State Transfer (REST) standard that allows exchange of messages between the user computer and the server. Data storage is performed using the MySQL [11] database management system (DBMS).
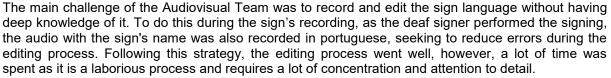
Importantly, all technologies used during the development of the Glossary are open source and free to use without charge. The Glossary is hosted at the School of Computing and Electrical Engineering (FEEC) at University of Campinas (Unicamp).

3. Discussion

The Glossary development was only feasible due to the availability of a professional team from Libras, Audiovisual and Computing areas, who together could find solutions to challenges encountered during this project.

Regarding the Libras Team, the main challenges were: selecting entries (signs) to compose the Glossary's vocabulary and dividing it by semantic categories designed specifically to facilitate the learning of Libras by a hearing student, finding a fluent deaf person to sign as well as give input on the most commonly used signs among deaf people, and when appropriate, to record linguistic variations of a sign.

The main challenge of the Audiovisual Team was to record and edit the sign language without having deep knowledge of it. To do this during the sign's recording, as the deaf signer performed the signing, the audio with the sign's name was also recorded in portuguese, seeking to reduce errors during the editing process. Following this strategy, the editing process went well, however, a lot of time was spent as it is a laborious process and requires a lot of concentration and attention to detail.

For the Computing Team, the most important issues involved the graphical user interface, support for large numbers of users, and video storage. During the development of the graphical interface some prototypes were developed and several tests were performed to ensure the proper functioning of the system on several devices. With the motivation of providing the service to both university students and outsiders across multiple device types, it was decided to develop the backend as a REST API, as this architecture allows you to scale the system horizontally, ie it becomes possible to include more computers in parallel and use the load balancing technique to serve more users if necessary. As for video storage, several compression methods were tested, always seeking the best cost-benefit ratio between image quality and storage space.

The link http://libras.fee.unicamp.br/ gives access to the Brazilian Sign Language Glossary which has about 2,000 signs distributed in 33 semantic categories: Manual Alphabet; Foods; Animals; Birthday; Personal presentation; Drinks; Calendar; Colors; Commemorative dates; Days of the week; School subjects; Documents; School; Sports; Family; Grammar; Hours; Age; Places; School supplies; Months of the year; Nature; Schooling levels; Notions of time; Numbers; Periods of the day; Professions; Pronouns; Greetings; Cheers; University; Monetary values; and Verbs.

The signs in the Brazilian Sign Language Glossary can be consulted alphabetically, by name (at least one letter), or by semantic categories, making it easy to search for signs. Due to the large number of entries, the Glossary can be considered as a useful signs database for research in the fields of linguistics, lexicology, and lexicography of Libras, as well as in computational research aimed at recognizing sign languages that seek to build systems capable of automatically translate these into oral or written languages [5][6][18].

When you first access it you can view the instructions for using the Glossary.

4. Conclusion

This project is the result of a partnership between the School of Medical Sciences (FCM) and the School of Electrical and Computer Engineering (FEEC) of the University of Campinas (Unicamp).

The Brazilian Sign Language Glossary records about 2,000 signs that are clearly and didactically divided into 33 semantic categories, which enables the user to query signs and makes it possible to learn Libras for any hearing person who speaks portuguese being a university student or not.

It is also possible to use the Glossary's Sign Database in research related to Lexicology, Lexicography and Linguistics of Libras, as well as in computational areas [5][6][18].

In future work, it is planned to expand the number of signs and semantic categories present in the system's database to encompass greater vocabulary, to include signing activities that encompass the signs in a contextualized manner and to analyze their impact on student's teaching throughout the course.

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