TweetDrops: A Visualization to Foster Awareness and Collective Learning of Sustainability

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Figure 1. *TweetDrops* interface with background drops and foreground tweets. The blue background raindrops each represent a sustainability-related tweet. The number of background drops represents the total number of retrieved tweets. The foreground tweets contain the content of randomly selected tweets.

Abstract

Whether or not you are paying attention to sustainability, you may become interested in it by reading about it online, or learning sustainable knowledge from others. We designed a system called *TweetDrops* (Figure 1), which is designed to draw people's attention to the issue of sustainability and to help them to learn sustainability-related knowledge by using an aesthetic visualization of qualitative data about sustainability attitudes and practices drawn from Twitter.

Author Keywords

Information visualization; Twitter; design; energy conservation; HCI; aesthetics

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

Introduction

Research has shown that exposure to energy-saving related information can enhance people's awareness and learning of energy conservation, drawing their attention even if they are not interested in saving energy [4]. Further, the way people treat consumption

and sustainability in their daily life is influenced by social media [7]. Twitter, a large online social networking system, receives hundreds of tweets related to the topic of energy consumption every week [5]. By posting, commenting, and retweeting such information on Twitter, people can collectively and collaboratively learn from each other. However, such tweets are sparsely located in the millions of tweets per day and updated at unpredictable times, making them hard to find and follow.

Inspired by how information affects people's awareness and actions, we designed an interactive system called *TweetDrops*, which finds tweets containing energy-saving information and aesthetically visualizes them as raindrops, along with text from randomly selected tweets. The design goal is to increase people's engagement, awareness, and collaborative learning through aesthetic visualization of qualitative information.

Related work

Information visualization and energy conservation
Many eco-feedback systems use data visualization to increase awareness of and facilitate understanding of consumption [8]. Visualizing one's own consumption data is a common tactic; for instance, FigureEnergy provides electricity consumption visualizations that help people become more aware of the consumption of each home appliance [3]. Visualizing others' energy consumption data is another popular practice, using comparisons to increase people's awareness of their own energy consumption and encourage them to be energy conservative. The *Reveal-it!* public energy display is an interactive project that shows comparisons of energy consumption data of individuals and

communities; the argument is that seeing such socially motivated, data-driven information will inspire awareness of energy consumption [11].

This type of work typically focuses on using quantitative data to emphasize social awareness, self-reflection, or understanding of energy data. Our focus, on the other hand, is on how descriptive, qualitative information such as Tweets might influence people by helping them think about how others treat and conserve energy.

Aesthetics
Aesthetic quality is an important aspect in interaction design, which is concerned with people's perception and interpretation of information [1]. Applying aesthetics in interaction designs often increases people's engagement [6]. For instance, Cosley et al. discussed how the aesthetic quality of an interactive visualization helped to foster people's awareness and learning in a museum setting [2]. We believe that applying aesthetics in visualizing the tweets and aggregating the tweets in one display system can enhance awareness of the information and encourage learning from others.

System design

TweetDrops is a computer-based visualization designed for people who have not paid attention to sustainability in their life before. *TweetDrops* opens up an opportunity for them to learn about energy conservation. It has two main visual components: one is the background rain drops, which represent the accumulation of energy related tweets collected from Twitter; the other is clickable foreground tweets with detailed content.

Strategy for filtering tweets

In pilot testing, hashtags resulted in finding more tweets relevant to energy conservation than using keywords. For example, using the keyword "saving energy" finds some tweets less associated with energy consumption, e.g., "I'm not lazy, I'm on energy saving mode" [8], while using the hashtag "#savingenergy" leads to more relevant results. We also found that changing the order of the words in a hashtag led to two different results, both related to energy conservation, e.g., "energysaving" and "savingenergy".

