APLYING COLORS BASED ON CULTURE KNOWLEDGE TO MOTIVATE COLLABORATION ON THE WEB

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Abstract: Collaborative and Participatory work via Web tends to increase due to teams of professionals' needs in accomplishing tasks separated by distance and time, which demands more effort and stronger commitment from each person. In this context, it must be considered cultural differences, which interfere with the performance of each individual and either promote or deny the communication intended for the group. This paper aims to discuss a multidisciplinary analysis about colors and stimuli in computing environment using Common Sense knowledge, considering the cultural association people make between colors and actions, emotions and objects, showing how it can motivate users to access and participate in collaborative tasks through stimuli using color symbolically built in the culture.

1 INTRODUCTION

With globalization and the need for fast communication without fixed places and time, the use of the Internet and Web tends to become more and more usual, creating the easiness of exchange information and users` collaboration via Web. New technologies have changed the ways in which people interact and collaborate in a distance. The users can be connected to the net and practice new ways of collaborative work (Schümmer et al., 2007).

As a result of such situation, the tendency is that more and more Web applications are designed to be used by more than one user in a collaborative way. The developers of collaborative work applications via Web should try to understand what motivates the users to engage and as well as to create a virtual environment that it makes possible the individual satisfaction to work with their applications in a productive way.

For such satisfaction, one of the main subjects chosen in this research is the application of colors in the Web project, essential for visual communication, that can reinforce or not the communicative intention. Colors can help the developers to highlight important points, as well as facilitate the content reading and increase the satisfaction and the user's engagement. It is important to study and to understand which are the values aggregated to the colors, once those values can be interpreted, and so that can vary from culture to culture.

The promotion of universal access to information comes from respect to culture, facilitating through the colors and their meanings the access to information and knowledge contextualized. This article offers a multidisciplinary analysis about colors symbolically constructed in culture to the development of Web applications that encourage collaborative work participatory. The significance of color is an issue that will be explored here considering the cultural context, represented by knowledge of people's common sense and what they associate with each color, with respect to stimuli, emotions and actions. This work considered people with normal vision, i.e. people that see the colors. The common sense knowledge to be used in this work comes from the Project Open Mind Common Sense Brazil (OMCS-Br) knowledge base (www.sensocomum.ufscar.br).

This paper is organized as follow: section 2 points Systems that support computer-mediated-human interaction; section 3 shows Motivation for the engagement in activities; section 4 presents Common sense knowledge to represent culture; the

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section 5 shows Colors classification; section 6 presents Colors and Emotions; section 7 shows Classification of Emotion, objects and actions according to the colors of common sense; section 8 brings some conclusions and future works.

2 SYSTEMS THAT SUPPORT COMPUTER-MEDIATED-HUMAN INTERACTION

There are three aspects that should be considered in the project of applications that support human-computer-human interaction (HCHI): (I) the core of the definition is the group, where the computing applications have the purpose of creating a solution that satisfies the users' needs; (II) the interaction of the group; (III) the process of the interaction should be supported by the application, being like this, the application should play an encouraging part to stimulate the interaction among the people, even at the distance. These are the objectives considered in this work which aims to achieve with the colors multidisciplinary analysis based on common sense knowledge, the promotion of information comprehension considering cultural aspects, facilitating, through the colors and their meanings, the collaborative work.

Huatong Sun (2001) quotes examples to demonstrate the importance of cultural aspects in interaction projects, such as: interface elements (the Brazilian users like vibrant colors and pages with many figures, and the Germans prefer organized links in alphabetical order); the cultural symbols (the Brazilians and Chinese feel comfortable when they see figures on their cultures - Sugar Loaf and lotus Flower); and the way of showing cultural symbols (the Germans prefer textual components, whereas the Brazilians and Chinese prefer colourful visual components). Even considering the importance of those subjects, developers still have difficulties in obtaining support to their research regarding to the interaction projected according to the users' culture.

3 MOTIVATION FOR THE ENGAGEMENT IN ACTIVITIES

In the literature, it is possible to find different definitions for the term "motivation", but all have a common meaning: motivation is a personal internal force to generate movement and it is a temporary need, and it only exists while such force persist (Bueno, 2007).

