Affective aspects of web museums

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AFFECTIVE ASPECTS OF WEB MUSEUMS

The purpose of this paper is to investigate the relationship between usability and user satisfaction in Web Museums. Web museums are websites that have specific goals to meet in terms of influencing their visitors' experiences. A user experience study was conducted with 28 graduate students, in which in addition to the students' opinions on the web museum's characteristics, it was attempted to capture the satisfaction and dissatisfaction levels that resulted from visiting those web museums. These results were analyzed in order to identify correlations between users' perceptions of web museum features and their subsequent (dis)satisfaction levels. It was concluded that most users' emotions of (dis)satisfaction were influenced by their perceptions of colours, image quality and information organization. Furthermore, we discovered that the users' overall opinion of the web museum was influenced by both aesthetic design and the features/functions offered. The paper concludes with a discussion on the implications of this work and provides suggestions for future research directions.

Keywords: vertical insight, cultural-heritage communication, usability, user satisfaction.

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1. Introduction

In recent years, Art Galleries and Museums have been targeted as application areas by several Computer Science disciplines, namely Computer Graphics, Hypermedia and Human Computer Interaction. Web Museums and Art Galleries have collections of digital resources containing artistic and cultural images such as, digital reproduction of paintings, ancient books and maps, frescoes, photographs, sculptures, archeological sites, architectural designs and so on. One can easily identify the benefits from using the World Wide Web for cultural heritage communication. Web museums can provide visitors with a unique means of accessing exhibits otherwise beyond their financial means or geographic boundaries. These resources are of particular interest for teachers and students since the multimedia format of the World Wide Web supplies an easy way to learn about art, music, folklore, history, and literature.

Web museums have a number of goals that they have to meet, some of which include: to supply physical museums with extra educational and informative instruments and thus complement them, and to offer such a powerful experience that more visitors are attracted to the physical museum. Consequently, images and their quality are very important for Web museums, since they are the tools to communicate the museum's collection. There are numerous organizations around the world that invest a vast amount of resources in projects of this nature (e.g. 3D reconstruction of archaeological sites). Since the emergence of Web museums, basic questions that have been raised are: to what degree do "Web museums" offer a comparable experience to that of "physical museums" ? What is the effectiveness of Web museums in terms of evoking user satisfaction and what does this have to do with the Web museum's characteristics?

In this paper we are concerned with the latter question. The purpose here is to present the findings of an evaluation study of web museums that has been conducted with 28 graduate students. Particularly, in addition to the students' opinions on the web museum's characteristics, it was attempted to capture the satisfaction and dissatisfaction levels that resulted from visiting those web museums. These results were analyzed in order to identify correlations between users' perceptions of web museum features and their subsequent (dis)satisfaction levels.

The structure of the paper is as follows. The next section discusses some theoretical issues related to the definition of emotion in general and

the ways that emotion and cognition conjointly contribute to perception, behaviour and action in design and usability of websites. Section three presents the theoretical framework of our study, and sections four and five describe our methodology and experimental setting. Section six analyzes and discusses the findings of the correlation experiments and finally, the last section considers the implications of this work and provides suggestions for future research directions.

2. User Experience and Emotions

The field of usability has its roots in a combination of cognitive sciences - psychology, computer science, and engineering (Norman 2004). Traditionally, in the cognitive sciences, the focus and value were almost exclusively placed on cognition and reason; affect, emotion, feelings and the like were deemed as "distracters" and therefore clear thinking required that emotions be eliminated (Calhoun & Solomon 1984). As a result, many cognitive theories established a clear dichotomy between cognition and emotion and submitted emotion to the authority of cognition.

However, the cognitive sciences and neurosciences have made groundbreaking advances in the past decade and have demonstrated that emotion and cognition cannot be separated but they conjointly contribute to perception, behaviour and action (e.g. see Damasio 1994, 1999; LeDoux 1998). For example, it has been found that positive emotion broadens the thought processes, making people more tolerant to minor difficulties and more flexible in finding solutions; on the contrary, negative emotions focus the mind, leading to better concentration but less flexibility in finding solutions (Ashby, Isen & Turken 1999).