Thus, to retrieve tweets we used the following strategy. First, we defined three sets of keywords related to energy conservation: the first set includes "energy", "electricity", and "water", the second set is "saving" and "conserving", and the third set contains "tips", "tip", "conservation", and "efficiency". We then matched one keyword from the first set with one from the second to form two hashtags for each pair, e.g., "energysaving" and "savingenergy", generating 12 hashtags. We created another 24 hashtags by matching the first set and the third. Finally, we used the Twitter API to retrieve the tweets with those hashtags, plus the hashtag "greenenergy". We collected tweets for about 3 months and stored them in a local file.

Visualization: background drops

One of the main features in *TweetDrops* is the visualization of tweets as background drops. We chose an aggregate view to encourage users to think about the number of people who care and talk about energy conservation. Tufte argues that people engage more readily with visualizations that have greater aesthetic quality [9], so rather than showing a raw number of tweets, or a plain list of them, we visualized the mass of retrieved tweets as rain drops in the background.

The system first initializes a number of drops, equal to the total number of retrieved tweets (currently 1917 in our demo). Drops are randomly placed horizontally and move with a random speed from top to bottom. Drops are continuously recycled after all drops have fallen, which conveys that energy conservation is continuously being discussed in Twitter.

Visualization: foreground tweets

The other main feature is the foreground tweets, which contain detailed content to provide specific information and tips that people might act on and learn from, to complement the general awareness that the raindrops convey.

The foreground tweets are randomly selected from the retrieved tweets to support serendipitous discovery of useful or interesting sustainability information. Like the drops, the foreground tweets move slowly from top to bottom. A new tweet appears from the top when the previous one moves to the middle of the window vertically, which allows people to have enough time to read the content. We used a large font and a different color from the background drops to enhance legibility (Figure 2).

Clicking the foreground tweet opens it in Twitter, allowing people to find the author and other (potentially sustainability-related) information posted by that author.

Figure 2. Foreground clickable tweets are displayed as large blue sentences in front of the raindrops.

Conclusion

TweetDrops is an aesthetic visualization of tweets retrieved from Twitter. The goal of *TweetDrops* is to enhance people's awareness of sustainability topics and help them learn from others collaboratively by aesthetically visualizing qualitative data. We plan to deploy *TweetDrops* and evaluate how people feel and react to the system in the following aspects: does it help to foster awareness of sustainability; how people perceive and understand the visualization; where is an appropriate place to install the visualization; and what to improve. We are also curious whether similar visualizations could be used to increase interest and engagement in topics beyond sustainability.

References

[1]   Bardzell, J. (2009). Interaction criticism and aesthetics. In *Proc. CHI*, 2357–2366.

[2]   Cosley, D., et al. (2008). ArtLinks: fostering social awareness and reflection in museums. In *Proc. CHI*, 403–412.

[3]   Costanza, E., Ramchurn, S. D., Jennings, N. R. (2012). Understanding domestic energy consumption through interactive visualisation: a field study. In *Proc. UbiComp*.

[4]   Fishbein, M., Yzer, M. C. (2003). Using Theory to Design Effective Health Behavior Interventions. *Communication Theory*, 13: 164–183.

[5]   Green Tweets: 75+ Environmentalists to Follow on Twitter. http://mashable.com/2009/06/15/twitter-environmentalists/.

[6]   Petersen, M. G., Iversen, O. S., Krogh, P. G., Ludvigsen, M. (2004). Aesthetic interaction: a pragmatist's aesthetics of interactive systems. In *Proc. DIS*, 269-276.

[7]   Petkov, P., Köbler, F., Foth, M., Krcmar, H. (2011). Motivating domestic energy conservation through comparative, community-based feedback in mobile and social media. In *Proc. C&T*, 21–30.

[8]   Pierce, J., Paulos, E. (2012). Beyond energy monitors: interaction, energy, and emerging energy systems. In *Proc. CHI*, 665–674.

[9]   Tufte, E. R. (1990). *Envisioning Information*. Graphics Pr.

[10] Twitter. http://www.twitter.com/.

[11] Valkanova, N., Jorda, S., Tomitsch, M., Moere, A. V. (2013). Reveal-it!: the impact of a social visualization projection on public awareness and discourse. In *Proc. CHI*, 3461–3470.