Motivation at the work environment has been studied since 1900 (Salgado, 2005). One of the best contributions for the area was the book "Motivation and Personality" written by Maslow (1954) with postulates that all humans have needs that lead them to satisfaction and motivation, as shown in Figure 1.

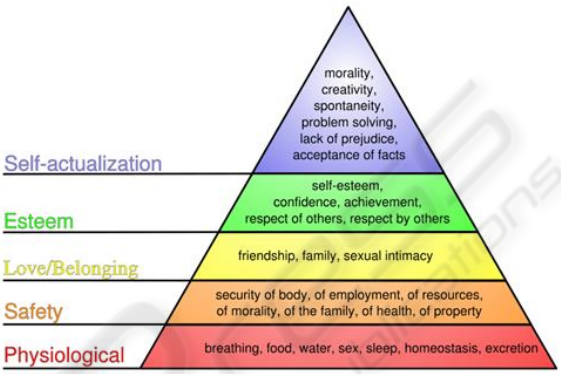

Figure 1: Maslow's need hierarchy (Maslow, 1954)

According to Salgado (2005), Maslow has structured the human necessities in a hierarchy, such that to satisfy one level (self-actualization) it is required to satisfy all the previous ones and the most basics ones should be resolved first. However, in agreement with Henry Murray apud (Novaes, 2007), necessity factors can act in a disordered way, according to the different personality` characteristics of each individual, which can be achieved simultaneously, without a rigid hierarchy.

The colors are related to people's emotions because each person attributes certain meanings to a certain color, what stimulates or inhibits their desire and degrees of satisfaction. If a person gets motivated by a color, he will possibly be able get to accomplish Maslow`s hierarchy of needs.

An example that can be mentioned in the Physiology level is that if a person feels good, happy and motivated to do something in a collaborative site, he will not fall sleep. Assisting the physiologic needs, the body safety will be assisted, since depends in parts on basic needs (Safety). When people feel safe, they can have good relationships, either with the family or friends (Love/Belonging). From this wealthy relationship, people will feel better, more valued, tending to respect the others and himself/herself (self-esteem). Consequently the person can reach the first level of the Maslow's need hierarchy which is personal accomplishment during the developed activity, through creativity, spontaneity and detachment for contribution that can

be only achieved when somebody feels good with himself/herself.

3.1 Motivation in the Organization

With the globalization and technological progress, competitiveness among the organizations has increased, the need for continuous training has been necessary and the processes of industrial automation have been activated. Besides that, the demand for better acting as collaborators' competence becomes vital. So, organizations are always looking for alternatives to motivate their collaborators, intending to provide a better organizational environment and a positive performance of their participant.

It is fundamental for the success of any organization to have collaborators stimulated to reach goals so that the expected and planned results are reached and even overcome with good will and satisfaction, because only after knowing the sources of motivation of those involved is that one can achieve additional, because the success of any organization involves, undoubtedly, the level of their collaborators' motivation (Novaes, 2007).

Bueno (2007) says that human motivation has been one of the biggest challenges in organizational administration for many psychologists, teachers and executives. Some researches and theories have been elaborated and have been trying to explain the operation of this force apparently mysterious, or even unknown that leads people to act in order to reach their objectives. When a person follows a goal, he is not necessarily motivated to reach this goal. The factors that make him to follow that direction can be intrinsic (internal) or extrinsic (external). When they are intrinsic, there is motivation; when they are extrinsic, there is either movement or satisfaction (Bueno, 2007).

It is important to remind that the differences among people make difficult the definition of universal parameters that organizations can use to motivate people in the same conditions. There is always a subjective component in motivation that is complex, related to culture and individual values. For that reason this study will be taken into consideration the common sense knowledge base of OMCS-Br Project to try to soften that inequality of conditions, as well as to provide solutions to assist each individual's cultural values involved in the collaborative task, considering his/her community.

