INTERNATIONAL COOPERATION ACTIONS FOR THE SYSTEMATIZATION OF A SIGN LANGUAGE GENERATOR AND PUBLISHER

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Abstract

This text describes the process of systematizing a study and developing a pilot technology aimed at the Brazilian Sign Language (Libras), a result of a collaboration between Brazil and Costa Rica. The Technological Institute of Costa Rica created the International Platform for Sign Language Editing (PIELS) to support the editing and learning of Costa Rican Sign Language (LESCO). PIELS emerged with the goal of finding technological solutions for the graphic representation of content in Sign Language, utilizing graphic and interaction libraries, programming languages, and a web server, with data stored locally in a lightweight and accessible format. The study in question involved creating 60 signs in Libras, starting from signs already existing in PIELS, which initially only included LESCO. Indicators for the tool's use were also analyzed, aiming to promote effective communication and mutual understanding between the teams from both countries. The process included meetings with a multidisciplinary team, composed of Libras interpreters, deaf individuals invited for the validation of the signs, and experts in programming and information technology. Topics covered in the meetings included: introduction to PIELS technology, technology studies in Sign Language, deaf culture in Costa Rica, morphology, phonology, syntax, and discourse in PIELS, dictionary and proximity, and Libras grammar. For the creation of the pilot systematization, six main categories of signs were selected, covering days of the week, months, colors, numbers from 1 to 10, greetings, and family context, chosen for their relevance and frequency of use in everyday life. The result was a library of common signs in LESCO and Libras. Regarding PIELS, the proposal is to include technologies that allow an avatar to reproduce Libras signs stored in a database. The signs, created and stored based on Libras grammar, are facilitated by an editor that optimizes the creation of complex signs. The signs consist of Libras parameters and their transitions, trained in the avatar, with hand movements such as linear, curved, circular, sinusoidal, and spiral, configurable for different directions.

Keywords: Brazilian sign language, platform for sign language, digital technology in education.

1. Introduction

In recent years, we have witnessed a notable increase in the development of technologies aimed at accessibility and inclusion for people with disabilities. One area of emphasis is the enhancement of Sign Language technologies, essential for the communication of the deaf community. This text describes the process of systematizing a study and developing a pilot technology for Brazilian Sign Language (Libras), resulting from a collaboration between Brazil and Costa Rica.

Chacón-Rivas (Naranjo-Zeledón et al., 2020) highlights the importance of technology in development and interaction processes, especially for deaf people, who often face social barriers due to a lack of awareness or information. For the author, technology is vital in education, and its inclusion has been more evident recently, with efforts to avoid the marginalization of vulnerable groups, such as the deaf community (Espinach, et al., 2021)

In this text, we report an ongoing study that involved the creation of 60 signs in Libras, categorized into six groups, based on signs already present in PIELS, previously restricted to Costa Rican Sign Language (LESCO). The efficacy of the tool and its potential to facilitate communication and mutual understanding between Brazilian and Costa Rican teams were evaluated.

Multidisciplinary teams from both countries, including Libras interpreters, members of the deaf community, information technology experts, and education professionals, participated in online meetings.

These meetings covered from the introduction to the International Platform for Editing Sign Language (PIELS), involving the cultural aspects of the deaf in Costa Rica and Brazil, culminating in the creation of a library of common signs between LESCO and Libras.

PIELS was developed by the Costa Rican Institute of Technology. PIELS seeks to provide technological solutions for the graphical representation of signs, starting with the Costa Rican Sign Language (LESCO), aiming to improve access and understanding of Sign Language. In this sense, this study collaborates to expand the library considering the Brazilian context.

The Costa Rican Institute of Technology, recognizing the importance of inclusion and accessibility, developed the International Platform for Editing Sign Language (PIELS). This platform was created with the aim of providing an innovative technological approach to facilitate the editing and learning of Costa Rican Sign Language (LESCO). The project began in 2016 and has evolved significantly, benefiting from strategic collaborations, mainly with the National Center for Resources for Inclusive Education (CENAREC), linked to the Ministry of Public Education of Costa Rica.

Zamora-Mora and Chacon-Rivas (2022) highlight the importance of recognizing sign language through computational means as a topic of international interest, as it helps to reduce the gap between deaf people and the society that communicates through verbal means, regardless of ethnicity, location, or origin of the sign language.

Over time, the PIELS project evolved to include a dictionary of LESCO signs, developed in close collaboration with the deaf community and based on the signs compiled by CENAREC. This dictionary, enriched by the active participation of the deaf community and the support of private entities, now houses a vast collection of over 2,200 signs, covering a wide range of knowledge areas.

