Seeing the Forest and Its Trees

A Hybrid Visual Research Tool for Exploring Look and Feel in Interface Design

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Abstract: In this paper, we report on a tool we developed for use by our students as part of a senior-level undergraduate degree course in Information Design. Students were asked to re-design a web site for a local not-for-profit agency. The first part of the project asked them to conduct an environmental scan on the topic most closely related to the client: HIV / AIDS, using a new tool we developed. The tool comprised of 6 semantic differential scales and the procedure required students to research and select web sites dealing with HIV / AIDS, and analyze the visual components for each site according to how they position along each scale. We modified the semantic differential scale (typically constructed just from a set of opposite word pairs and spaces in between to put marks indicating judgements) by asking students to extract actual visual samples from a web site, then place each sample along the scale between the two contrasting word pairs. The end result of the environmental scan was a collection of 84 visual analysis grids submitted by 28 students. This method allowed us to compare multiple visual analysis for the same web site, observe patterns for sites about HIV / AIDS, and discuss the contribution of specific design elements towards a particular type of look and feel.

Key words: Look-and-feel, environmental scan, semantic differential, interface design, design education

1. Introduction

In this paper we propose the Environmental Scan Tool for use by visual communication design students at the start of a print or web-based design process. The purpose of the tool is to support the collection, constructions, analysis and annotation of existing visual design samples that may inform decisions regarding the "look and feel" of later proposed designs.

The tool is meant to provide students with an easy way to collect, then explore the "visual landscape" of a particular subject area. It is a hybrid tool that embraces and builds upon the moodboarding technique, common within visual design practice, and the well-established semantic differential technique [1]. This particular connection between techniques is meant to facilitate the pinning down of relationships between content embodied in visual components of existing visual designs and the connotative meaning they might evoke. The relationships are documented within an annotated collection of gathered visual samples. Further, by using the interface of the tool, based on an approach called rich prospect browsing [2], the integrated collection can be visually manipulated in order to enable pattern and relationship finding and, potentially, knowledge discovery.

The objective of the environmental scanning tool is to facilitate and speed-up the process of environmental scanning. One or a team of designers collect a set of visual design samples that are, in some way, related to the design project on hand. This collection is meant to help the designer(s) during the initial phase of a design process, during which they familiarize themselves with the subject area, as well as with a sample landscape of preceding design solutions. Looking at and thinking about existing design work is meant to support the extraction of knowledge that might be useful in subsequent phases of the design process.

The tool is comprised of the following:

- an overview of the "visual landscape" of a particular subject area to which the new design is supposed to contribute;
- a collection of example designs, deconstructed to their smallest yet still meaningful visual components (rhetorical clusters);
- an overview and potential for comparison of the components based on connotative meaning(s) they evoke;
- the capacity for annotation, exploration, pattern-finding, and referencing;
- the collection as an instantiation of networked connections (documented in recorded metadata) between samples (rhetorical clusters), indicated meaning, that can be visually explored according to rich prospect browsing principles.

The necessity of the environmental scanning phase in the design process seems unquestionable since it establishes the context for the upcoming design work and quite often can lead to a shift in the definition of the actual design problem. Christopher Alexander put it in an even more definite way: "… we are never capable of stating a design problem except in terms of the errors we have observed in past solutions to past problems. Even if we try to design something for an entirely new purpose that has never been conceived before, the best we can do in stating the problem is to anticipate how it might possibly go wrong by scanning mentally all the ways in which other things have gone wrong in the past." [3].

The significance of careful attention which should be given to this phase of the design process was also underscored by Werner Kunz and Horst Rittel [4] reflecting on problem formulation: "It is not possible to separate 'understanding the problem' as a phase from 'information' or 'solution' since every formulation of the problem is also a statement about a potential solution."

The problem we are trying to address through our proposed tool is how to gather, sample, organize and manipulate the existing resources to effectively learn from them and transfer the knowledge to new situations.

2. Background

2.2 Dealing with "Wicked Problems"

The main challenge faced by designers approaching a particular design problem comes from its uniqueness or, like many design thinkers would agree, from its usual "wickedness". The usual complexity, multidimensionality, and dynamics of a situation which conditions every design problem makes past solutions, even directed towards similar problems, only partially applicable to new problems.

There is a well-documented thread in design theory, which places design as an activity that deals with complex problems in ill-structured domains, namely "wicked problems." The phrase was coined by Horst Rittel in '60 [5].

