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A Semiotic Inspection of ICDL

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Abstract. This study reports the results of a semiotic inspection carried out with the International Children's Digital Library, a paradigmatic example of multi-cultural systems, since it poses very concrete and difficult HCI design challenges in terms of cultural issues. The study is part of the ICDL-Brasil Project, a binational cooperation partnership that aims at finding alternatives for cultural adaptation of the ICDL website to the Brazilian context.

Keywords: evaluation, HCI, semiotic inspection, semiotic engineering.

Resumo. Este estudo reporta os resultados da inspeção semiótica feita sobre a *International Children's Digital Library*, um exemplo paradigmático de um sistema multi-cultural, já que apresenta desafios concretos e difíceis para o design de IHC. O estudo faz parte do Projeto ICDL-Brasil, uma parceira de cooperação binacional com o objetivo de encontrar alternativas para adaptação cultural do website da ICDL para o contexto brasileiro.

Palavras-chave: avaliação, IHC, inspeção semiótica, engenharia semiótica

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1. Introduction

The Semiotic Engineering Research Group (SERG) at PUC-Rio has been working for two years in the ICDL-Brazil Project [ICDL-Brasil, 2009], a partnership with the Human-Computer Interaction Lab (HCIL) at the University of Maryland College Park. The International Children Digital Library (ICDL) is a public digital library designed to provide a collection with 10000 books in 100 languages for children (from 3 until 13 years old – age between 3 and 13), teachers, and researches on the Internet [ICDL, 2009]. ICDL was launched in 2002 as a joint effort of the National Science Foundation and University of Maryland, aiming at exposing children to different cultures through literature.

The ICDL-Brazil Project's goal is to adapt the ICDL website to Brazilian conditions, as well as to the social and cultural interests of Brazilian children, parents, tutors and teachers. Until now the multi-cultural support provided by the ICDL website interface is the translation of textual contents into various languages. However, an empirical study with ICDL [de Souza et al, 2008], along with a state of the art survey about cultural issues in HCI [Nielsen, 1990; del Gado, 1996; Marcus, 2001], has strengthened our belief in that there is more to cultural adequacy than linguistic translation of textual interface materials. Thus we have set out to gather elements for redesigning the ICDL interface with the purpose of achieving enhanced cultural adaptation.

The main tools and concepts we have used in this preparation for redesigning ICDL are the Semiotic Inspection Method (SIM) [de Souza et al., 2006, de Souza and Leitão, 2009] and the basic Semiotic Engineering model of HCI as metacommunication [de Souza, 2005]. Our first step was to elicit the *original* ICDL designer-to-user metacommunication using SIM. This was important because we do not want to *replace* the original ICDL designers' metacommunication with our own, but rather to adapt it, culturally, to a Brazilian context, so that it is appropriately communicated. SIM is a method specifically designed to make an in-depth analysis of metacommunication and to produce a rich description of what designers are telling to (and about) their users, in the eyes of a *semiotic inspector* (i.e. an HCI evaluator using the Semiotic Inspection Method). As we will see in the next sections, the canonical application of SIM – a qualitative semiotic engineering method – to the International Digital Library (ICDL) website helped us to identify the quality of designer-to-user meta-communication, as it happens at interaction time, and to plan our future work steps.

We begin, in section 2, with a brief overview of Semiotic Engineering and SIM. In section 3, we report the ICDL case study with SIM, and then, in section 4, we briefly present our current conclusions, as part of on-going work.

2. Semiotic Engineering concepts and SIM

Semiotic Engineering is an HCI theory that frames human-computer interaction according to the view that Semiotics is a discipline that studies signs[1], signifying systems and communication [Eco, 1976]. Like all semiotically-inspired theories and approaches

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1 Signs have been defined by Peirce as anything that stands for something to some observer or interpreter (Houser and Klesel, 1992-1998).

(see, for example, [Andersen, 1990]), this theory characterizes human-computer interaction as a computer-mediated human communication process. The three *agents* involved in HCI interpretation and communication processes are: designers, users and system. They are brought together at interaction time because Semiotic Engineering introduces the notion of designer-to-user meta-communication, that is: communication *about* communication (that is, how, when, why to communicate with the system in order to achieve an open-ended range of results and effects). In this process the designers send a message to users through the interface, telling them their vision about who the users are, and about how, what for and why the users should communicate with the system while aiming to meet specific goals.

