Brainstagram: Presenting Diverse Visually Inspiring Stimuli For Creative Design

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Abstract
This paper presents Brainstagram, a web-based tool leveraging the structure of social networks to assist designers in finding inspiration. One challenge designers face when brainstorming is knowing how to search for unlikely sources of inspiration. In our study we present designers with Brainstagram, which organizes visual stimuli through tag co-occurrence to display related concepts. This allows users to easily navigate from relevant to unexpected images. In this pilot study, 6 participants generated 29 different designs which were evaluated on creativity and diversity. Our study demonstrates Brainstagram as a potentially effective tool in the brainstorming process.

Author Keywords
Creativity; Inspiration; Brainstorming; Design; Social Media

ACM Classification Keywords
H.3.3 [Information Storage and Retrieval]: Information Search and Retrieval --- Search process, Selection process; H.5.2 [User Interfaces]: Information and Presentation --- User-centered design.

Figure 1. On one side of the Brainstagram interface the user can select different nodes in the web to see the photos tagged with that term. A user can easily navigate from the search seed node to the edge of the graph. Selecting nodes on the edge of the graph allows the user to view distantly related and unexpected photos.

Introduction

Ideation is one of the crucial stages in design process. Previous work has shown that the originality of a design is greatly influenced by the extent of analogical transfer, the type of analogies used, and the presence of external primes [5]. Professional designers are trained to generate diverse ideas through various ideation methods [2, 4, 6]. Designers rely on Web search [1, 11], interaction with the physical world [14], group brainstorming [7] or viewing examples from peers [8, 10, 13] to get inspiration during early stages of design.

The Web is a great resource for providing inspiration for design tasks for both professional and novice designers. Researchers have noted that finding some unexpected discovery and making a connection back to a design problem has a long history of creativity, innovation and breakthroughs [2]. Other research has shown that it is possible to find interesting and unrelated results when performing a directed Web search [3]. These types of discoveries have the potential for serendipitous experiences leading to innovative creation. Although the work in [3] demonstrates the possibility to have serendipitous inspiration while searching the web, it does not necessarily show how to organize the search results in a manner that makes it easy for the user to find the interesting but distantly related results.

There are existing platforms that try to assist designers in the process of organizing and finding new search directions for inspiration. For instance, in TweetSpiration the user is presented with filtered tweets and a word cloud generated directly from a user-specified search key term [5]. Designers using the TweetSpiration application are shown stimuli closely related to the user's specific design task. These stimuli are intended to help the designer discover new sources of inspiration. TweetSpiration makes use of social networks to help the designer gather data. Using social networks allows the user to see tweets tagged by real people and associated with relevant topics. However, the data presented in this tool only makes use of Tweets closely related to the user's search term.

In this paper, we present Brainstagram, a Web-based tool that leverages the structure of tagged social media content to assist designers in finding inspirational material. Social networking sites provide data that is structured so that concepts are linked through co-occurring tags. We use this structure to understand concept similarity. The tags generated by users for photos capture abstract concepts such as emotions, as well as real world object labels. We leverage the fact that tags that are not only descriptive of what is in an image, but might also be creative and describe something related to the image. In this case, the photo may contain a tag that will link to other images that are removed from the starting domain. We create a tree structure to display the different image topics and link them together via co-occurring tags. In this study we show that stimuli generated from social media and organized using the built-in social networking structure helps designers discover unexpected sources of inspiration in the brainstorming process. In the following we give an overview of the design and development of our application as well as a pilot user study.

Generating Concept Graphs

Brainstagram was created to aid designers in finding serendipitous inspiration. Our application presents

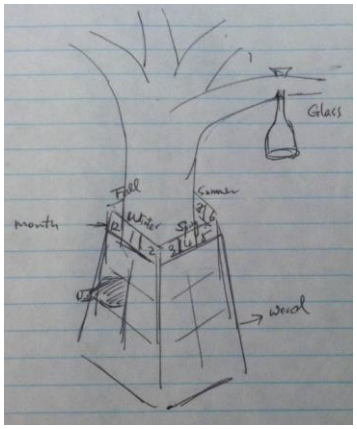

Figure 2. Example of one participant taking inspiration from a photo of a wine shelf and a tree to create a new idea.