Using this phrase Rittel [6] referred to complex, hard-to-grasp, practically unsolvable problems, which are therefore addressed repeatedly. Wicked problems are ill-defined, hard to formalize, rely on changeable judgment, politically and socially colored, human-factored, not definite (not false or true but rather good or bad for a particular context), impossible to deal with by trial and error due to uniqueness of each instance (there is no other chance to deal with a particular configuration of factors constituting a wicked problem), each problem is a symptom of another one, each solution creates ultimately new problems, non-separable in the interconnected network of interrelating problems.

Since design problems are made-up of the above-listed set of characteristics, no ready-made prescribed solutions can be applied to any new situation. Questions persist of whether there is any particular range of design knowledge that is transferred from previous to new problem solutions, to which extent such transfer can be useful, and how such transfer should be managed and applied to be most effective.

2.2 The Need for Multiple Cases

Spiro et al. [7] provide a theoretical model of an instructional system that is meant for facilitating knowledge transfer in ill-structured domains of knowledge, and advocates learning from past cases and the application of "cognitive flexibility" principles as a possible approach, when there is not properly arranged/ordered knowledge to fit a particular new situation, and knowledge must be re-assembled from different sources and transferred to the new context [8].

Since the general characteristic of such domains is a lack of organizing principles, the valid way to deal with them is to rely on analyses of multiplicity of examples, where multiple "knowledge precedents will need to be applied to new situations (multiple schemas, several past cases, overlapping analogies)." [9].

The system establishes some initial conditions for precedent knowledge representation, which help to avoid narrow categorization and interpretation of cases and examples, which otherwise might be treated just as illustrations for some earlier established thematic abstracted pinpoints. The opposite to these abstracted and already fixed knowledge structures, which prevent possible knowledge transfer, is to follow the "cognitive flexibility" principles enabling adaptation of one's knowledge in different contexts. These are "multiple interconnectedness between different aspects of domain knowledge, multidimensional or multiperspectival representation of examples / cases, and allowance for various forms of naturally occurring complexity and irregularity … emphasis must shift from the *retrieval* of a precompiled schema to the *assembly* of a situation-sensitive schema from knowledge fragments." [10]

Cognitive flexibility can be facilitated by building a network of connections between cases within a domain. The cases / examples are firstly "decomposed and represented along many partially overlapping dimensions (i.e., the same information must be represented in lots of different ways)." [11]. The connections should be established among cases and their aspects based on a level of difference, which carefully managed can make future new arrangements of knowledge fragments capable of providing with new concepts. Their studies suggest two possible approaches. One is based on juxtaposition of intermediary different cases, which means that information included in the cases partially overlap and partially differs. Second approach is to group cases in a way that would point attention to possible misleading areas within the domain. This can be done by grouping of superficially similar cases, which in fact are distinctively different or by grouping cases different at the first sight but in fact similar. Spiro et al. [12] point also to the importance of case sequencing, i.e. the actual sequence of information

acquisition from collected cases. This higlights questions of optimization of time needed to acquire sufficient amount of information and the number of necessary cases and their characteristics.

At the end Spiro et al. [13] reflects shortly on using "visual-perceptual representations" as means for facilitating recognition of complex relationships within cases, and similarities and/or difference between cases.

We believe that the tool presented in this paper can extend the affordances offered by visual presentation of knowledge as described by Spiro et al., while keep the principles of knowledge management as outlined by them. Through this approach, we chose to focus on one particular kind of knowledge: connotative meaning as it is evoked by the visual design of websites. The representation of knowledge is consistent in the design of the tool structure. Designers collect samples as basic component units – visual rhetorical clusters – which contribute to the "look and feel" of a website. By selecting, cutting out from screenshots, annotating and rating the samples on semantic differential scales the network of interconnections between the samples is created. The connections are established according to the dimensions of markup added to the samples. Then different ways of visual ordering and visualizing the collection are made possible.

2.3 Identifying Connotative Meaning

We pilot tested the Environmental Scanning Tool as part of a semester-long project in a senior-level information design class. We are aware that the scale of our pilot was limited, but believe the exercise offered some first insights into the tool's potential. We narrowed down the range of investigated properties of precedent web resources to their visual aspects and meaning evoked by the visual design. In other words we focused on the relation between evoked meanings and formal qualities, which support and strengthen them. We were interested in enabling students to experience how they can respond and how others can respond in their first perception of the website at the subjective and emotional level. The information we wanted students to collect was meant to bridge the gap between "look" and "feel".