The users take part in this process by interpreting meta-communication messages that are presented to them during interaction, and by reacting to them according to the possibilities and alternatives offered by the system's interface. In other words, the interface constrains the kinds of communication that goes on. It is, in fact, the designer's deputy, a representative of the designers (actually of the HCI design *team*) at interaction time, since it is the designers that choose and constrain the shape and course of interaction that users can have with the system. The interface, as the designers' deputy, tells users what the design team wants to say, and listens back to the users' reaction, thus establishing a mediated conversation with (and about) the system.

During the design process, the designers encode their intentional meta-communication message in the form of a computer system. For this, they elaborate and use (at design time) a unique interface language, with a specific vocabulary, grammar, semantics and pragmatic rules. It is unique because no application is exactly like any other application; so, in order to represent an application's semantics and to put it to use at interaction time, designers must always design a *unique* interactive language (even if follows well-known *patterns* that makes it similar to other languages). As this language may consist of heterogeneous types of signs, we can characterize it as a signification system. Signification systems result from a regular association between content and expression, as established by social and cultural conventions. Users of such systems share deeply-rooted complex socio-cultural knowledge and practices [Eco, 1976] that make communication possible among them. Once encoded in a computer system's interface, this signification system 'decays' to become the equivalent of an artificial language. although it carries the cultural decisions of the designer and will be used and interpreted by users that belong to a particular culture, they *cannot* and *do not* incorporate the dynamics of social, cultural and even psychological processes that permeate human signification and communication. However, expressions and content encoded in such *computerized* signification systems may be very similar to those encountered in *natural* signification systems produced by cultures and societies.

The main quality pursued in Semiotic Engineering is communicability – an interactive system's ability to convey the designer's message effectively and efficiently. So, the theory proposes certain models and methods that designers can use to get their message across to users in an organized and resourceful way. Semiotic Engineering models and methods are not predictive – their aim is to help designers interpret and understand design problems, and then generate and evaluate design alternatives.

Semiotic Engineering has an inspection method to evaluate the quality of meta-communication in HCI: the Semiotic Inspection Method (SIM). This method differs from other inspections methods proposed by other theories and perspectives. While others like Heuristics Evaluation [Nielsen and Molich, 1990] and the Cognitive Walkthrough [Wharton et al, 1994] focus on the usability of computer artifacts, SIM focuses

on communicability,. The difference is subtle but fundamentally important. Usability refers to how easily users learn and retain the *logic* of a particular system, and how satisfied they are with is, whereas communicability refers to how effectively and efficiently the *designers' deputy* (i.e. a system's interface) conveys the system's logic. In other words, communicability contributes to usability, but not vice-versa. It is thus a more basic phenomenon than usability.

SIM is an inspection method conceived to explore the designer's deputy's interactive discourse with an emphasis on its *emission* [de Souza and Leitão, 2009], that is, on how it is *expressed*. The object of investigation of SIM is the messages conveyed through designer-to-user metacommunication. These messages are expressed with a very wide range of signs, from one or more signification systems. The aim of SIM analysis is the evaluation of the quality of designer-to-user metacommunication, searching for actual or potential problems of communication and redesign opportunities to improve communication.

Before the inspection, evaluators should plan it carefully. The preparation step includes the definition of which part of the system should be explored during inspection, the focus of analysis and the elaboration of inspection scenarios (Carroll, 2000).

The core five steps of SIM are [de Souza et al., 2006; de Souza and Leitão, 2009]:
1. The inspection of metalinguistic signs.

2. The inspection of interface static signs.

3. The inspection of interface dynamic signs.

4. A comparison of the designer' metacommunication message generated in the

   previous steps; and

5. A conclusive evaluation of the quality of whole metacommunication de-

   signer-to-user.

Before we proceed, we should quickly define metalinguistic, static and dynamic signs. We quote de Souza and co-authors' definition [de Souza et al., 2009]:
1. **Static** signs are those whose representation is motionless and persistent when no interaction is taking place. These representations can be perceived (and interpreted) in snapshots of the system's interface before or after interaction occurs.
2. **Dynamic** signs are those whose representation is in motion regardless of users' actions or whose representation unfolds and transforms itself in response to an interactive turn. They can only be entirely actualized over time, and lose their substance outside the temporal dimension.
3. **Metalinguistic** signs, as their name suggests, are signs that represent other static, dynamic, or metalinguistic signs. Representations of metalinguistic signs depend on the separation between two representational levels: one where the action is performed and the other where information, instructions, descriptions, or explanations about the action are provided. These levels may be accessed by specific types of interaction (e.g. pressing a certain key to get help), or they may be co-present in the same space and time (e.g. there may be embedded tips in the interface to help the user interact with the system).

