

Users Impressions about Visualization Techniques in Social Networks Context

Eduardo Ghidini, Elisa Costa Diel, João Pedro Dewes Guterres, Greice de Carli Roman, Milene Selbach Silveira

PUCRS, Faculdade de Informática
Porto Alegre - Brazil

{eduardo.ghidini, elisa.diel, greice.roman, joao.guterres}@acad.pucrs.br, milene.silveira@pucrs.br

ABSTRACT

This paper introduces a study to analyse the users impressions about different visualization techniques. To achieve this, we used the Spot tool, which provides a set of different visualization techniques to users with information retrieved from Twitter. This study was conducted with a sample of 7 Twitter users who have never used this tool before. We collected their impressions and interactions with the system on each visualization technique available. When running a qualitative analysis of the data gathered, an interesting set of results were found. Advantages and disadvantages for each visualization technique introduced were found by all users. This led us to a discussion on where each kind of those techniques would be better introduced or used.

Author Keywords

Visualization Techniques; Social Networks; Twitter.

ACM Classification Keywords

H.5.2. Information interfaces and presentation (e.g., HCI): Evaluation/methodology.

INTRODUCTION

Nowadays a massive volume of data is constantly been generated through user's interactions in Social Networks. Looking through all this data, it's possible to extract useful information, which can be used for different goals [6]. However, the discovery and the manipulation of such data can be of some challenge. First, due to the need of pre-processing the data, then due to the definition of the form of presentation and also the features that will be available to users [2]. According to Azzam [1], the definition of data visualization relies on three criteria. Data visualization is a process that (a) is based on qualitative or quantitative data and (b) results in an image that

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than ACM must be honored. Abstracting with credit is permitted. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from Permissions@acm.org.

IHC 2015, November 3–6, 2015, Salvador, Brazil

© 2015 Association for Computing Machinery. ACM ISBN

978-1-4503-5362-5/15/11...\$15.00

DOI: <https://doi.org/10.1145/3148456.3148515>

is representative of the raw data, which is (c) readable by viewers and supports exploration, examination, and communication of the data.

The goal of our study is to analyse different visualization techniques, in social network context, through users' impressions. To perform this, we used the Spot tool [4], which allowed us to centralize the study in one tool. Next sections present the related work, focused on visualization techniques applied on Social Networks context. After that we present our research methodology. Finally, after the description of the findings, we discuss the analysis and final considerations.

RELATED WORK

An initial literature review showed that Information Visualization, applied in context of Social Networks, have been subject to study of many researchers [10, 11, 12]. With the progress of this field, the interfaces have become more interactive. Because of this, many studies and works have been made to better assess visualization techniques. [13, 5, 9].

DeepTwitter [10] is a interactive prototype that allows, through visualization techniques, to analyze user's connections and visualize tweets of a specific user or of a group of users. User's and groups connections are visualized in a Graph, and Tweets are shown in a timeline, organized by the day and the time of the tweet. This tool also provides a Tag Cloud visualization and the possibility to create categories of tags, in which users can differentiate tweets by subjects and visualize them separately.

OpinionFlow [11] allows a visual analysis of opinion diffusion over Twitter, from a certain subject. The interface shows, in a timeline, the topics related to the chosen subject. All topics related are displayed in a chart, in which the words that are closest to each other, are the words that have a strongest relationship. The interface also provides the sentiment analysis result, through the color representation, in a scale that green represents positive opinion, and red represents negative opinion.

FluxFlow [12] is a tool that, by machine learning algorithms, detects anomalous information in Twitter. It provides a mechanism for visualizing retweets threads. The threads, called Thread Glyph, are grouped and shown as a circle, which contains the anomalous score and the sentiment score. The Thread

Glyphs can be detailed to show the Twitter thread in three distinct timelines.

RESEARCH METHODOLOGY

The research question that underlies our study is: *What are the advantages and disadvantages of using different visualization techniques to display tweets based on the acquisition of information by the user?* To start to understand it we conducted an exploratory descriptive investigation [7] on the Spot tool.

Spot tool

Spot tool is an interactive real-time Twitter Visualization, created by the company Neoformix, that uses a particle to represent tweets. Figure 1 shows the six forms to visualization techniques used by this tool: (a) Banner View (top five groups of similar tweets); (b) Timeline View (tweets along a timeline); (c) User View (a bar chart with the people sending the most tweets in the set); (d) Word View (word bubbles with tweets attracted to the words); (e) Source View (a bar chart showing the tool used to send the tweets); and (f) Group View (tweets that share common words inside large circles).