In this particular case the subject area was HIV / AIDS due to our collaboration with a local not-for-profit agency. We were tasked with the re-design of the agency's website, while considering their need to reframe away from the identity of a passive (and visually-dated) information provider, towards an action oriented, community based hub of support for people affected by HIV / AIDS.

To find out what meaning, especially what connotative aspects of meaning, could be associated with existing web resources dealing with HIV / AIDS we decided to re-design the semantic differential technique so that it could map out an existing visual territory for use within the design process.

Students also faced additional tasks of extrapolating what meaning or tone was most commonly used within on-line HIV / AIDS representations, what graphical representations were considered as appropriate, and where possibilities for improvement exist.

2.4 Moodboards

An existing alternate approach to the Environmental Scan Tool is the Moodboard – a visual presentation of juxtaposed elements in a more or less free form, consisting of samples of typography, images, graphics, and colors. All of these elements are intended to set a "mood" or "tone" for the proposed design. Although the moodboard technique is usually used as a device for communicating planned visual design proposals to a client, its characteristics make it also suitable as a research and documentation tool. Moodboards are effective in

documenting a designer's research into the state of an existing "visual landscape" and as documenting tool for the different visual proposals of possible directions for his/her own design.

The general idea of a moodboard is to sketch a possible solution in very broad brushstrokes without going into details. The moodboard technique allows fast development of visual concepts (direction and general style, general look and feel) and is very useful for communicating visual concepts (by explaining through example) at the concept formation stage of the design process.

There are four important characteristics of moodboards which are relevant to our tool. First, they use existing samples of work. Since moodboards are used at the very beginning stage of the design process, when there is not yet any visual material developed for the on-going project the usual practice is to use ready-made, available elements from existing websites or other visual resources as the elements of a moodboard. Even at this very general level a choice must be made on the crucial element types for a particular look and feel. Second, they allow to relate a designer to previous work, help her think about new solution in terms of existing ones. This aspect of moodboarding addresses a particular challenge in a design process related to work with preceding examples of objects being the focus of design activity. Third, the effectiveness of the moodboarding comes from its characterictics of converging visual elements from already existing sources with novel ideas and bringing them together to form new wholes. The fourth aspect is that moodboards are instances of fast prototyping related to concept generation and communication. Prototypes are temporal, not finished, reifications of certain aspect of proposed design, bringing the project little bit closer to the final product or enabling many alternative solution to be tested. They are usually meant for clarifying certain areas of design, which are hard to be predicted in more abstract representations.

2.5 The Semantic Differential

The semantic differential technique "is essentially a combination of controlled association and scaling procedures" [14]. It indexes "meaning" by subsequent narrowing down, isolating, differentiating it against the set of verbally described scales and thus gradually diminshes uncertainty in a similar way to the game of "Twenty Questions". [15]

It is important from the perspective of our work that the preceding research from which the idea of semantic differential has grown was concerned with synesthesia. The research reported by Osgood et al. [16] has shown that stimuli from different modalities may share meanings, that there is a cross-modality equivalence in interpretations of stimuli. This parallelism seems to be rooted in real-life experience and is especially clearly visible in using metaphors in language. For the method it was important to notice that different dimensions of experience could be described as bipolar statements and then translated one to another (e.g. something good is usually associated with being up and with the light and that there is a correlation between intensities, so better is lighter etc.).

In general, the semantic differential process follows this set of steps. The respondent is asked to indicate meaning of a presented "concept" and encode it in bipolar (opposite-in-meaning) verbal scales. The respondent marks on the scale the direction and the intensity of association. The scale has, usually, either five or seven steps.

The core of the method lays in the careful choice of bipolar terms. The general rule is to precisely check the connotative meaning of word pairs and choose the proper one (compare for instance: "friendly/unfriendly or friendly/not Friendly or friendly/hostile" [17]). Osgood et al. [18] suggested other general rules. Firstly, the set of

scales should be representative for the way respondent may approach the subject in order to gather full possible information. The best option is to elicit the descriptor pair directly from the respondents. Secondly the scales should be relevant to the concept being rated. The irrelevant scales usually yield neutral rating so reduce the meaningful information, which can be obtained from limited set of scales. Third aspect is related to semantic stability of scales for a particular study. It is crucial for making comparisons. The fourth aspect is the relevance of scale order, which also can influence on meaning indicated using a particular scale in a context of other particular scales. This should be taken into account.