In the next section we present the application of SIM in practice with the ICDL case study.

3. The Semiotic Inspection of ICDL

The Semiotic Inspection was carried out by three evaluators. All had about the same level of expertise in Semiotic Engineering and SIM. Firstly, in the preparation stage, the evaluators conducted a general inspection of ICDL aiming to get the overall meta-communication content regardless of specific task contexts.

The most important issues raised at this early stage were:

[i] The ICDL collection has two primary audiences. The first audience is children ages 3-13, as well as librarians, teachers, parents, and caregivers who work with them in various *reading* contexts and situations. The second audience is that of international scholars and researchers working with children's *literature* [ICDL, 2009].

[ii] The ICDL mission, as stated in the website's home page, calls our attention to the possibility of children becoming members of a global community built around the library.

[iii] On-line help is scarce and there is no specific information to attend the needs of various user profiles comprehended by the ICDL intended audience.

[iv] The library's main interface (the simple search) was designed *by* children and *for* children.

After this preliminary step, still in the preparation stage, the evaluators chose the inspection focus, defined the targeted user profile, and elaborated the inspection scenario.

The inspection focus was the Simple Search, because: almost all links in the ICDL home page lead users to this search; and it is a basic function which all users are likely to perform. The selected user profile was that of a volunteer adult tutor, with the following characteristics:

(a) regarding his/her Internet experience: the user goes to the Internet basically to send and receive e-mail;

(b) regarding his/her fluency in English: the user has only a basic knowledge of English;

(c) regarding the ICDL website: the user was introduced to the website two days ago in a workshop; and

(d) regarding his/her knowledge about other digital libraries: the user has none.

The evaluators conducted the inspection with the following scenario:

"Rafael is a student of Journalism. Last week he was involved in the University's literary week. This time, Rafael attended talks on Brazilian literature; he met personally some authors, and participated in some workshops. In one of the workshops, Rafael was introduced to the ICDL website and he signed up as a volunteer to participate in a project where some young graduating students will read on-line texts of children's literature from the ICDL collection to children between 6 and 9 years of age. Tomorrow, Rafael will be in the first meeting with volunteers, so

he decides to visit the ICDL website today. He wants to explore (or read) books in Portuguese and thus improve his understanding about the resources that the digital library has to offer. From the home page of ICDL he chooses the "Read Books" icon that leads to a simple search on the books of the digital library. Within this section, Rafael begins to explore the collection of books in Portuguese."

The five steps of the semiotic inspection method were carefully carried out by the three evaluators: an inspection of online documentation and help content; an inspection of static interface signs[2]; an inspection of dynamic interaction signs[3]; a contrastive comparison of designer-to-user meta-communication identified in the previous steps; and a conclusive appreciation of the quality of overall designer-to-user meta-communication.

Once individual evaluators had concluded their analysis, one of them consolidated all the results, analyzing the recurrence of communicative problems, as well as singular problems that entailed important communicability issues.

The consolidation of the three analyses of designer-to-user meta-communication in ICDL revealed many cases of inconsistency and ambiguity. Before we present some selected examples, it is important to show the main interactive path walked by the evaluators during the inspection. It will support our explanations and demonstrations about the website.

Figure 1. Screen shot of ICDL website home page.

On the website's home page (see Figure 1), they selected the "Read Books" icon in order to access the "Simple Search". This page is presented in English by default (see Figure 2), so the evaluators explored meta-communication in the search interface by keeping the interface language in English. The main signs explored in "Simple Search" were the interface language drop-down list (sign 1), the book category buttons (sign 2), the 'more options' button (sign 3), the book's language drop down list (sign 4), the keyword search text box (sign 5), the book's title and language (sign 6), the featured reviews (sign 7), and the featured books (sign 8). All these signs are highlighted in Figure 2. Then, the evaluators chose some books freely and explored the "About this

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2 Static signs express (and mean) the system state [5].