Emotion is nowadays considered to play a critical role in design and usability, as aesthetic and other affective aspects of design and usability become major competitive factors in the market economy (Jordan 2000, 2002; McDonagh et al. 2004; Norman 2004). Not surprisingly, then, emotion is recognized as one of the strongest factors in user's experience of the web, because of its influence on one's perception and navigation of websites (Norman, Ortony & Russell 2003; Diaper & Stanton 2003). For example, a well-organized, functional and "appealing" website influences one's feeling of trust, perception of security and usability, and sense of credibility (Dillon 2003; Kim, Lee & Choi 2003; Kim & Moon 1998; Schenkman & Johnson 2000). Thus, emotion is inextricable to a user's motivations and expectations, because as one explores a website he/she

tries to achieve a desired cognitive and emotional outcome. The importance of a user's perceptions in navigating the web is also supported by Bandura's (1986, 1997) key ideas which emphasize that self-efficacy beliefs are critical factors of how well knowledge and skill are acquired. This theory is consistent with the view of many well-known theorists and philosophers who have argued that self-efficacy beliefs influence perceptions and evaluations of experiences (e.g., William James, John Dewey, Abraham Maslow).

It becomes then necessary to explore how the field of web design can take advantage of such ideas in order to promote positive affective and increased self-efficacy to the user. Although it is widely acknowledged that emotional and aesthetic factors are important in web design and human-computer interaction (Brinck, Gergle & Wood 2002; Nielsen 2000), there is hardly any systematic research on the complexity of the interrelation between *web usability* and *affective factors*. Most research focuses on cognitive functions of web pages (Kim et al. 2003). According to Kim et al. (2003), very few studies have focused on the emotional aspects of web pages. Thus, there is a clear need for studies that (a) identify the usability factors that are used to elicit emotions and (b) explore the relations between the usability factors and the emotional dimensions of navigating web pages. We hope that our research project in this study will contribute towards this direction. In particular, the affective factors we are interested in exploring are focused on the notion of *satisfaction* and *dissatisfaction* (see below). Thus, when we refer to "affective factors" in this paper, we will particularly refer to the (dis)satisfaction levels of the user's experiences (likes and dislikes), because satisfaction (as a positive *emotional* response) and dissatisfaction (as a negative *emotional* response) constitute major factors of emotional usability, more generally.

3. A Conceptual Framework of Studying Affective Factors in Web Design

For the purposes of this study, the following definitions are advanced. First of all, it is useful to make a distinction between "emotion" and "attitude," since emotions and attitudes can have different meanings (see McLeod 1992). Attitude is generally defined as a predisposition to respond in a favourable or unfavourable way with respect to a person, an object or an idea (Hart 1989). This definition has three components: (a) the emotional response to the object, (b) the behaviour toward the

object, and (c) beliefs about the object. In other words, this definition suggests that emotions contribute to attitude formation; they are not attitudes. Attitudes refer to a total situation that involves emotions, beliefs and behaviours. Another distinction between attitudes and emotions is that the latter are relatively short in duration whereas the former are often long-term (McLeod 1992).

Also, throughout this paper, we have decided to use the term *emotion*, rather than *feeling*, or *affect*, although occasionally we use those terms for reasons that are made clear in the context that we use them. Our rationale for using the term "emotion" is primarily because we wish to make a distinction from "feeling" which in psychological scholarly circles refers to the bodily and sensational experiences of an emotion (feelings *of*, feelings *for*). *Affect* is a more general term and is usually employed to refer to a variety of concepts and phenomena including feelings, moods, motivation, and emotions.