Exploratory Investigation

We conducted a study with a sample of 7 active Twitter users individually. After collect users demographics, we conducted an user observation. The tasks proposed to all users were the following: (A) Login at Twitter and search for a hashtag(s) of your choice; (B) Now visit the Spot tool and perform the same search done on Twitter. After the tasks accomplishment, we interviewed the participants, in order to collect their impressions of each visualization technique provided by the tool.

It is important to highlight that we conducted a pilot user observation to verify that we were indeed collecting all data necessary to answer our research question, and only after some improvements made on the instrument we went on the field to collect data.

All interviews had the audio recorded, and we recorded a video with the interaction of two participants, by using a software that records the screen of the computer. Users feedback analysis was performed by peers, using the method Qualitative Content Analysis, following guidelines used by Mayring [8]. Our initial findings will be shown in details in the next section.

FINDINGS

Participant Profile

We collected data from 7 different Twitter users - 5 men and 2 women. Their age vary between 21-35 years old. Among those, 6 of them considered themselves advanced computer user, while the other one said to be an intermediate computer user. The average time spent on Twitter by these users ranges from less than an hour to up to three hours (daily). When asked about for what purpose they use Twitter, the most general answer was to stay informed. The most popular device used by these users to access Twitter is computer but smartphones were also cited by some. Before using the Neoformix Spot tool, 4 users reported to have used another tool to visualize tweets outside Twitter environment. The tools cited were: TweetDeck (2 users), TweetBot (1 user), Follow my hashtag (1 user).

Interaction and presentation

Regarding the interaction with the tool, 6 out of the 7 users seem to have enjoyed it. The user that was the exception said that it was difficult to interact with the tool when comparing it to Twitter's way of doing the same thing: *"I don't find a quick way to read a tweet, the fact that I have to see the user's photo and then find out what this tweet is about, I think this is much more work than simply giving scroll in a list."* (U6). When asked if the tool was clear and of easy understanding, 2 users said yes, though, they had difficulties while fully understanding some of the visualization techniques; other 2 said it was not that easy but also not that hard to understand the usage but the whole tool was clear; 3 users said it was difficult to understand.

Different visualization techniques (VT)

Banner View: According to U1, the understanding of how things are displayed in this one impacted its clarity: *"I didn't understand the difference between the three columns displayed here. It took me a while to fully understand it and those bubbles on the side don't make any sense."* U3 also reported difficulties: *"The difficulty was to understand if they were grouped by word or by that hashtag."* U2 and U3 ranked Banner View as the worst among them, though U2 didn't make any comments about this one.

Timeline View: Only U5 mentioned this visualization technique as one of his favorites. Other quotes are: *"This lets you view the timeline verifying what has been spoken at a certain time."* (U5); *"It was intuitive to understand. And good to know which tweet is older and which is younger."* (U6). This visualization option, in addition to Word View, were ranked as the best visualization technique, among the options provided by the tool.

User View: This one was elected by U3 and U4 as their less favourite. However, only U7 explained why: *"I don't see much usage in this type of display. It would be more relevant if it showed people who have the most retweets, or more replies, or long conversations (relevant tweets)."* On the other hand, some advantages were mentioned by other users: *"It may be useful to see if someone has a lot of information on that matter."* (U2).

Word View: Despite the fact that from the six different visualization techniques provided by Spot tool, all members - unanimously - indicated that the this option was the one that they liked more, U5 and U6 listed some difficulties: *"The mix between the words and tweets are a little confusing."* (U5); *"I kept wondering if the proximity among the bubbles had some influence in each other (if bubbles next to each other meant that those words were related or if their layout were just random."* (U6). However, many advantages were recorded, for example: *"This is the coolest. You can see how people is talking about this matter and the word is highlighted as well."* (U3).

Source View: Even though all users were able to understand the main purpose of this option (which are group tweets by device), some of them did not understand the meaning of some