4 COMMON SENSE TO REPRESENT CULTURE

OMCS-Br Project (Anacleto et al., 2006) explores the Web as a way for collaboratively constructing a common sense knowledge base, counting on contributions of Brazilian volunteers' statements. Common Sense is defined here as a group of facts known by most people, "including a wide part of human experiences, knowledge on special, physical, social, temporary and psychological aspects involving daily experiences of humans" (Liu et al., 2004) and that express of a certain group's culture.

OMCS-Br Project can contribute to overcome difficulties that many developers have to obtain support from researches regarding the target user's culture designed for collaborative environment. This project, to support this research, has been collected information about what people think of certain colors, what they remember when they see a certain color, or which color people associate with certain concepts presented. Currently, there are seven templates used on OMCS-Br Project to collect common sense knowledge on colors, objects and emotions (Dias et al., 2009): Five templates (1-5) for colors and objects, and three templates (6, 7, 8) for colors and emotions according to table 1.

Table 1: Templates of common sense knowledge collecting related the colors, objects and emotions.

No	Templates
1	(object) | **makes me remind of color** | (COLOR NAME)
2	(*color image*) | **makes me feel like** | (OBJECT)
3	(*image color*) | **reminds me of a** | (OBJECT)
4	(color name) | **makes me remind of a** | (OBJECT)
5	(color name) | **makes me feel like** | (OBJECT)
6	**Color** (*image color*) | **makes me feel** | (EMOTION)
7	**When I am** (emotion) | **it reminds me of color** | (COLOR NAME)
8	**Color** (*image color*)|**makes me remind of color** |(COLOR NAME)

According to templates in Table 1, it is observed that there are three tables in the database, a table to stores complete sentences entered by the site (Table entries), a table for emotions (Table emotion), another for names of the colors (Table colors) being the images of colors generated randomly. The outstanding words with capital letters are typed by the users and feedback in other templates, the underlined words are the words originated from of other templates and the words in italic are generated randomly. An example is presented in Figure 2.

Figure 2: Example of feedback in Templates.

In this example, there are two templates. The first is the template 6 of Table 1 that collects emotions that serve as feedback for the second template, which is the number 7 in Table 1. From Figure 2, is perceived as such knowledge is collected for Common Sense which is used in the review process. To learn how these data are organized so they can be used the next section deals with the classification of colors.

5 COLOR CLASSIFICATIONS

The human eye is able to discriminate perception of thousands of different colors, but the language display a limited number of basic terms of color. According to Berlin and Kay (1969), every language that has words for colors, uses from two to eleven basic terms, and the colors not included in these terms, are considered variant colors.

The emergence of the basic terms for color follows a natural logic. This logic is composed by several evolutive trends, in particular: 1) from general to specific, i.e., from light/dark distinction to tone discrimination, 2) from the more evident the less - for example, red before other tones, 3) from the simple to the complex, i.e., from the isolated colors for mixed ones (Sahlins, 2004). The basic terms for color are the result of social use of color not only to mean objective differences of nature, but also communicate significant distinctions of culture.

This work uses the classification suggested by Berlin and Kay (1969). The eleven colors spoken by Brazilians are: yellow, blue, white, gray, orange, brown, black, pink, purple, green and red. As shown in Table 1, template 8 on common sense knowledge collection site has been developed to confirm, through common sense that people express themselves using a few names of colors when they see various shades of them. Some data already collected by template 8 can be seen in Figure 3:

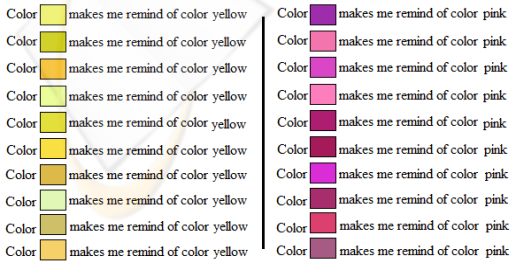

Figure 3: Example of data collected by the OMCS-Br Project site

6 COLORS AND EMOTIONS

It is known that the light of each one of the colors, starting from the moment that it is reflected in the eyes and processed in the mind, can affect the center of the emotions directly. However, each person answers to the color in a particular way. People tend to be attracted to some colors because of some decisive factors, such as, personality, incidental conditions of life or in desires and deeper more intimate and even unconscious mental processes. Nevertheless, Berlin and Kay (1969) report that the personal choices are conditioned to the community culture background what is considered in our research. Our focus is on the culture of the community, once it involves the individual's culture.