What was also noticed that the pairs chosen by subjects enabling them to present their judgments (describe their attitude) could be clustered in three clear groups: evaluative, potency, and activity clusters. Those clusters form three dimensions of semantic space where objects of ratings is located "profiled" in a sense of indicating how it is judged by respondents. The evaluation cluster proved to be the most significant out of the three dimensions of semantic space. Evaluation is also described as the "connotative" or "affective" dimension. [19]

2.6 Advantages of Merging both Techniques

We believe the main strength of the proposed Environmental Scan tool lays in merging the advantages of the two techniques. The moodboard technique enables fast prototyping of concepts, using actual visual samples (not translating them into other abstracted indicators), working with real-life objects treated as an embodiment of certain knowledge that can be elicited, restructured and used in new contexts.

However, there are important differences in our approach to the moodboard. We narrow the collected materials only to web sites closely related to the subject of our own work in terms of subject and media. We chose very carefully the sampling procedure and we carefully document the additional data about samples (metadata). The arrangement of samples as resulted from working with the environmental scan tool is not "impressionistic" but controlled to be meaningful as visualization of certain relationships, pattern or aspects of the collection.

The semantic differential technique provided us with the possibility of mapping different dimensions of experience onto bipolar verbal scales, thus enabling translation between modalities (verbal to visual, visual to verbal).

The Environmental Scan tool does not give "impressionistic" results. It leverages capacities inherent to the human visual perception system as an instrument for visual pattern finding. The environmental scan tool is capable of producing multiple layouts of samples according to properties controlled by the user, which can address particular aspects of meaning-making in the process of analysis of the existing artifacts.

3. Environmental Scan Tool

The process of utilization of the tool can be divided into two main parts. One deals with feeding the tool with actual data collected from existing web resources (in the case of our pilot project, screenshots of web sites). Second, is a manipulation and visual reorganization of collected material in looking for patterns across samples and scales.

3.1 The Basic Unit of Visual Analysis

Before the collection part can start a decision must be made on the general characteristic of a basic unit of comparison. This is a general decision about what kind of "concepts" or "samples" (in Osgood et al.'s terms) or "knowledge fragments" (in Spiro et al.'s) will be collected. It is important is to keep a consistency regarding the

chosen units within the collection taken from different resources / websites. Comparison of the samples can be done on different levels of detail. as seen in comparison to basic level categories. The special attention should be given to the choice of representative, meaningful and relevant samples from the area under scrutiny so the number of samples, respondents and the quality of information that could be expected from the exercise are optimized. The choice of samples should depend on "good judgment" [20] of what a meaningful unit could be for a particular group of tool users and the users' goals. In our case, in which the group consisted of senior student designers making comparison of visual design of websites resources on a topic of HIV / AIDS the level of detail taken into consideration should reflect their interest in further use of gained knowledge for their own design work. In other words they are prepared and need to deal with quite detailed distinctions of samples of visual designs. (cf. [21]).

In the case reported here we opted towards a unit, which would be considered as the smallest possible rhetorical cluster [22]. This term and the entity it refers to was used by Schriver within the context of document design field. It points to basic functional units of intentionally juxtaposed content [23]. In other words we were interested in the visually distinct clusters, which were purposefully designed to allow the user to arrive with certain interpretation about the content. That could be captioned images, text samples formatted in a particular way, color samples within graphic elements, distinct visual structures within the overall layout of a page realizing certain functionalities.

Making the smallest rhetorical cluster a basic unit of analysis made the study of connotative meaning relevant for the level of skills and goals of design students. For instance, it would be impossible to use as level of comparison basic graphic elements (like color, line, pattern, typeface, point, plane etc.) since there are no direct relationships between particular basic graphic features and particular meanings. The basic graphic elements alone have polysemic and homonymic character i.e. one element can contribute to many meanings, and one meaning can be evoked by many different elements. The larger context is always necessary. On the other hand using, for instance, the whole screen layout as a unit of analyses, which is by no means a rhetorical cluster but on the higher level of complexity instead of the "smallest rhetorical cluster", would make the comparisons inadequate to expected detail of comparisons enabled by visual training of design student and therefore useless for their learning.