The Brazil-Costa Rica collaboration aims to enable a greater understanding and identification of the technological advancements achieved, as well as to ponder future possibilities of technological development that facilitate communication and promote the inclusion of deaf people, adopting an inclusive perspective.

2. Results and discussions: Contributions of the training program

This international cooperation between the involved educational institutions presents a promising opportunity to further expand this technology and its impact and usefulness through a collaborative project aimed at expanding the sign repertoire on the platform. This expansion will meet the growing needs associated with LESCO, as well as contemplate the inclusion of Brazilian Sign Language (LIBRAS). With this, PIELS can broaden its reach, serving a more diverse and international user base, reinforcing its role as an essential tool for education and communication in the deaf community.

The main objective of the project is to establish the theoretical and practical foundations for the generation of Libras signs, using a digital avatar in PIELS. The specific objectives include: presenting the scope and limitations of PIELS as a Sign Language editing platform; analyzing previous versions of PIELS, focusing on the technological complexities and grammatical characteristics of Costa Rican Sign Language (LESCO); exploring the cultural experiences of the deaf community that influenced the development of PIELS; providing insights into Brazilian deaf culture and the grammatical aspects of LIBRAS.

As an initial step for the development of the project, eight meetings were held via Google Meet (Table 1), involving multidisciplinary teams from Brazil and Costa Rica. These teams included Libras and LESCO interpreters, programming specialists, and members of the Study Group from the Center for the Promotion of Digital School and Social Inclusion (CPIDES).

Table 1. Meetings via Google Meet.

07/02/2023	1st Meeting - PIELS - International Platform for Sign Language Publishing - Lesson 1
14/02/2023	2nd Meeting - PIELS - International Platform for Sign Language Publishing - Lesson 2
28/02/2023	3rd Meeting - PIELS - International Platform for Sign Language Publishing - Lesson 3
28/02/2023	Support material for the meeting: True or False LESCO
07/03/2023	4th Meeting - PIELS - International Platform for Sign Language Publishing - Lesson 4

14/03/2023	5th Meeting - PIELS - International Platform for Sign Language Publishing - Lesson 5
04/04/2023	6th Meeting - PIELS - International Platform for Sign Language Publishing - Lesson 6
11/04/2023	7th Meeting - PIELS - International Platform for Sign Language Publishing - Lesson 7
25/04/2023	8th Meeting - PIELS - International Platform for Sign Language Publishing - Lesson 8
02/05/2023	9th Meeting - PIELS - International Platform for Sign Language Publishing - Lesson 9

In these meetings, various topics were discussed, ranging from technical issues of implementing signs on the platform to linguistic aspects of sign languages. A space was dedicated to sharing experiences and perspectives on deaf culture and the needs of the deaf communities in both countries. The contribution of Libras and LESCO interpreters was crucial to ensure the accuracy and understanding of the topics. The participation of deaf people was equally important, providing insights into linguistic and cultural issues. These asynchronous meetings fostered a collaborative environment, where various areas of knowledge came together to achieve the project's objectives. Interdisciplinarity was a key element for the successful development of the pilot technology for Libras.

One of the tangible results was the creation of a Portuguese language prototype for the production of LIBRAS signs, using a digital avatar. Comparing the 2018 (Figure 1) and 2023 (Figure 2) versions of PIELS, one can observe the evolution of the editing interface and the inclusion of a more sophisticated avatar.