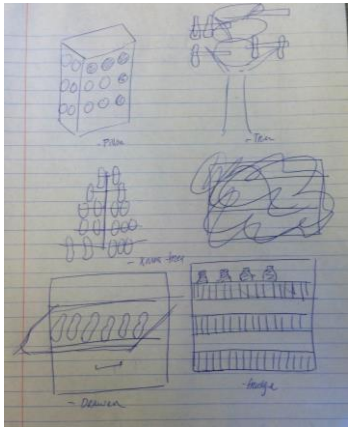

Figure 3. Example of one participant's solutions for the wine holder task in the control condition.

photos collected from Instagram users. Instagram is an online social photo-sharing website that allows users to attach descriptive tags to their photos. Using these tags, Brainstagram organizes visual stimuli to the user in a way that allows them to navigate from relevant to unexpected images in relation to their starting search.

The data presented in the interface uses a tree structure and each node is connected by sharing at least one common tag. We define the root of the tree as the "search seed". This represents the specified term when first starting a search. The images associated with this term will be very relevant to design task. We define the nodes directly connected to the search seed to be 0-degrees separated. We increase degrees of separation based on the distance to the search seed. For example, the nodes connected to a 0-degree node but not connected to the search seed would be 1-degree separated.

Building the Tree

Brainstagram is built using Java and the D3 JavaScript library. The Instagram API was used to search Instagram for photos using a specified terms. To determine what keywords would serve as search seed in the Brainstagram interface, 30 workers from Amazon's Mechanical Turk were recruited to generate phrases. Each worker was asked to provide two phrases that they might use to search to find inspiration for completing a design task. Participants were asked to generate phrases for two given tasks. After collecting the data we selected the most frequent terms to be the search seed for collecting the Instagram photos. Once the search seeds were selected, we built our database of Instagram photos. We selected the top 10 related tags to build the children for each node. Our tree was expanded to be 2-degrees away from the search seed.

Preliminary Results

A pilot user study was conducted to test the utility of the application for inspiring creative brainstorming sessions. The study consisted of one design task and a semi-structured interview post-study.

Methods and Procedures

Six volunteers (3 female) were recruited to participate in this study. None of the participants were professional designers or have previously used the Brainstagram interface. We define three conditions of experiments: no tool (control group), 0-degrees, and 2-degrees separated from the search seed (test group). Each participant was randomly assigned to one of the three conditions for one of the design tasks. Participants were asked to complete the task by generating as many new and different ideas as they were able. The design tasks were phrased as follows: "Your task is to [design new wine holders OR plan wedding proposals]. Within the time allotted, generate as many new and different wine holders of your own creative design as you are able."

Participants were given the freedom to use text or drawings to communicate their ideas. Participants in the test group were given 90 seconds to explore the interface. The participants in the control group were asked to think about the design task for 90 seconds. After, each participant was given 7 minutes to generate ideas for their design task. Finally, the participant was asked a few questions about their background (education and design experience) and about their experience during the study. The questions were used to see how the participants explore the interface, what

features were liked/disliked, what photos were inspirational, and what was easy/difficult about the design task.

Results and Discussion

To compare the performance of brainstorming process under different conditions, we evaluate the quantity of the ideas generated as solutions to the two design tasks. In addition, we do a qualitative analysis on the user study.

Number of Generated Design Ideas

The study generated a total of 11 solutions to the wine holder task, and 18 solutions to the wedding proposal. We noticed that the results match the findings in [15] in terms of the quantity of generated ideas. The more information provided to the participants yielded fewer number of designs in both tasks. Both participants in the 2-degrees condition generated only one solution, while both participants in control group generated more than five solutions for the design tasks. From our observation, participants in test conditions spent time browsing/selecting inspirational pictures and figuring out the associations between the design task and selected inspirations. They tended to work on only one idea but in great detail. Subject P6 asked the following questions several times during his design session, "*Should I use these photos in design task? Should I select more pictures?*" We believe there is a trade-off between direct examples provided by [3] and indirect stimuli presented in this work. We have witnessed that participants will greatly rely on presented information. Direct examples have closer relationships toward the design goals that participants can easily derive new ideas by modifying or improving existing solution. However, it may cause conformity that people mostly borrow part of concepts from previous solutions. In our system, although it is more challenging to figure out the associations between unexpected inspirations and the design goals, participants keep augmenting their ideas during the design session. Subject P3 stated, "*without seeing the pictures and terms in the interface*" they could not come up with their solutions.