Based on the above definitions, emotions are essentially an individual's *evaluations* of events, objects and people (Ortony, Clore & Collins 1988; Stocker 1996). Emotions provide evidence for what one values: for example, one's guilt at not paying his/her taxes provides evidence for what this individuals values, that is, it shows that (s)he thinks (s)he ought to pay them. Our claims about the structure of particular emotions (e.g. anxiety, frustration, enjoyment etc.) is that *if* an individual *perceives* a situation in a certain way, *then* the potential for a particular emotion arises (without assuming that the opposite does not happen, i.e. it is also true that an emotional response colours one's perceptions of an event, see Ortony et al. 1988). We do not attempt to specify the mechanisms that determine this process; this is a more general and complex problem for cognitive sciences and it is not specific to the study of emotions (e.g. see Frijda, Manstead & Bem 2000; Ortony et al. 1988). Our goal in this project is to contribute to an exploration of affective factors in web design through the development of a computational model of emotion (similar efforts have been going on for some time in the field of artificial intelligence and affective computing; see, e.g. Picard 1997).

In particular, our interest here is to examine a user's *emotional responses* - focused on the levels of satisfaction or dissatisfaction - associated with web design. *Satisfaction* refers to a user's emotional response to a particular web design and is a function of the *perceived* relationship between what one wants from a website and what one *perceives* it is offering to a user. In other words, it involves a user's *perceptions* of a website - e.g. his

or her mental effort, attention distribution, cognitive overload - and a user's *emotional responses,* as a result of these perceptions - e.g. his or her positive or negative experience (i.e. satisfaction or dissatisfaction) from interacting with a website; to what extent the user feels able to influence the interaction experience (feeling of control); and, who is perceived to be at blame for positive/negative experiences from interacting with the website. Such emotional responses are primarily rooted in evaluations of *appealingness* - momentary reactions of liking or disliking (Ortony et al. 1988). Satisfaction or dissatisfaction thus derives from how a user perceives the characteristics of a website as well as what emotional reactions these characteristics create to the user.

4. Capturing Emotions

Generally, emotion computing involves techniques from signal processing for capturing facial features or the intonation of voice and then inferences about the underlying emotional states. Techniques beyond human perception have also been used, such as an infrared thermogram.

In the current study, we have considered a much simpler way of capturing emotions: we have constructed a questionnaire. The questionnaire we have designed involves both perceptual and emotional aspects related to virtual visits in museums. The questionnaire is filled up upon the completion of the visit and involves questions about objective observations of elements of the website; the responses to these questions represent the user's *perceptions*. The questionnaire also includes questions that elicit subjective responses; these responses provide indications for the user's emotions and in particular, the satisfaction and dissatisfaction levels. Based on the theoretical framework we have described earlier, we distinguish between *perceptions* and *emotions* because we wish to discover the relationship between particular perceptions and particular emotions, so that we can form rules of the kind: *if* perception(i), *then* emotion(j), that is if a certain perception is present it elicits a certain emotion. We have distinguished questions (see Table II) that refer to perceptual end emotional elements of a website according to the following Table I:

Table I: Perception versus Emotion Questions

Perception, related questions	Emotion, related questions
Questions 1-32	Questions 33-37

5. Experimental setting

A web museum does not constitute a copy of the physical museum, in the sense that the two serve different goals. The physical museum visitor will engage in a series of activities, such as locating the museum, planning a visit, conducting the visit and looking back at the visit. A web museum's main goal is to attract the visitor to conduct an actual visit, but sometimes also to offer services following the actual visit, such as allowing the purchase of gifts online.

The questionnaire (see Table II) that was designed for the experiment described in this section, and specifically questions 1-6, aimed at identifying whether the web museums that were studied met the minimum requirements (in the form of features offered) to reach the aforementioned goal. The remaining questions, as mentioned in section 4, aimed at recording user perceptions on more specific usability issues, as well as emotional responses.

Participants

The total number of students who responded to the survey was 28 (15 males and 13 females). All of them attend an MSc programme on e-learning technologies. Most of them are school teachers of different specialities (from language teaching to technology education) in public schools, while some of them work as tutors in private schools. Due to the diversity of their interests, both professional and personal, we had to offer them access to a variety of web museums in order to meet their preferences.

All participants were well aware of usability issues of interactive systems, since they had already attended an advanced course on Human Computer Interaction. The motivation of participants to give their best in this study was a promise of one additional mark to a course in the MSc programme. Finally, participants had also experience in working in groups; therefore, it was not difficult to form groups of participants for the synergetic task of the evaluation study.

