2013 13th International Conference on Computational Science and Its Applications

Using Semiotic Profiles to Design Graphical User Interfaces for Social Media Data Spaces on Mobile Phone Screens

Andre Valdestilhas
Sao Paulo, Brazil
firmao@gmail.com

Ansgar Scherp
Research Group on Data and Web Science
University of Mannheim
Mannheim, Germany
ansgar@informatik.uni-mannheim.de

Paulo Marcotti
Termomecnica College of Technology (FTT)
Caminho do Mar. Avenue, 2.652, Sao Bernardo do Campo.
So Paulo -Brazil
pmarcotti@gmail.com

***Abstract*—Providing an intuitive and user friendly interface is a challenging task. This challenge is even harder when it comes to mobile phones as such devices have limited interaction possibilities and smaller display size. The present work will develop a study about semiotic profiles as a way to improve techniques for designing graphical interfaces using large social media data spaces such as GeoNames, Eventful and DBpedia in the context of mobile phones screens.**

***Keywords*-Semiotic profile; social media; mobile;**

I. Introduction

New services for mobile phones have been developed with the aim of allowing people to create, develop and strengthen social bonds. Similarly to social networking sites on Internet [1] [1], these services can help users to build valuable networks through which it is possible to share information and resources. MySpace and Facebook both made agreements with mobile operators to develop limited phone versions of their services [16]. When going this step, one has two answer to questions.

1) How can we provide an intuitive and user friendly interface capable of exploring a big data space on mobile devices?
2) What are the limits of mobile device displays and how to deal with them?

Among the goals of this work, we are particularly concerned with developing and evaluating new interfaces for mobile devices so that they are able to examine large amounts of data in social media spaces and assessing the portability, usability and technical constraints of applications in smart mobile devices such as smartphones, tablets, among others. Bearing these challenges in mind, we suggest semiotic profiles in order to find ways to develop and evaluate novel user interfaces for mobile devices.

II. Mobile Phone Screens

According to Nipan [9], the screen size of a typical mobile phone is approximately 1.65 inches diagonally, comparing with the screen size of a PDA (2.75 inches), laptop (12 inches), desktop computer (17 inches), television (25 inches), projectors (100 inches) and theatre screens (50 feet). There are two underlying reasons why considering screen size as a problem, the human visual perception system and human attention [6]. Human visual perception not only limits the level of small detail that can be grasped as it also affects users' attention span. To deal with this problem, users can zoom in to make images and videos bigger. However, in this situation, users have to mentalize all the visual information and build up an impression of the whole picture. Their ability to do it will be limited by the capabilities of human attention span. What if a tailor-made video, created to suit television screen, had to be delivered on a mobile phone?

A study carried out by Knoche [4] suggested that screen size affects the quality of viewers' visual experience as well as their perception and attention, when delivering television programmes on mobile phone. The study also suggested that mobile TV programmes such as football and soap operas should be tailor-made to screen environment with extensive use of close-ups to raise viewers' quality of experience.

There have been suggestions that screen size is critical to the success of effective learning [10,12]. This idea is also supported by an empirical work that has already demonstrated that screen size can affect the general usability of a mobile device [14,2,7]. However, no other work has specifically investigated the effect mobile device screen sizes have on video-based learning.

Tailoring content for mobile phones may be a solution, but there are no such algorithms or guidelines to convert already existing television programmes into mobile viewing format [9]. Mobile phone operators are investing considerably in the delivery and design areas for mobile video content [13], but there is no such investment made by some institutions to adapt your videos designed for mobile environment.

III. The Semiotic Profile

According De Souza [3], it is largely agreed that usability and user interface design emphasize behavior and presentation of interface elements rather than their meaning, a typical case in which a semiotic approach would positively intervene.

978-0-7695-5045-9/13 $26.00 © 2013 IEEE
DOI 10.1109/ICCSA.2013.45

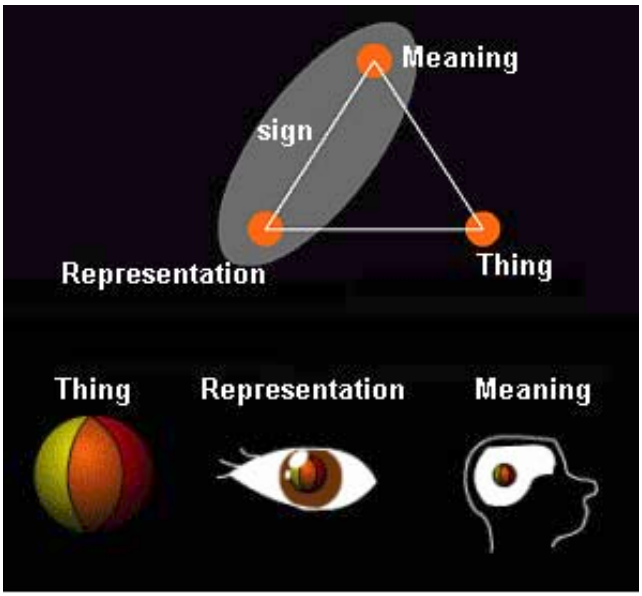

Figure 1. This version of the semiotic model is adapted from the work of the American philosopher Charles S. Pierce [11].

