The Low Use of SignWriting Computational Tools from HCI Perspective

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Abstract. There are several ways of communication, however, these
are considered volatiles, i.e. passed from people to people, there is the
risk of having changed meaning and significance. But the writing stays
intact and that's why comes the need of the written record of languages,
even of sign languages. Several tools exists to provide support for the
written record of sign languages, however which are not used by these
communities, especially the Brazilian. This paper supported in the HCI
literature, has the objective point out the reasons from no or low use of
these tools by an analytical inspection.

Keywords: Human-computer interaction · Deaf culture · Social inclu-
sion · Computational tools for citizenship · SignWriting

1 Introduction

The deaf community in Brazil and worldwide uses sign language for communi-
cation between the deaf and the society in general. When the members of this
community need to write their language using computing devices, they need to
rely on the written representation of an oral language not used by their, in the
case of Brazil, the Portuguese language [16].

There are various forms of communication between humans, such as speech
and gestures, but these are volatile ones, in the sense that they can change when
they are passed among people at high risk of meaning modification. Writing
is a nonvolatile form of communication, the preservation of records in written
form allows for the storage and spreading of information by individuals that
are distanced geographically and also between generations, emerges naturally
relevance of the written form of sign language [1].

The use of the country's oral language as the only option for the language
written record interferes with the deaf culture, because the communication
between individuals must be mediated or adapted in a process between the sign
languages and the oral language in question [3].

The existence of sign language writing is a reality since many years ago,
as researchers have created different writing systems, like Stokoe's System [22],

the François Neve's Notation [23], the HamNoSys's Notation [15] and SignWriting [24], the latter being the most comprehensive and the most used, although not taken advantage, by deaf communities around the world.

SignWriting is a notation for writing the visual language of signs. Its components allow for any sign language to be visually represented, i.e., they allow for the representation of the grammatical structure of sign languages in graphical form. SW was developed by Valerie Sutton in 1981 and is part of a larger system of movement notation, the Sutton Movement Writing & Shorthand, able to systematically record any movement, whether in dance, sign language, mime, sports, physiotherapy, among others [24]. In Brazil, the use of SignWriting is still very limited, being the hypothesis of to come from the fact that most of the information and knowledge legacy is recorded in other written languages, such as Portuguese [23].

There are some tools that have been developed in order to assist these communities in regards to learning, documentation and record of sign languages through SignWriting. These artifacts do not address the needs of deaf, so they are not adopted by the deaf as communication, interaction and learning resources.

The first sign languages have emerged around 1755 and was brought to Brazil in 1856. The LIBRAS was recognized as the National Sign Language in the Brazilian Constitution of 2002. Stokoe created the first writing system for sign languages in 1960. Nowadays there are several tools for the graphic recording of sign languages, and a question arises: Why these tools have not been taked advantage of by Deaf Communities?

A detailed study on several existing tools in literature, helps to understand the reasons why deaf communities have not adopted these tools in their daily life. Human Computer Interaction literature is full with sets of principles, guidelines and heuristics, that lead designed systems to be quickly and easily learned by users [14]. However, the misuse of these criteria leads to systems that are not suitable for the target audience and this may be the primary response to the low (non) use of these tools.

From this study that indicated the reasons for the low usage of the tools of LIBRAS graphic record and after having worked together and identified the needs of this community, this paper present literature based evaluation of existing SignWriting Computational Tools and also reports mistakes found in these softwares. This way, it is expected that new tools do not repeat the same mistakes, have greater acceptance and meet the need for information access by the deaf communities. Therefore, it won't be necessary to appeal to the oral language graphic record of the country only for lack of inner writing system. Additionally documentation of sign languages worldwide will be facilitated.

Section 2 describes Deaf Community: characteristics ans needs, Sect. 3 presents SignWriting Computational Tools and Evaluation, Sect. 4 shows The Low Use of SignWriting Computational Tools from HCI Perspective. Finally, Sect. 5 discusses Conclusions and Future Works.