Figure.1 AIDS Calgary Logo

The good example, which will be also used in the presentation of the tool later, is a logo of the organization – AIDS Calgary as taken from their website (Figure 1). On the level of its basic graphic elements it consist of: graphic element (drawing of a ribbon) in white placed on clear (only little shaded) red color background, text set in Gill Sans typeface in 15 pixels (capital letters "AIDS CALGARY") and 10 pixels ("awarness association") on the 14 pixel leading. Can these elements approached separately account for connotations as: simple, engaging, warm, vibrant, innovative, trustworthy, bold? These are descriptors, which were identified as relevant by the participating students during the exercise.

3.2 Collection and Sample Rating

Students worked with prepared data collection sheets comprised of 6 semantic differential scales. Students were asked to research and select web sites dealing with HIV / AIDS, and choose the basic rhetorical clusters for each site and identify their connotative meaning according to a particular scale or scales. The chosen elements evaluated by positioning them on the scales in proper locations between the opposite descriptors.

We modified the Osgood et al.'s [24] semantic differential tool typically constructed from a set of contrasted word pairs positioned on opposite ends of five increment scales. Since the "concepts" we are dealing with have visual character the actual extracted rhetorical clusters could be placed each along the proper scale between the two contrasting word pairs. For example, a sample that included the logo AIDS Calgary extracted from the institution's website, was positioned along the simple vs. complex scale. Its placement on the scale (the direction towards a chosen word "simple" and "extreme" intensity) indicated a particular meaning evoked by this sample. (Figure 2)
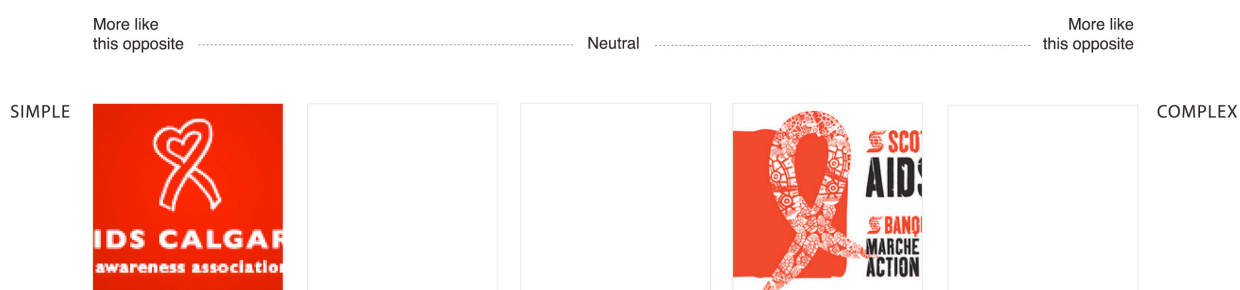

Figure 2. Example of the "simple/complex" scale with two samples' thumbnails placed on it indicating opposite meanings.

4. Results

As result of the collection part of the exercise we gathered an extensive set of annotated visual samples (more than 700), made up of 84 visual analysis sheets of 41 different websites (there were websites which were evaluated as many as 11 times) involving 35 different descriptor pairs.

The placement of each basic visual sample on a particular scale was in fact a process of categorizing and annotating each sample (providing samples with metadata). The annotation (both automatic and manual) is done according to:

- its connotative meaning indicated by the chosen scale;
- meaning strength indicated by a sample position on the scale (direction and intensity);
- a source of the sample i.e. a website, which the element was taken from;
- a type of visual rhetorical clusters (captioned image, formatted text, graphics: logo, inforgraphics, etc.)
- specific graphic and text elements used within rhetorical clusters (e.g string of text, typeface, color);
- a particular location within the screen layout of the website (for this we developed a generic grid to be able to code a position of the element);
- a size of the sample (although the evaluation sheets are planned to incorporate always square shaped thumbnails for convenience the actual samples' shapes can vary).

We have also collected 35 unique descriptor pairs out of 84 of all chosen pairs. The examples of the pairs chosen the most frequently: casual/formal (5 times), warm/cold (4 times), traditional/modern (4 times), blunt/subtle (3 times), aggressive/calm (3 times), classic/trendy (3 times), organized/scattered (3 times). In general the analysis of those pairs supported the general rule found be Osgood et al. [25] the there are three distinct groups related to "evaluation" (e.g. good/bad), "potency" (e.g. strong/weak) and "activity" (e.g. passive/active), with the "evaluation" group being the most represented. The "evaluation" group is usually called "affective" group.