The Semiotic Engineering [3] goes further and proposes a theory for Human-Computer Interaction (HCI) in which the designer"s role is as important as the user's because they are both ends of a two-way communication process. The theory supports the practice, creating epistemological tools to improve communication between the designer and the user via interface. Unlike the main surveys that focus on HCI, the analysis of interfaces behavior has mostly to do with content. Mullet and Sano [5] contextualize Semiotics in the graphic design of interfaces, but restricts its application to the creation and evaluation of interface elements, how Figure 1 shows.

The model is most often represented as the semiotic triangle [11]:

- Representation (sign): something which is perceived, but which stands for something else,
- The concept (Meaning): the thoughts or images that are brought to mind by the perception of the sign,
- The object (Thing): the "something else" in the world to which the sign refers.

But there is a problem identified by the term unlimited semiosis [11] which is to be obtained where the meaning of significance and so on.

In a similar way, it is also important to discuss how semiotic profiles help us to develop and evaluate new interfaces for mobile devices so that they can explore large amounts of data social media spaces.

Figure 2. Icons. From Free Icons [17].

Figure 3. Examples of indexes.

IV. SEMIOTIC PROFILE IN GRAPHIC INTERFACES ON LARGE SOCIAL MEDIA DATA SPACES FOR MOBILE PHONES

To specify a friendlier graphical interface, we can use semiotic profiles which, according to Peirce [11], originate from three types of signals, as follows:

A. *Icons*

A clear representation of the object itself that keeps its characteristics. There is no distinction between the icon and the real object [11]. Examples are photographs, drawings, imitations, and other onomatopoeia, shown in Figure 2.

B. *Index*

They indicate something. The index is related to its meaning (not arbitrary), but unlike the icon, it is not the object itself. As an example, we can say that smoke indicates fire, smiles indicate happiness, the smell of fresh coffee in the morning indicates the preparation of the breakfast. Even medical symptoms and measuring instruments are indexes, because they represent something, shown in Figure 3, as follows [11]:

C. *Symbols*

According Pierce [11] they have no resemblance to the actual object; symbols are results of convention. A symbol can only make sense if the person already knows the agreed meaning. It is then a matter of culture and prior knowledge. We all know that a dove represents peace, but there is no actual connection between the animal and peace. Letters and words are examples of symbols. The graphic sign

Figure 4. Examples of symbols.

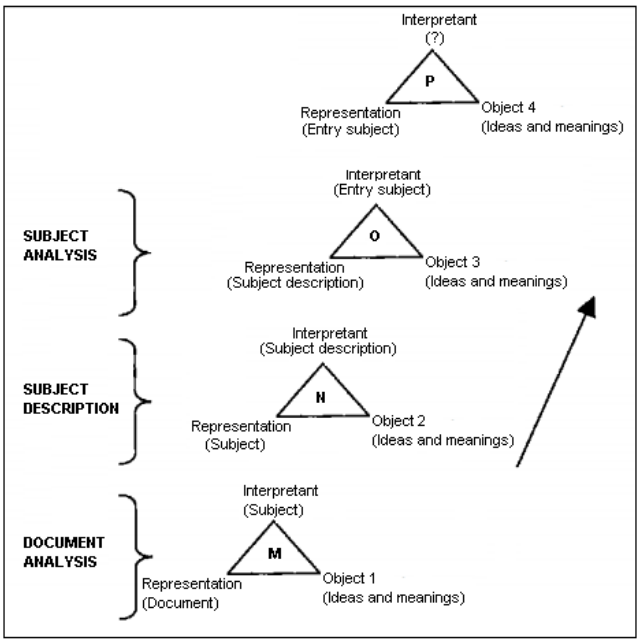

Figure 5. Semiose Index [8].

(words) has no direct connection with the thing itself, but to each culture, they make sense. In our culture, mourning is represented by the colour black, but it changes from culture to culture, following some examples, shown in Figure 4:

It is believed that the problem of unlimited semiosis can be avoided by using a certain limit, and this limit should be the moment when signs are understood by the user, according an idea presented by Mai [8].

The semiotic model of indexing presented in the Figure 5 is only a representation of a larger process; each triangle is a sign that constitutes an element in the process of unlimited semiosis. The clear distinction between elements and steps of indexing collapses because there are no precise bounding lines to separete elements and steps [8]. It is important to remember that when the index performs indexing, it does not distinguish elements and steps, everything is done almost simultaneously from the standpoint of semiotic.