3 Dynamic signs express (and mean) the system behavior [5].

book" page (see Figure 3). In this page the most relevant sign for inspection is the book preview language drop down list (sign 9).
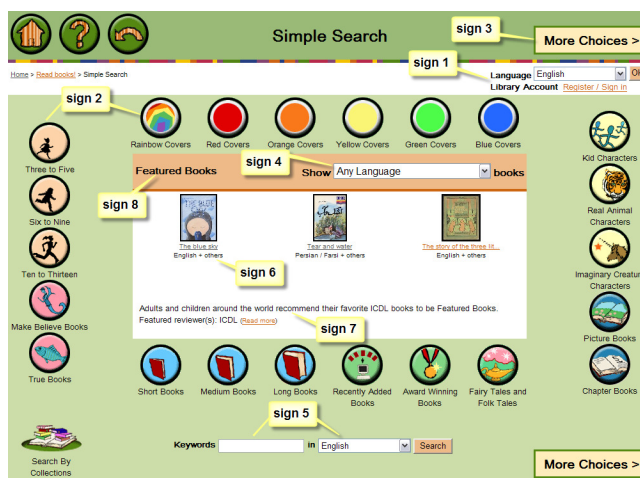

Figure 2. Screen shot of ICDL "Simple Search" with some highlighted signs.

After having done this basic inspection task, the evaluators explored the ICDL interface in many different ways, each one following distinct strategies that, as they saw it, best helped them to advocate for the targeted users of this inspection. They paid special attention to plausible situations and contexts where communication breakdowns might occur because of the designers' choice of interactive signs. Specifically, in ICDL this activity included switching to Portuguese as the interface language, book language, book details language, and language choice for a 'search by keyword'.

Figure 3. Screen shot of ICDL "About this Book" with a highlighted sign.

In the following we mention selected examples to illustrate the problems found with SIM. We classify them according to the part of the meta-communication they are related to:

a) **"Who is the user?"** The audience of the ICDL collection is very heterogeneous, but meta-communication makes no distinction between the various user profiles. In the case of this inspection the user is someone who wants to work with children and we found no signs sent directly to this type of user. Most signs we directed to a children's audience.

b) **"What does the user want or need to do?"** The metalinguistic signs tell us that users need to support and/or motivate children to become members of a global community of reading around the ICDL, but the static and dynamic signs do not say much about this. For instance, there is a static sign that reports that children and adults around the world have made revisions, and recommended their favorite books to be "Featured Books" (see sign number 7 in Figure 2). But there is no indication of how one can help or motivate children to be part of such global community.

The metalinguistic signs analysis also tells us that the user may wish to create a "Personal Bookshelf" with his/her favorite books, but there are no static or dynamic signs for this feature when the user is not logged in as a registered user. Similarly there is not a hint that this feature will be available for those who decide to become a member of the digital library (i.e. those who register).

Another evidence of possible communicability breakdowns comes from the book categories buttons (sign 2) and book's language drop down list (sign 4). The user may wish to find books through these categories, but evaluators could not find an explanation of sign 4 among the metalinguistic signs. Likewise, the analysis of static and dynamic signs found that the user may think that this sign is related to the "Featured Books" sign (see sign number 8 in Figure 2). In our scenario, Rafael may try to choose Portuguese using sign 4, hoping to see the featured books in Portuguese; however, although this interpretation is clearly plausible, this is not what happens when one interacts with this interface sign.

Besides that, the choice of categories filters not only the books, but also the other categories. The categories (presented as buttons) will not disappear, however; they will just be disabled. So, although apparently sign 4 in Figure 2 remains the same ("Show any language books"), it may not be telling the truth, because only the languages that meet constraints corresponding to the selected categories will remain on the list.

c) **"In which preferred ways, and why"**. Regarding the language of the interface, book contents and book details, the metalinguistic signs do talk about them, but do not explain or anticipate the problems that one may have. For instance, ICDL can be viewed in 16 different languages (as described in the ICDL on-line help) and the interface is presented (by default) in English. Evaluators analyzed some distinct interactive ways and found that the user may not always realize where or how he/she can use it. For example, sign 1 (see Figure 2) has a definite function – to 'switch the interface language to X', but the user may think that it this choice is actually related (or extends) to the book language as well (which is not the case). Besides, the languages listed when the user activates sign 1 are shown in the current interface language. For example, if the current language is Portuguese, all the available languages are presented in Portuguese (e.g. 'Inglês', 'Tailandês', and 'Chinês'). But, suppose someone inadvertently chooses a very uncommon language that he or she cannot understand, say Thai. How can he or she choose 'English' on the language menu if all is written in Thai characters (like all the rest of the interface, by the way)? Additionally, sign 1 has another problem: after selecting a language the user has to confirm selection by clicking the "ok" button. Other drop down lists in the site work differently – no confirmation is required. So, if the user fails to realize that he or she must press OK, after selecting a language from the list and seeing that nothing happens, the user may erroneously conclude that there is no translation for selected language.