Colors not only evoke emotions, but also can communicate messages or transmit concepts. It is important to stand out that in any culture, colors can transmit good or bad meanings. Some authors (Pastoreau, 1997), (Silveira, 2005) mention some of those meanings for colors in the western culture: **Yellow** (color for light and heat, for sun and summer, it is associated to prosperity and wealth); **Blue** (favorite color of more than half of the western population, color of water); **Green** (color of fortune and money, nature, ecology); **Red** (color of danger, prohibition, love and passion).

According to Dias et al. (2009) from that list of meanings of the colors, then we find the need for integration between colors and emotions to a better light of the decisions of design of collaborative computing environments to be developed. The following subsections present the colors in the web and the colors based on common sense that can be used in the design of computational promoting the motivation and the importance of considering the emotions in the Web.

6.1 Colors in Web Context

According to Silveira et al. (2005), talking about colors guarantees a debate full of controversies and a lot of discussion, as it is a complex study and basically interdisciplinary. For Pastoreau (1997), it is possible to identify characteristics attributed to the culture that the individual is inserted through the study of symbology of colors, what helps the Web designer take advantage of that knowledge, besides noticing the collective meaning of colors in that community.

For Silveira et al. (2005), to use just intuition for color projects in the Web can work, but most of the time it doesn't happen. For this reason, intuition

should be used added to a lot of information and certain types or reasoning to get harmony, so that the designer doesn't take the risk of elaborating an unpleasant chromatic composition and driving the project to a no-communication between user and the system and, consequently, among people members of the collaborative work team. To decrease the chance of make a mistake, we propose to analyze the common sense knowledge from a certain community (Brazilians) and the relation among color, emotions, actions and objects. From that analysis we are going to formalize motivational patterns for Web design.

6.1.1 Colors based on the Common Sense Knowledge

From the OMCS-Br Project, it can be collected several meanings for colors related to the culture of individuals from a certain community. An example can be seen in Table 2 that illustrates the sentences built by people registered in the site.

Table 2: Examples of sentences collected by OMCS-Br Project, related to Templates 1, 2, 3, 4 and 5 in Table 1.

1	sky **makes me remind of color** blue
2	**akes me feel like** dipping in the pool
3	**minds me of a** ocean
4	light blue **makes remind a** sky
5	blue **makes me feel like** swimming

According to the sample shown in Table 2, it can be seen that blue color is related to water by most people, which can be inferred that when a Web designer will projects a site to a enterprise to work collaboratively using blue color most of the team members will tend to think in something related to water, relaxing, and comfortable due to the blue tone of the site, reflecting on the individual motivation and the group productivity.

However, the emotions wakened from that memory can hardly be inferred by people that are not specialist in psychology, anthropology or similar areas. The following subsection deals with the direct association that the people make between colors and emotions in the OMCS-Br Project.

6.2 Emotions in the Web Context

Emotion is defined as any restlessness and trouble of the mind, or feeling or passion; any vehement or excited mental state (Soto, 2005). An emotion-producer stimulus originates an emotional answer (inner reaction) that acts as a motivator stimulus that takes to an expression of the emotion which is the external reaction or emotional behaviour, as shown in Figure 4.

According to Soto (2005), emotion is the emotional behaviour or answer facing one emotional state which turns into incentive. The function of emotion is to provide to the organism the level of arousal (pleasure or displeasure experience) according to the emission of the most appropriated answer to each specific situation. Emotion predisposes people to a certain answer, alternatively: (I) to get what can be useful to satisfy the needs; (II) to avoid what can be opposed to that satisfaction.

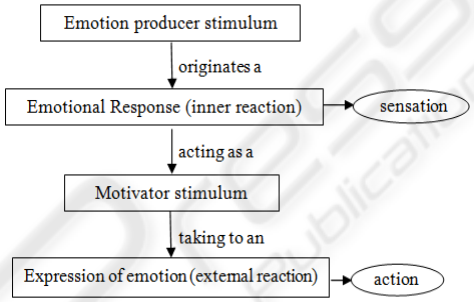

Figure 4: Reaction chain to emotion produces stimulus.