The unlimited semiosis semiotic model presented in [8] contributes directly to studies on thematic treatment of information. Through this model, the interpretive process is revealed, showing what happens when indexing and when users get in contact with their final products. We can conclude that even without guidelines based on the document structure or a formalized standard (manual) to perform the indexing of documents, based on the semiotic model, it is possible to understand how the process actually occurs.

Applying the same process to the development of graphical interfaces for mobile phones, one can draw a semiotic profile for them, providing a thematic treatment while indexing.

V. Choosing the Signs

According to Valente [15] an important step in the Semiotic Engineering of the mobile phone interface is to choose the appropriate signification system(s) that user and designer will use to communicate with each other, excluding systems that just rely on visual representations. Choices of signification systems must be based on cultural conventions associated with the messages that have to be communicated on mobile phone screens.

Failing to do so will require users to learn an unfamiliar and arbitrary signification system to manipulate the mobile phone, which is surely a source of usability problems. We have resorted to mobile phone screen interfaces, which often apply such cultural conventions as ancillary reinforcements to communication. For example, to increase the perceived sensations and emotional setting in the mobile phone screen, sound and music may be used, as well as tactile signs of different sorts. The role of cognitive metaphors is particularly important to compose this setting.

VI. Conclusion and Future Works

The construction of a graphical user's interface indexing, using semiotic profile concepts, can improve the organization of information in large data spaces for social media mobile phones. To provide an intuitive and user friendly interface for exploring an area such as complex data is a challenging task. Yet, given not only the reduced size of mobile devices but also their limited possibilities of interaction, the proposed research may be an interesting direction of future research

A. Future works

Expected as future works are:

- An analysis of portability, technical demands and usability of existing applications to access the portals of commercial content considering their access via mobile devices.
- An assessment of the impact of mobility and usability in the context of smart-phones applications.
- Provide a prototype or mockup to help explain the idea of this work.

ACKNOWLEDGMENT

To Termomecnica College of Technology for financial support.

REFERENCES

[1] Boyd, D. Friendster and publicly articulated social networking. In proceedings of the ACM CHI Conference on Human Factors in Computing Systems, ACM Press (Vienna, Austria, 2004), 1279-1282.

[2] Chae, M., and Kim, J. Do size and structure matter to mobile users? an empirical study of the effects of screen size, information structure, and task complexity on user activities with standard web phones. vol. 3, Behavior Information Technology (2004), 165-181.

[3] De Souza, C. S. The semiotic engineering of human-computer interaction. MIT Press, Cambrige, 2005.

[4] H. Knoche, J. M. . M. S. A close-up on mobile tv: The e ect of low resolutions on shot types. vol. 4, Proceedings of EuroITV (Athens University of Economics and Business, 2006), 359-367.

[5] K. Mullet, D. S. Designing visual interfaces: Communication oriented techniques. Prentice Hall, 1995.

[6] L. Chen, X. Xie, X. F. W. M. H. Z., and Zhou, H. A visual attention model for adapting images on small displays. vol. 4, ACM Multimedia Systems Journal (2003), 353-364.

[7] M. Jones, G. Marsden, N. M.-N. K. B. K., and Buchanan, G. Improving web interaction on small displays. Proceeding of the 8 t International Conference on World Wide Web (1999), 1129-1137.

[8] MAI, J.-E. Analysis in indexing: document and domain centered approaches. In Information Processing and Management: An International Journal, vol. 41 (2005), 599-611.

[9] Nipan Maniar, Emily Bennett, S. H.-G. A. The Effect of Mobile Phone Screen Size on Video Based Learning. vol. 3, Journal of Software (JSW, ISSN 1796-217X) (2008), 51-61.

[10] Papanikolaou, K., and Mavromoustakos, S. Critical success factors for the development of mobile learning applications. Proceedings of IASTED Conference on Internet, Multimedia Systems and Applications (2006), 19-24.

[11] Peirce, C. S. Semiotic. No. 2. Perspectiva, So Paulo, 1995.

[12] Shudong, W., and Higgins, M. Limitations of mobile phone learning. Proceedings of the IEEE International Workshop on Wireless and Mobile Technologies in Education (2005), 179-181.

[13] Sodergrd, C. Mobile television technology and user experiences. VTT Publications (2003).

[14] Sweeney, S., and Crestani, F. Effective search results summary size and device screen size: Is there a relationship? vol. 4, Information Processing and Management (2006), 1056-1074.

[15] Valente, L., Souza, C. S. d., and Feij A, B. Turn off the graphics: designing non-visual interfaces for mobile phone games. Journal of the Brazilian Computer Society 15 (03 2009), 45-58.

[16] Yuan, L., and Buckman, R. Social networking goes mobile: Myspace, facebook strike deals with cell companies. The Wall Street Journal (2006), D1.

[17] Free Icons. Disponible at: http://br.freepik.com/. Acessed at May 30 th. 2013.