Tasks

Taking part in the study of user experience of web museums, participants had to put individual effort as well as collective effort. Each participant had to choose three (3) out of 24 candidate museums (see appendix for a complete list of the museums) without accessing its website. We wanted to ensure that each participant had no prior idea of the quality of the web museum.

The participants were subsequently asked to assume that they wanted to physically visit the particular museums and for that purpose they needed to know:

- Where the museums are located (i.e. their addresses),
- Opening times,
- Permanent exhibitions,
- Current exhibitions, and
- Whether they could get a tour, and how (e.g. contact number)

Moreover, they were asked to browse through the website to identify sections that would interest them the most, as well as to get an idea of the museums' collections and items. Participants had been encouraged to use the search facility to quickly find what they wanted, as well as to keep notes for the things that they liked or disliked. The aforementioned tasks aimed to cover the basic and most important functions that web museums have to offer their visitors.

After accessing and browsing through the website of each museum, the participants were asked to fill in an online questionnaire (found at http://cosy.ted.unipi.gr/survey3/) which is analysed in the next section.

Concerning the collective task, groups of three participants were formed and arranged a meeting in order to exchange experiences and write a report (between 500-1000 words) about the nicest, most functional points of the museums visited. Not all members of a group had chosen the same triad of museums, since we wanted to extract general principles of web museums usability and not of specific museums.

Table II: Extract from the questionnaire given to subjects

I. General questions
(Answer List: *Yes, it was easy; Yes, but it was difficult; I found something, but I am not sure that's it; No, and I am sure it is not available*)

1. Were you able to find the museum's address?
2. Were you able to find the days/times it is open?
3. Were you able to identify the museum's permanent exhibition/ collection?
4. Were you able to identify the museum's current exhibition?
5. Were you able to find out whether you can get a tour and how?
6. Was there a search facility?

II. Specific questions
(Answer List: *Strongly Disagree; Disagree; Neutral; Agree; Strongly Agree*)

7. I felt that the colours used on this website were not appropriate.
8. The colours used were distracting.
9. The colours used seemed to be related to the theme of the museum.
10. This website lacked colour.
11. The colours used were depressing.
12. This website was very suitable for a web museum.
13. My first impression from this website was that it was very complex.
14. Important information was very difficult (or impossible) to locate.
15. Information on the website was organized in a very logical way.
16. I found it easy to follow the various links and acquire the information I needed.
17. Images on the website were too big in size and took a long time to download.
18. Images were too small to see the artefact properly.
19. The image quality was excellent.
20. There were not enough images on the website to give a good idea of the museum's collection.
21. I think that images are the most important feature of a web museum.
22. I particularly liked the animated images that were included in the website
23. The website had virtual tours of the rooms of the museum.
24. I did not like virtual tours.
25. I enjoyed the additional features that were available on this website.
26. This website was also educational.
27. I learnt so many things from the website that I do not need to visit the museum itself.
28. The website made a bad impression on me and so I changed my mind about visiting it.
29. It was so interesting that I spent more time than I thought I would.
30. Overall, this was a very good website.
31. This website was dull
32. I would visit this website again to find out what's new.

III. Satisfaction Questions:
(Answer List: *Highly Dissatisfying; Dissatisfying; Neutral; Satisfying; Highly Satisfying*)

33. How satisfying did you find the aesthetic design of this web museum?
34. How satisfying did you find the features/ functions offered in this web museum?
35. How satisfying did you find your interaction with this website?
36. How satisfying did you find your capacity to gather the information you needed from this website?
37. How satisfying did you find the amount of mental effort required to navigate through the web museum?

6. Correlation Experiments

We investigated the interrelationships of certain questions (from Table II). The mining of significant interrelationships aims to discover which questions influence which ones. Significant interrelationships do not necessarily occur between pairs of questions, but it is often the case that a bunch of questions influence one another. Complex interrelationships such as these can be expressed in a rule form which has an *if* and a *then* part. In the *if* part, we record the conditions (that is the questions that significantly influence a specific question), whereas the *then* part contains the question that is being influenced. In the *if* part not all factors (that is, questions) are equal, but they have a weight which denotes their significance.