Therefore, it is noticed that emotion is an important issue in human behaviour and it assumes significant role in the motivational process. Besides, that emotion requires great level of arousal, which is the product of subsequent physiological changes to the activation of the nervous system.

6.2.1 Emotions based on the Common Sense Knowledge

Some templates have been created for the OMCS-Br Project to collect common sense knowledge related to emotion. People tend to relate an emotion when seeing a certain color and when speaking about a color they remember to feel a certain emotion. Some examples can be seen in Table 3.

Table 3: Examples of sentences collected by OMCS-Br Project, related to Templates 6 and 7 in Table 1.

1	**Color akes me feel** JOY FUL
2	**Color akes me feel** CALM
3	**Color akes me feel** QUIET
4	**Color akes me feel** JOY FUL
5	**Color akes me feel** HAPPINESS
6	**When I am** passionate **it reminds me the color** RED
7	**When I am** happy **it reminds me the color** YELLOW
8	**When I am** depressed **it reminds me the color** BLUE
9	**When I am** aggressive **it reminds me the color** RED
10	**When I am** sleepy **it reminds me the color** BABY BLUE

In table 3 it is observed that the blue colors can be related to several characteristics such as: to be cheerful, calm, depressed; while the red colors are related to passion or aggressiveness. However a wide study on the common sense knowledge base is being developed, to notice the cultural association of colors and emotions, not only personal choices.

It is known that motivation is essential for running organizations. No matter the amount of machines, equipments or activities an organization has, those elements cannot be used if people are neither motivated nor engaged in their tasks (Novaes, 2007). That is the intention here – to give some support to motivate people to get engaged into their Web-based tasks.

7 USING COLORS OF COMMON SENSE TO CLASSIFICATE EMOTIONS

To analyze the information these templates collect it is being done a classification of emotions, actions and objects. Figure 5 shows an example with the red color, where the square shows the color to be analyzed. The list of emotions that red evokes in people is show in the left ellipse. In the back ellipse, the actions that people are willing to perform when they see the red color. The right ellipse brings the objects related to the red color. See http://www.dc.ufscar.br/~ana_dias/esquema.html for all colors analyzed.

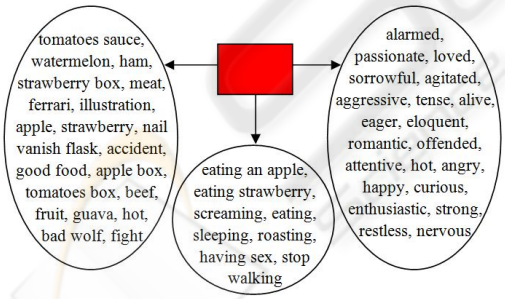

Figure 5: The red color associated to actions, emotions and objects.

8 CONCLUSION

According to the hypothesis explored in this work, individual motivation and participation in work via Web are encouraged by the application of colors in the computing environment design. Therefore, its success is achieved when other variables are considered in this application of color, exploring the cultural meanings that evoque stimulus and action. This application of colors can determine the individual`s degree of engagement and participation. We believe that information comprehension happens when culture is respected, facilitating, through colors and their meanings, the access to information and contextualized knowledge. For these considerations happen, assessments are being made from the common sense knowledge base of potential users to collaborative Web environments.

In the future, from the analysis of colors collected in common sense, this work intends to formalize Motivational Patterns, which describe social processes (intrinsic motivation) and may propose either changes or extensions to secondary tech support as it is traditional in design patterns (extrinsic motivations) (Schümmer et al., 2007). There are some formalized Motivational Patterns (Clear et al., 2005), (Schümmer et al., 2007). None of these papers, however, explore the question about the use of color in Web design for collaboration promotion, the need to consider issues involving the users` culture in collaborative work sites, as well as the correlation between these two elements - color and culture - to promote universal access to information. Additionally, this work will extend to people with some problems, such as: daltonism or others disabilities.

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