2   Deaf Community: Characteristics and Needs

People with special needs are generally excluded in society, and among them, are the Deaf and their communities. The prejudices faced by the deaf community are many, for example, the mistaken ideas of society, which are seen as politically correct. The definitions of deafness like "hearing impaired Deaf" and/or "deaf and dumb" are examples of this erroneous conception which tend to create stereotypes. The deaf has its own language, which disqualifies the term "dumb", for example [18].

At the same time, members of the Deaf community do not want to be defined by their deafness. They want to be included in society acting naturaly in their universe. For this, the deaf require a tool to help them in the communication with each other and with other members of society. After all, more and more the world is based on information and knowledge, and who is not included in this circle, is excluded from the society [11].

For communicating, the Brazilian Deaf using the Brazilian Sign Language (LIBRAS), which is a legitimate and natural language system that enables the social and intellectual development, favoring their access to cultural and scientific knowledge, as well the integration to the social group to which it belongs. LIBRAS express feelings, psychological states, concrete and abstract concepts and reasoning processes [17]. Its form of representation guard specificities that differentiates it from other languages, such as Portuguese, yet at the same time, it allows the expression of any concept of reality or reference data [7].
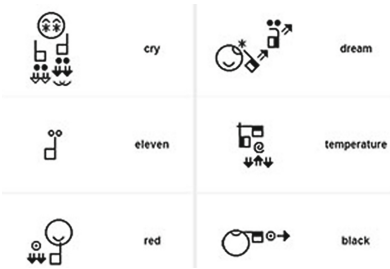

Fig. 1. Examples of SignWriting. Adapted from [3] and [9]

Even though they use the LIBRAS for communication, the deaf still have difficulty as the registration of knowledge in written form. When it happens, it is still mediated by written Portuguese and in this way, the knowledge and culture is unsatisfactorily reported since they are not represented by the sign language [24]. Many written systems for sign languages have emerged to try to solve the spelling of the signs, but this did not solve the problem for the community.

The SignWriting Writing System is the most used by the communities. It was developed by the American researcher Valerie Sutton, in the 70s, to spell the

footsteps of traditional ballet. Its components permit any sign language words visually represented, allowing the writing system represent the graphically grammatical structure [3]. In Brazil, the use of the system is restricted, however, many authors defend that their use is necessary for increasing the documentation of LIBRAS [23]. Figure 1 shows examples of SignWriting.

3   SignWriting Computational Tools

There are some initiatives whose purpose is to assist those communities with respect to the learning of sign languages and record of languages through Sign-Writing. Often the developed tools although they have the objective of helping the Deaf, are produced for a very specific audience (Deaf that dominate the reading and writing the main language of their country) and, in this way, are not adopted in the daily lives of the Deaf as communication resources, interaction and learning.

Many of these artifacts do not address the needs of the deaf, among which we can mention language issues (e.g. the information is represented mostly in a language other than LIBRAS in case the Portuguese on the understanding that all the deaf has the domain of this language) and interaction (e.g. most of the tools for user interaction with the interface is not mediated by LIBRAS). The computational support tools for SignWriting were studied:

– AGA-Sign (UFRGS - Federal University of Rio Grande do Sul / UCPel - Catholic University of Pelotas): is a gesture animator applied to sign language,developed for applications directed to special education, particularly for Deaf education. The tool besides the animator, includes among other modules SignWriting editor and translator [5].
– SignNet (UCPel - Catholic University of Pelotas): is intended to adapt the Internet technology for sign languages and special education of the Deaf. Its goal was to implement software and computer systems oriented towards writing of sign languages [23].
– SW-Edit (UCPel - Catholic University of Pelotas): this system has the main functionality, editing text in sign languages, based on SignWriting writing system. Their data base is expandable and has a sign dictionary, which is available as a file on the web [26].
– SignTalk, SignSim e SignEd (UCPel - Catholic University of Pelotas): has the objective interaction through LIBRAS and Portuguese via chat, semi-automatic translator between sign language and a editor for writtin signs [2].
– SignWriter (USA - Deaf Action Committe): is a text editor in SignWriting signs. Arrived until the 4.4 version and has been discontinued, despite having support for multiple languages, no success, mainly by the precariousness of their interface, destined for MS-DOS [8]. Figure 2, presents the Interface of SignWriter.
– SignPuddle (SignWriting.org): has several online tools, such as dictionary, maker for written signs, search for symbols or explanations, signs of maker in
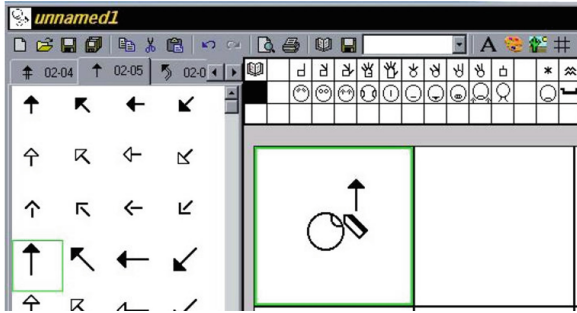
Fig. 2. SignWriter interface adapted from [8]

the mail and simple editor. Has online help with a single click, multilingual support with unique code and storage of texts in various versions [20]. Figure 3, shows the interface of SignPuddle Online.

- SignWebMessage (UFRGS - Federal University of Rio Grande do Sul): is the development of a prototype software, similar to a webmail, where messages may be exchanged through the writing of Brazilian Sign Language - LIBRAS, based on SignWriting system [21].
- SignWriter Studio (Jonathan Duncan - FreeWare): was developed to provide an easier starting point for beginners who are learning SignWriting and a faster way for everybody to write and share sign languages [6].

Fig. 3. SignPuddle online interface adapted from [20]

3.1   Evaluation of SignWriting Computational Tools

To make it possible to identify the reasons from low or no use of computational tools to support SignWriting, by the deaf community in general and especially the Brazilian, an analytical review of these (users are not directly involved) was held.

This inspection was carried out by three specialists in HCI, provided with a set of heuristics and guidelines, performing a check that the interfaces of each tool violates one or more heuristics, where and why.

For each of the mentioned above tools, an evaluation session between one and two hours was carried out. The following heuristics and guidelines were used in the evaluation:

– Correspondence to the user expectations;
– Simplicity in the structures of tasks;
– Balance between user control and freedom;
– Consistency and standardization;
– Stimulus for the user efficiency;
– Anticipation of user needs;
– Visibility and recognition;
– Relevant content and adequate expression;
– Design for errors;
– Usability;
– Communicability.

The evaluation was considered satisfactory by the evaluators, because it raised several hypotheses for the low use of the tools.

4   The Low Use of SignWriting Computational Tools from HCI Perspective

The HCI literature is replete with sets and principles, guidelines and heuristics. The proper application of many of the principles and guidelines depends on the designer's knowledge of the users of the problem domain and its activities in this area [10].

For the deaf community use an interactive system, that is interact with its interface to reach goals in a particular context of use, in this case written signs through SignWriting, the interface must be adequate for these users, in particular to make the most of computational support offered by the system.

These people expect that the computational potential offered through the support SignWriting tools, is simple, fast and easy to learn. Employing information and communication technologies every day is justified to facilitate the implementation of activities, and not make them more difficult and complex. In the following subsections will be presented the guidelines and heuristics IHC, which held by inspection, were not covered by tools.

4.1   Simplicity in the Structures of Tasks

To facilitate user interaction, it is recommended to simplify the structure of the tasks, reducing the amount of planning and problem solving that they require. Unnecessarily complex tasks can be restructured using technological innovations [13].

The SignWriting already has an extremely complex structure, because of the wide number of classification groups and large number of primitives used for the spelling of the signs. The way, that the tools organize these primitive, often ends up, despising this criterion of simplicity, so hampering interaction. Figure 4, presents the complex groups of SignWriting.