Data preparation
The rule discovery experiment involved 83 experiments. The data gathered from the users were cast into a numerical form as follows: the answers to questions 1-6 (*Yes, it was easy; Yes, but it was difficult; I found something, but I am not sure that's it; No, and I am sure it is not available*) were translated into 4, 3, 2, 1 respectively. The answers to questions 7-32 (*strongly agree, agree, neutral, disagree, strongly disagree*), were mapped into 5, 4, 3, 2, 1. Finally, the answers to questions 33-37 (*Highly Dissatisfying, Dissatisfying, Neutral, Satisfying, Highly Satisfying*) were translated as 5, 4, 3, 2, 1 respectively.

We have tried to uncover the relationship between answers to questions 7-32 and answers to questions 33-37. This involved the discovery of rules of the form *perception(i_j), perception(i_{j+1})..., perception(i_{j+n})* $\rightarrow$ *emotion(j)*. The first group refers to features of the website, and the second group refers to their respective emotional impact. We have built

a linear model, where the input is a linear combination of the features of the site and the output is one of the questions (32-37). The linear model is a neural network (Bishop, 1995). The inputs are selected from questions 7-32 (depending on the experiment we perform) and there is one output, selected from questions 33-37. The inputs and outputs are pre-processed as follows: first category values: *strongly disagree, strongly agree* are conflated into one value: *agree*. Similarly, *strongly disagree, disagree* are conflated into: *disagree*. Thus each of inputs has just three values: *disagree, neutral, agree (1,2,3* in numerical form). We apply the same transformation to values of questions q27-q31, where *highly dissatisfying* and *dissatisfying* become *dissatisfying; satisfying* and *highly satisfying* are conflated into *satisfying; neutral* remains as it is.

Modeling interrelationships

The exact form of a neural network is the following. Let us suppose that we intend to relate *n* questions selected from 7-22 with one question selected from 33-37. Each of the *n* questions is transformed into three inputs corresponding to values (1 for disagree, 2 for neutral and 3 for agree) —that is we employ a unary encoding. The output is also transformed into three categories (1 for dissatisfying, 2 for neutral and 3 for highly satisfying). All inputs are directly connected to every output (linear model) with a weight factor. The correct weights are obtained as part of the training process. Positive weights denote positive impact of the corresponding input, whereas negative ones denote the reverse. The magnitude of each weight denotes the importance (positive/negative) of each input. In particular we investigated the relation between questions with the numbering they appear in Table II:

1. q33 ("*satisfying*") with q9, q15 and q19
2. q30 ("*disagree*") with q33, q34
3. q30 ("*agree*") with q33, q34

The model was built with ¾ of the data set (comprising a total 83 observations). The data set used for model building is referred as training set; whereas ¼ was used for testing the model, which is referred as testing set. The percentages appearing in the following rules denote the percentage of data that conform to that rule.

Table III: Rules formed after processing the data. The reported numbers are averages over 10 experiments

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RULE1: (72% success in training set, 73% success in testing set)

q33: Web museum's aesthetic design ("*satisfying*") =
      0.1151*q9: Colours related to the museum's theme ("*agree*") +
      0.0137*q15: Information was organized in a very logical way ("*agree*") +
      0.1024*q19: Image quality was excellent ("*agree*")

RULE2: (73% success in training set, 86% success in testing set)

q30: Overall, this was a very good web site ("*disagree*") =
      0.1907*q33: Aesthetic Design ("*dissatisfying*") +
      0.0143*q33: Aesthetic Design ("*neutral*") +
      0.0050*q33: Aesthetic Design ("*satisfying*") +
      0.4665*q34: Features/Functions offered ("*dissatisfying*") +
      -0.0910*q34: Features/Functions offered ("*neutral*") +
      -0.1655*q34: Features/Functions offered ("*satisfying*")