Figure 1. 2018 version.
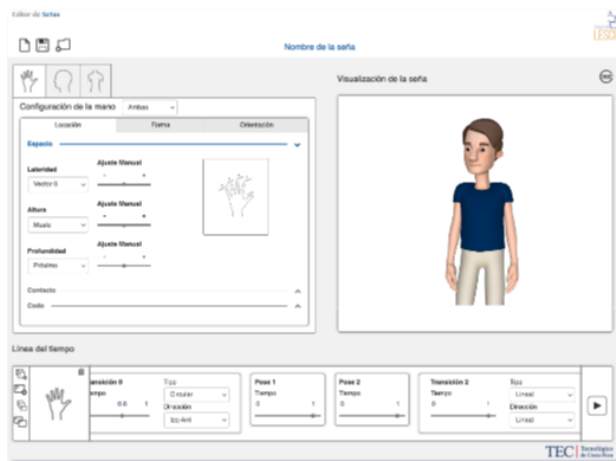
source: PIELS

Figure 2. 2023 version.
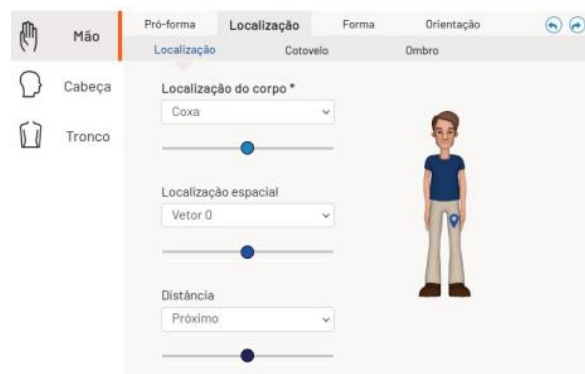
Source: PIELS

According to Espinach and colleagues (2021), the project began in 2015, focused on animating a digital avatar for Costa Rican Sign Language (LESCO). Between 2016 and 2018, the project included more than 2150 signs, with the collaboration of LESCO editors and deaf graphic designers. Validation sessions, called Señatón, were held in 2016 and 2018 to verify the comprehension of signs by the avatar. These events provided valuable information and raised awareness of the urgent needs of the deaf community.

For the creation of the pilot systematization with the partnership between Brazil and Costa Rica institutions, six main categories of signage were selected, covering days of the week, months, colors, numbers from 1 to 10, greetings, and family context, chosen for their relevance and frequency of use in daily life. The result was a library of common signs in LESCO and Libras. Regarding PIELS, the proposal is to include technologies that allow an avatar to reproduce Libras signs stored in a database. The signs, created and stored based on the grammar of Libras, are facilitated by an editor that optimizes the creation of complex signs. The signs are composed of Libras parameters and their transitions, trained on the avatar, with hand movements such as linear, curved, circular, sinusoidal, and spiral, configurable for different directions.

The future goals of this collaboration include expanding the technology to allow a digital avatar to reproduce sign languages from different countries, stored in a database. This advancement aims to promote inclusion and accessibility for deaf people, reflecting on the potential impact of these technologies on the lives of deaf communities.

Chacón-Rivas (Vallejos, Zeledón, & Chacón-Rivas, 2019) explains that technology facilitates interaction with information and the environment, making possible things that would otherwise be difficult for people with disabilities. The author highlights that technological projects are increasingly oriented towards including these people, driven by the Sustainable Development Goals and the 2030 Agenda. A specific example is the Costa Rican Sign Language (LESCO) translation project, which began in 2015 and uses computerized avatars to represent Spanish texts in LESCO, helping to reduce communication barriers, through PIELS.

3. Final considerations

Throughout its analysis, this article illuminated the fundamental role of international collaboration and technological innovation in promoting the accessibility and inclusion of deaf people. The partnership established between Brazil and Costa Rica emerged as an emblematic example, resulting in notable advances in the field of technology applied to Sign Language, with an emphasis on the development and improvement of the International Platform for Editing Sign Language (PIELS).

The evolution of PIELS is a testament to the importance of innovative technological approaches in the education and communication of deaf communities. The expansion of the platform to encompass Brazilian Sign Language (Libras), in addition to the more than 2,200 signs already included in LESCO, reflects an ongoing commitment to the tool's improvement and accessibility.

The teams involved in the development of PIELS, composed of professionals from multiple disciplines, including members of the deaf community, reinforce the importance of an inclusive and collaborative approach. This diversity was essential not only for the technical development of the platform but also to ensure that it effectively meets the needs of the deaf community.

The creation of a prototype for the production of Libras signs, employing digital avatars, is a milestone that highlights the potential of digital technologies in the accurate and accessible representation of sign languages. This innovation aims to improve accessibility and also opens doors for future expansions, adaptable to various sign languages.

Looking to the future, the project envisions expanding the technology to allow digital avatars to reproduce sign languages from different countries. This advancement promises to further enhance inclusion and accessibility for deaf people, highlighting the transformative impact such technologies can have.

In conclusion, this article emphasizes the synergy between international collaboration and technological innovation as key elements in overcoming communication barriers faced by deaf people. The collaboration between Brazil and Costa Rica serves as an inspiring model, demonstrating how technology, combined with cooperation and intercultural understanding, can create meaningful solutions to accessibility and inclusion challenges. The continuation of this partnership, along with future technological innovations, has the potential to generate an even deeper and more comprehensive impact on the world of linguistic accessibility for deaf communities.

Acknowledgments

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