Below (Figure 03) we show all rating sheets showing rating of the same web site. There are partially overlapping scales, sometimes the same rhetorical clusters were chosen. This kind of overview, generic one, cannot tell us too much.
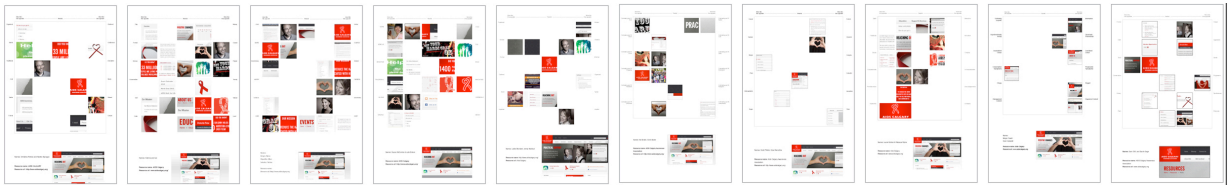

Figure 03. Overview of submitted student rating sheets (grids) showing evaluation of one paricular website. The sheets consist of samples, scales and, at the bottom right, screenshots of the whole page layout, where locations of all chosen samples were noted.

The following screens of sample analyses will shed some light on the functioning of the environmental scan tool. Possible comparisons include analyzing one website across many 6 scale ratings (general attitude as seen from ratings, rhetorical clusters as related to re-occurring descriptors over many ratings, elements responsible for particular response, polysemic and homonymic character of clusters i.e. one cluster can have many meanings, and one meaning can be evoked by many different rhetorical clusters.)
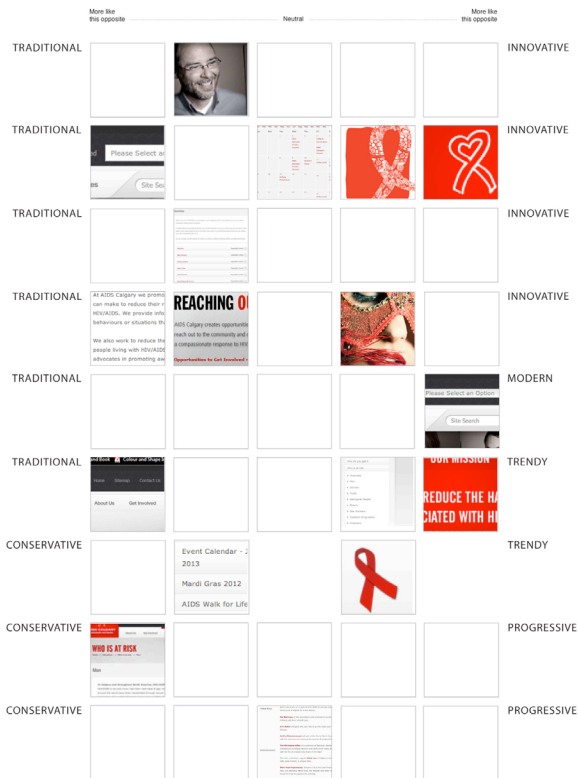

Figure 3. The comparison of rhetorical clusters from one website ordered according to one scale "traditional/innovative" and rated by nine students. There are distinct visual patterns related to both opposite groups especially in terms of color. There is a black and gray dominant towards "traditional" direction characterized by ordinary graphics and text oriented rhetorical clusters. It is opposed to a visible trend for "innovative" direction related to use of red and white color scheme combined with creative graphics and smaller amount of text.