RULE3: (73% success in training set, 86% success in testing set)

q30: Overall this was a very good web site ("*agree*") =
      -0.0316*q33: Aesthetic Design ("*dissatisfying*") +
      -0.0657*q33: Aesthetic Design ("*neutral*") +
      0.2938*q33: Aesthetic Design ("*satisfying*") +
      -0.2571*q34: Features/Functions offered ("*dissatisfying*") +
      0.0452*q34: Features/Functions offered ("*neutral*") +
      0.4084*q34: Features/Functions offered ("*satisfying*")

Examining RULE1, we derived that the colours and the image quality seem to influence almost equally the perception of aesthetics; on the other hand the logical organization of information is an order of magnitude less important than the previous two factors. This confirms what we expected.

Concerning the overall evaluation of the website, we composed rules 2 and 3. In particular a *bad* overall impression of the website (as it was established from RULE2) is primarily caused by non satisfactory offered features/functions and secondly by dissatisfying aesthetics (dissatisfying aesthetics is twice less important than non satisfactory features). The same result (reversed of course) holds for a *good* overall impression of a website (see RULE3): very good features are more important than good aesthetic design.

The aforementioned rules of Table III capture certain user opinions that may not be obvious at a first glance: The perception of aesthetics in a web museum is also influenced (to a certain degree) by the logical organization of information. Moreover a good website is a function of the features offered and to a lesser degree of aesthetic design. These conclusions should be used as guidelines for the designer of a web museum. They denote what should be improved to achieve a specific result. In addition the rules demonstrate that aesthetics is a complex issue influenced by many factors; the same holds for the notion of a good website.

Admittedly, the questionnaire was general enough not to capture finer nuances of the website design features. For instance, questions about the fonts and size of text; relative placement of images and text; the terminology (comprehensible or esoteric), the existence of alternative ways of presentation of information for visually impaired visitors for example; different views of the museum for different visitors (children, casual visitor, scholars); finally even the accessibility of the museums' website from mobile devices are options that should be included in a more comprehensive questionnaire. However, the questionnaire even as it stands allows website designers to evaluate web museums in relation to users. It is often the case that despite the existence of usability guidelines a web designer cannot predict every possible usage of the site; thus users have to visit the site and the analysis of their preferences and opinions can be used to improve the site. The level of details that can be gathered from users determines the level of adaptation guidelines that can produced.

7. Conclusions and Future work

In this study, we performed a preliminary analysis to investigate the relationship between usability and user satisfaction in Web Museums. For instance in RULE1, we related the aesthetic design of the website to the

emotional response and to a very low degree to perceptual elements. In the next rules (RULE2 and RULE3) we found out that the utterance "Overall this was a very good website" is a mixture of offered features and to some degree of aesthetics.

For the current study, we have utilized only a small part of the questionnaire. Far more in-depth results can be extracted by relating the answers of more questions to the features of the website or to their emotional impact. For instance, the ability to find the current and hosted exhibitions or the existence of tours etc. (q1-q6) might influence the user's satisfaction.

Further investigation of the user's answers will allow us to refine the questionnaire. It is suspected that certain questions have nuances that are too subtle such as: *website lacked colour, colours were depressing* etc. Some of these questions could be eliminated. Other questions could become more specialized. For instance a question about colours could specifically ask about particular colours. Furthermore, it is within our immediate plans to perform another survey in which many more users will participate and a revised questionnaire will be utilized.

The analysis of the questionnaire can serve the purpose of issuing guidelines for the adaptation of the website to user preferences. For instance, analysis of specific questions about content preferences could provide an update to the navigation model. Thus, scholars visiting an art museum could be pointed to detailed critiques of the exhibits, whereas children could be presented with a simpler and more captivating view of the site. Also, a step further would be to combine the analysis of a questionnaire with an analysis of the access patterns (i.e. users visited page 'a' then page 'b' and so on) to derive the most popular and less popular pages and to change the link structure of the site to reflect that. As an example, more popular pages should be made more accessible by adding a link to them from the starting page of the site. Or even, a link could be added to pages which are usually accessed one after the other and yet there is no direct link.