Fig. 4. Examples of SignWriting. Adapted from [9]

4.2   Anticipation of User Needs

Applications should try to predict what the user wants and needs rather than wait which they seek or collect information on tools. The software should take initiative and provide useful information, instead of just answer the question precisely what the user does. Is important to carefully define the values and the default setting (default) also defaults should be easily replaced by more specific values appropriate to the current situation [4, 25].

Neither of tools has functionality to meet the anticipation criteria, that is, no action to facilitate user interaction, for example, offer motion-local options or movement, after the user enters the hand configuration, or withdraw the options of facial expression, after it's inserted. These are small details that can increase user affinity with the tool.

4.3   Relevant Content and Adequate Expression

For a simple interaction is required following four maxims: quality, quantity, relevance and clarity. Dialogues should not contain information which is irrelevant or rarely needed. The instruction and help messages must be concise and informative about problems that occur. The labels on menus and buttons should be clear and free of ambiguity. Besides taking care of the content, the designer must make sure that the text is also readable [4, 12, 25].

This is a criterion that is ignored by virtually all SignWriting support tools, because the information is represented in the oral language of the country for which it was developed and not the primary language of the deaf. To follow this guideline,Textual information, menus, documentation, and among others should present the information in SignWriting too.

4.4   Design for Errors

Researchers recommend that the designer attempt to, firstly, prevent errors, if possible. If an error is made, the system must be able to detect it and provide simple and intelligible ways to treat it. Besides errors, it must also support users to clarify their doubts during the interaction. For this, high quality documentation and help is needed [12,19].

Although it is one of the most important guidelines in the literature, in the tools it is partially or totally ignored. Few tools offer feedback so that users do not come to make mistakes, but the biggest shortcoming is related to the documentation, because in addition to totally scarce or inexistent, they are not in the main language of the Deaf (sign language).

4.5   Stimulus for the User Efficiency

The system should be sensitive to what the user is doing and should not interrupt him unnecessarily while the user is working on something. In order to promote efficiency of frequent users, it is recommended to provide shortcuts and accelerators. As the frequency of use increases so the desire of users to reduce the number of interactions and accelerate the pace of interaction. For frequent operations, the designer can also provide the default configuration values, individually or in groups, forming on which such transactions profiles [4,12,19].

This criterion was the most ignored by all the tools and possibly coming to cause more aversion from the community. None of the tools promotes user efficiency, on the contrary, makes that it has to spend considerable effort and time to perform a high writing a single signal, practically making it impossible to write long texts.

4.6   Correspondence to the User Expectations

It is recommended to structure the dialogue form following a line of thought and provide a closure, the sequences of actions must be organized into groups with a beginning, middle and end. Designers must follow the real-world conventions, making the information appear in a natural and logical order [12,19].

The tools do not follow a reasoning logic with real-world conventions, they have no order and even less logic in the order of inclusion of the primitives to the composition of the signs.

Several other guidelines were partially or totally ignored by some tools,but there were no problems found in unanimity among them, such as: consistency and standardization, visibility and recognition, usability and communicability.

5   Conclusions and Future Works

As previously mentioned in the introduction, sign languages are old in the world, including Brazil, which is a law of the national constitution, systems for writing sign languages have existed for more than 50 years and the high number of computational tools to assist the communities in their day-to-day, in this case in particular to the deaf community in access to information. Why still the community do not use these tools that are extremely important?

The present study in this papper, where an analytical assessment was performed on the main existing tools, may at the same time give us an answer and in the future a solution for this serious problem. The guidelines and heuristics must be followed so that the interfaces from any tool have quality, especially when you are developing something that is intended for a community which have special needs such as the Deaf community.

Tools created to offer accessibility, that do not consider HCI guidelines are not alternative to information access for this community, on the contrary, they cause aversion to the tools. To resolve this, designers must reproject existing interfaces and design new interfaces considering the guidelines and heuristics mentioned in this work.

To eliminate this aversion and to enable access the information through the graphical record of sign languages, as future guidelines and specific HCI heuristics will be created (derived from existing) to the development of interfaces intended for deaf community, thus seeking a final order to solve this problem.

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