We noticed that solutions coming from control group mostly contain only one concept per design (shown in Figure 3) while solutions coming from test group mostly consists of multiple concepts (shown in Figure 2). Subject P3 stated, "*I think about wood materials first and then I see the pictures with trees, I figure out that I can borrow the idea and make a tree-shape wine holder. I also saw the pictures showing how people suspend the wine glasses. I end up thinking about placing the wine bottles in the tree root and glasses on the tree branch. Also, I saw a pictures categorizing the wines so I make the tree root four-sided as for wines suitable for drinking in four seasons. These pictures are really inspiring.*"

Interview Discussion

We conducted a post-design session interview, asking participants their thoughts and previous experiences on brainstorming. When asked if they were allowed to do a Web search for the assigned design task, one participant in the control group indicated that she would have "Googled 'cool/fun/sweet ways to propose'" and used "blogs and YouTube". Subject P3 stated, "I will search for wine holder directly and see examples first". Most participants mentioned that they brainstorm without assistance first and then find examples in the Internet. One subject noted that she likes to use social networking sites such as Reddit to expand or improve

on the ideas. This indicated that during daily life when people are brainstorming ideas they often turn to Web search or social networking sites. However, "unexpected" but inspiring pictures are rarely found by people without using our interface. Subject P4 [0-degree condition] stated, "*I would never think of using a watch instead of a ring to make a wedding proposal*" without seeing it in the application.

Our application also increases the efficiency of organizing a more complex design idea. Subject P6 [2-degrees condition] believed that it would take far longer time to come up with the complete wedding proposal idea if he cannot see the pictures provided by our interface. He stated, "*This interface is really useful in particular if you have no concrete idea about a design*. *I came up with many detailed ideas based on pictures that are not directly associated with wedding proposal.*" This indicated that our interface makes it easier for the user to use online resources by organizing the content to make it easy to explore and see the relationship between results. Many participants noted that they liked the organization of the tags and seeing them in the tree structure.

Also, our experimental result shows that direct examples indeed limit participant's mindset while diverse and farther stimuli help in increasing the creativity. One participant in 0-degree condition stated, "*You want me to create unique and creative ideas but all terms and pictures I can see from the interface are something very trivial, I am kind of stuck in these pictures.*" In her case, she can only access to terms directly associated to *proposal*. This exactly matches our hypothesis that presenting examples of designs may constrain people's idea generation.

Furthermore, both participants in 0-degree condition expected to explore deeper level of the search tree. Subject P4, "*I don't see any inspirational terms in the tree, these terms are all very common. But it would be great if I can explore more, for example, second layer of 'love'. There must be many types of love, I might be able to find something unique to think about.*"

All participants in test group have high expectations on the system and give us many useful suggestions. All participants like the tree structure presentation for the word inspirations. One participant in 2-degrees condition mentioned "*I believe this system would be very useful in many search spaces, the only problem is the term filtering. Some terms are really weird to appear in the interface. I don't even want to explore them. If you can provide more associated terms, I would definitely use this system to find new ideas.*" One participant mentioned that our interface can assist group brainstorming. "*I would like to use this interface with others when we need to generate ideas. But the terms should be more diverse and unexpected, not only close terms.*" It is really interesting to see people eager to have both diverse and associated inspirations.

Conclusion and Future Work

This pilot study of Brainstagram has demonstrated our application as an effective tool for showing novice designers unexpectedly inspirational stimuli. Brainstagram assisted participants in triggering unexpected ideas. Using our interface, participants were able to create brand new ideas by combining multiple concepts drawn from different domains into one design. This application contributes to a better understanding of the brainstorming process and techniques for finding unlikely inspirations.

To continue forward in our work, we are interested in performing a more in-depth study to get a better understand of the best way to present inspirational stimuli. We would like to improve on study by evaluating the design solutions in terms of creativity and diversity, similar to the work in [10]. This type of evaluation will allow us to compare the quality of designs generated using our application. Brainstagram was created as a tool for designers when looking for new search directions. We find the results presented in this paper promising and believe future studies will support and expand our findings.

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