Another step we aim to undertake is to map any findings which connect perceptions (website features) with emotions (impression of website) into a formal framework. A calculus language is prime candidate for such an undertaking. It is envisaged that an exhaustive study of websites of museums will produce tens of rules as the ones cited in our paper. Such rules forming a knowledge base will be useful for future web museum designers; at the very least, they will be useful at producing a skeleton of

the site that is effective both from a usability perspective as well as from the emotional impact it conveys. Future designers, will be also able to ask the rule base for good advice about which features could provide an emotional impact and the knowledge base will be producing not only good advice, but also the reasoning for certain choices. We plan to organize the knowledge of building websites for museums into a hierarchy, where at the top there are both perceptions and emotions that concern the overall design of the website. At lower levels one may find more specific perceptions and emotions concerning finer elements of the website, all the way down to specific elements of the site (such as the colours or the size of web fonts). Inferencing is necessary because upper levels of the hierarchy are substantiated by lower ones.

Perceptions and emotions can be represented as predicates of a first order calculus. Normally, we can devise plausible predicates with an adequate number of parameters so as to represent our world of visits to web museums. However, we believe it is far better to employ an established ontology; the one we have in mind is the CYC common sense knowledge base (www.opencyc.org). CYC is a knowledge base (or ontology) that expands over many themes of human related affairs and even beyond that. It is an hierarchically organized set of predicates, covering subjects ranging from *geography, food and clothing* up to *perceptions, emotions* and *financial.* This is the upper part of the ontology and covers more than 40 concepts form every aspect of everyday life and human endeavor. We will focus on the categories of *emotions* and *perceptions* as they are presented. For instance, (#$sensoryResponse virtualTour visitor_satisfaction high), meaning that the user is satisfied form the virtual tour of the museum. Another example is (#feelsEmotion user distraction colours high).

The current study provides a set of ideas and experimental techniques that can be used to engage in a systematic exploration of the affective aspects of websites. We believe that further elaboration of such ideas and experimental techniques are important in enriching our understanding of the emotional aspects of navigating the web.

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Appendix

Web Museums' URLs which were visited and evaluated

Musée McCord Museum: http://www.musee-mccord.qc.ca/

The David and Alfred Smart Museum of Art:
http://smartmuseum.uchicago.edu/index.html

The Nicholas P. Goulandris Foundation, Museum of Cycladic Art:
http://www.cycladic-m.gr/index.htm

Benaki Museum: http://www.benaki.gr/index-en.htm

Musée du Louvre: http://www.louvre.fr/louvrea.htm

Tate: http://www.tate.org.uk/home/default.htm

Naturhistoriska riksmuseer: http://www.nrm.se/welcome.html.en

Egyptian museum: http://www.egyptianmuseum.gov.eg/

Smithsonian National Air and Space Museum: http://www.nasm.si.edu/

Australian National Maritime Museum: http://www.anmm.gov.au/

New England Aquarium: http://www.neaq.org/

Exploratorium, the museum of science art and human perception:
http://www.exploratorium.edu/

National Museum: http://www.nm.cz/english/

Statens Museum for Kunst: http://www.smk.dk/smk.nsf/docs/forside!opendocument

The California State Military Museum: http://www.militarymuseum.org/

Museum of Physics: http://www.na.infn.it/Museum/eng/frameng.htm

Israel National Museum of Science: http://www.mustsee.co.il/

The Andy Warhol Museum: http://www.warhol.org/default.asp

Chester Betty Library: http://www.cbl.ie/

The Indonesian National Museum: http://www.museumnasional.org/

Van Gogh Museum: http://www.vangoghmuseum.com/bisrd/top-1-2.html

Lin Hsin Hsin Art Museum: http://www.lhham.com.sg/lhh.html

Vatican Museums: http://mv.vatican.va/3_EN/pages/MV_Home.html

Rama IX Art Museum, Thai Contemporary and Modern Art:
http://www.rama9art.org/