Another mismatch between metalinguistic and dynamic signs was detected when evaluators inspected the consequences of a statement in the on-line help: "For instance, selecting Spanish will change the text in the interface from English to Spanish. Note that information about individual books (e.g. title, summary) will remain in the language of the book." Firstly, because the change of interface language affects the interface text, the book metadata, the language of the keyword search, instead of remaining the original information about the book (as described in the on-line help). Secondly, because when there is no book metadata (or it is not complete) translated into the chosen interface language, the book title is presented by default in English. Figure 4 shows what happens when the user changes the interface language to Portuguese: one book has its title in English while the others book titles was changed to Portuguese.

O Céu Azul
Inglês + others

Tear and water
Persa / Farsi + others

A estória dos três porquinhos
Inglês + others

Figure 4. "Featured Books" after the user changed the interface language to Portuguese.

Of course the user will realize these changes have occurred, but he/she might not understand why there are such differences. The user may also interpret that those books whose title were translated are also available in Portuguese, whereas others are unavailable. However, these are not related to the availability of the book content in this or that language. Translations are shown or not depending on whether the book's metadata are translated into Portuguese, or not. The title of the first book, for example, "O Céu Azul", is translated into Portuguese although the book is available only in English, Croatian and Italian.

A book is written in a language and could be translated into other languages. ICDL shows different signs in the simple search page, book details page and in the book preview page according to this situation. For example, when the sign 6 is "English – Spanish" or "English-French…" or "English/Tagalog", so in the "Book Preview" page the title will be presented simultaneously in two languages: "Angels ride bikes and other fall poems = Los ángeles andan en bicicleta y otros poemas de otoño". When the sign is, for example, "English + others", so in the "Book Preview" page the Book title is presented in English and one ore more links will indicate the other languages. Again one may have difficulties to anticipate in which languages they may read a book.

In conclusion, our appreciation of the quality of overall designer-to-user meta-communication is that with the many problems we found the users (no matter if a child or an adult) will probably have communicability breakdowns at interaction time.

The user experience will be profoundly affected due to how the language (of the interface, book and the book details) issues are related and influenced by the presence, absence and quality of book metadata. It is correct to say that the lack of control over the quality of the metadata translation that is done by volunteers worldwide impacts directly this problem. And it also confirms the necessity of a careful design in construction of the designer-to-user meta-communication.

Expectations of an adult tutor may be frustrated in the absence of support for his or her job. The user might for instance like to know what activities are being carried out

by other tutors and see comments on the books made by other adults. But, none of these options are available in the ICDL interface version we analyzed.

4. Brief Conclusion

This study presented the results from the application of the Semiotic Inspection Method to inform the redesign of multi-cultural systems. We took advantage of ICDL, a digital library which is intended to be multicultural. The very definition of ICDL reflects the reason for our choice: "ICDL is an international, multi-cultural and multi-lingual digital library, ICDL is to be shared by people of various cultures in the world through the literature" [ICDL, 2009].

The semiotic inspection helped us identify crucial aspects of the designer-to-user meta-communication. As we said, communicability problems tend to lead to usability problems, since usability tacitly requires that users 'get the system's logic through interface signs' before they can possibly learn to use them, retain them, and be satisfied with interaction. But, more central to the purpose of this study, the results from this investigation led us to realize that ICDL is not fully prepared to face the needs of users from widely *different cultures*. That is, regardless of usability problems, what we saw is that the only cultural parameter in the ICDL interface that can be changed to *adapt* to users from different cultures is **language**. However, language plays a multiplicity of roles in the ICDL domain. It refers to the language of interaction (interface language), of course, but it also refers to the language in which books are written, and the language of keywords and other metadata. Although some of these 'languages' can be manipulated independently of each other, the *logic* of using language as a cultural sign is very confusing in ICDL, and entails many usability problems.

Our next step in this research is to propose a **model** to help designers frame multicultural meta-communication problems as they design systems to be used in different cultural settings.

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