Figure 4. Next comparison shows AIDS Calgary logo rated according to different scales by nine students. Firstly, the logo was chosen as significant sample by most of students rating this website (9 students out of 10), and at the same time it was used as exemplar rhetorical cluster for eight different scales (the "warm/cold" pair occurred twice). The scales on the screen are ordered according to chosen level of intensity. The attitudes of students and their strenght can be easily read from the evaluation. Another ordering of scales can be imagined as conforming to three dimensions of Osgood et al.'s semantic space (evaluation, potency, and activity groups). This would allow other interpretation of students' responses.
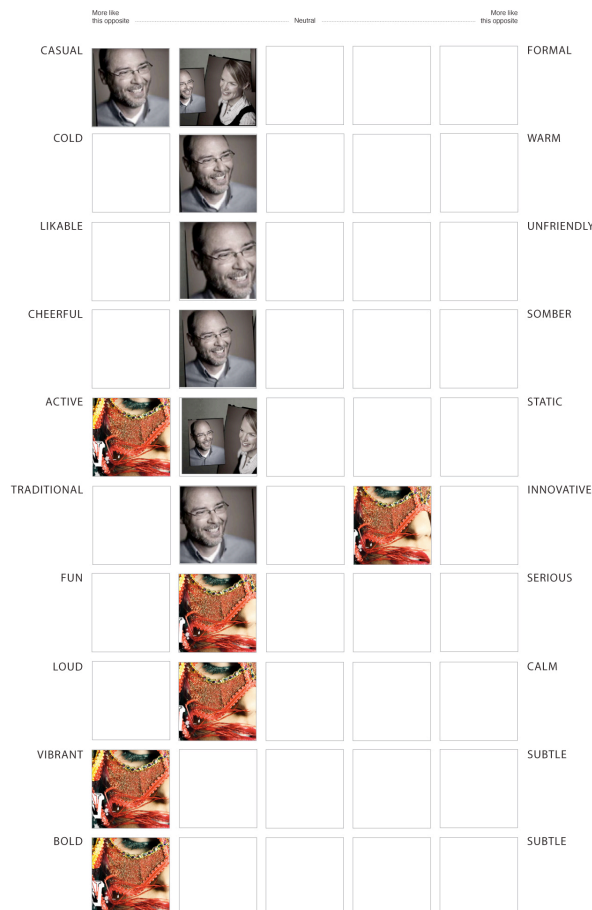

Figure 5. The screenshots show a photograph of a man's face from Figure 3. It turned out that this photograph has been almost always placed in mild steps on many different scales. It suggests the photograph's moderate visual impact on the one hand, but on the other its significance in building particular "look and feel" of the website. The photograph of a woman's face was chosen as contrasting image in the evaluation direction and intensity (as it could be seen in Figure 3). The goal was to check if there is contrast between the two photographs according to other scales besides the "traditional/innovative" one. However it seems that here is no special correlation between them. The apparent contrast is not direct. The scales according to which both photographs were rated almost do not overlap.

4.1 Advantages

There are several main advantages evident from our pilot. The tool appears easy to use for collecting, rating and annotating samples (rhetorical clusters) taken from existing resources merging advantages of a freehand moodboard technique and simple with powerful semantic differential technique. Operating/manipulating the collection of visual samples within the tool is also very intuitive due to its conformance to the rich prospect browsing principles, which are based on the capacities of human perception. The environmental scan tool combines the structured method of eliciting people's attitudes toward visual samples with visualization as a method of making visual comparisons across the collection of samples. The interconnection of both approaches of provides with informative and relatively quick results. Finally, making as a basic unit of visual comparison a rhetorical cluster made moved the analysis from comparison of basic graphic elements (like color, line, pattern, typeface, point, plane etc.) to a higher level, where clusters of meaning are created and analyzed.

The proposed new approach embedded in the proposed tool stems from the conviction that there is some unexplored area between highly "impressionistic" method of visual research often applied in an undergraduate class for similar tasks (e.g. moodboards) and quantifiable formalized techniques for meaning measurement (rarely used due to complexity of the procedure and skills needed). Still, working in the class setting at the undergraduate level we wanted to find a balance between those approaches.

5. Future Work

In the next phase of this project, we are working on extending the Environmental Scan tool into an interactive, rich-prospect environment. Based on the principles of Rich-Prospect Browsing (RPB) theory [26], and RPB for environmental scanning would enable users to collect and upload samples, tag and annotate them, then browse the entire collection. Samples could be linked to detailed views and/or the original source. The idea behind RPB theory is that an interactive display composed of a wealth of well-designed visual information will be better at supporting the user than a display that attempts to artificially or arbitrarily restrict the amount of information provided, especially if certain features of the visual display can be easily controlled by the user. RPB interfaces have been designed for collections as diverse as literary historical texts [27], decision support for provincial parks management [28], and knowledge discovery processes for data mining operations [29]. Currently, we are in the process of designing an RPB for environmental scanning.

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