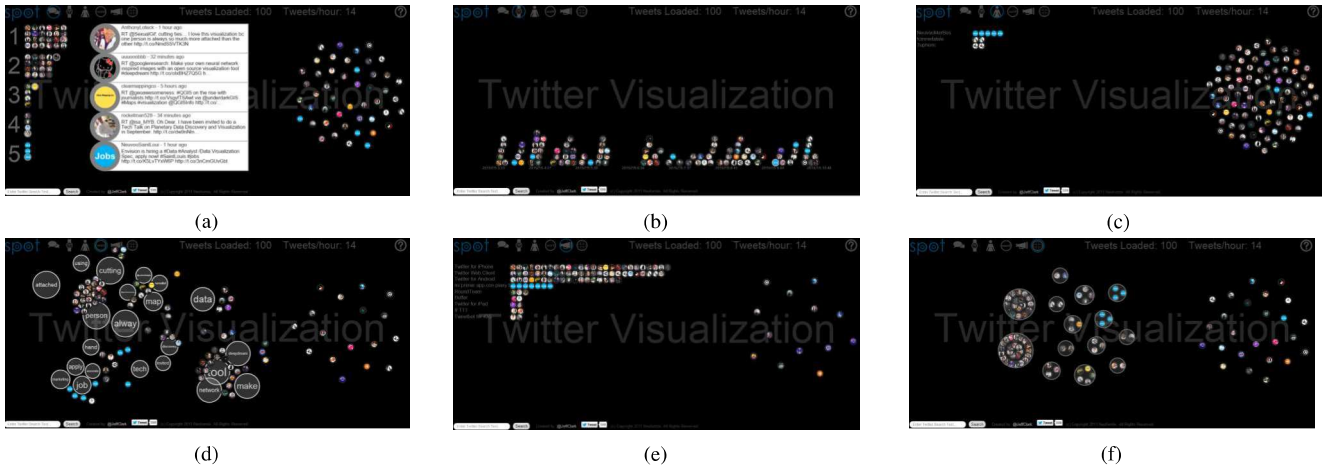


Figure 1: Spot tool Visualization Options: (a) Banner View; (b) Timeline View; (c) User View; (d) Word View; (e) Source View; and (f) Group View.

non-clustered tweets. U3 mentioned this fact: *"I didn't quite understand the guys loose on the right."*

Group View: U1, U4, and U7 pointed this option as the one they liked least. U2 and U5 reported not having understood the purpose of this one: *"I didn't understand the purpose of 'users' face' aggregation. The icon was not clear on what was being clustered."* (U6); *"I'm not interested in knowing who is speaking something similar to each other... what matters is what friends or relevant pages are talking and not just random people."* said U7 referring to the lack of a profile classification the grouped tweets.

Comparing Neoformix Spot tool with Twitter's hashtag search

When asked to compare this tool to Twitter's visualization technique while searching for hashtags, U2, U3, and U5 said to prefer Spot tool: *"Here you have more information, you can filter out much more. You can understand things faster and even link it to events."* (U2); *"Twitter is very hard-coded, it hasn't changed for a long time. This one has a lot more interaction, so I think it is better."* (U3); *"This view gathers more information - even with the time limit."* said U4 referring to the tool's limitation of only loading 100 tweets in a time span.

On the other hand, U1, U4, U6, and U7 preferred Twitter for the following reasons: *"Twitter seems to me extremely organized. It's important you have an order so you can know what's happening. Another thing is that on Twitter, you have a way to follow a discussion and here (in this tool) you can't."* (U1); *"I couldn't find a quick way to read a tweet, having to see the photo of the user, then find out about what this tweet is about, I found it to be a lot more work than simply to scroll through a list."* (U6).

Going a little further, U6 talked about some good points when comparing both tools: *"This tools don't allow me to interact with other people, so this is a bummer. The tool, as an information extraction is very weak; I mean Twitter always*

shows the most relevant first, opposite from this tool, which showed me random tweets. Other thing, is the tool's limitation (it only loads 100 tweets) and shows me that there are X people talking about a subject, and Y people talking about other. Also, this tool showed me lot duplicated info. Furthermore, to show that a user A simply said something about this hashtag doesn't matter to me. It would be relevant to show what my friends and people I follow are talking about, or at least, show what influential people are talking about. I have a feeling that Twitter has more personalized information for me."

Suggested Improvements

During the observation and interview process, users also reported some improvements that they'd like to see on the tool: *"In fact, I'd like for this search box not to be there at the bottom. I was under the impression that I was going to search on Google and not on the tool. This is what I think, that this search box won't search within this tool. It should be in the center of the screen and when you do the search, it would fade away and then it would come the views."* (U1); *"There, in the timeline, it should highlight the time, it passes by unnoticed."* (U2); *"In view 4, the bubble size has to be according to the number of incidences of the word (as a word was identified in tweets, the greater the size of it. Also, the tool should display a relevant time-frame, to display the most relevant hashtags (a more intelligent search)"* (U7); *"I should be able to increase the number of tweets the search returns and also to be able to define the time-frame."* (U6); *"There could be a connection to my Twitter's profile and it could display my photo. And also, it could allow you to reply to a tweet in here."* (U2); *"On the search, it would be nice to be able to search multiple hashtags and see how they relate to each other."* (U1).

Another important thing to notice is that all users complained about the help available on the tool: *"Perhaps, I could have a caption on the icons to help out."* (U2); *"The tool could have a help pop-up, where you hover the mouse over the menu and it would explain to me what each view offers. It would be very useful."* (U3); *"Views have to be more intuitive, with more*

integration, less intuitive icons, each view should have its own explanation.” (U5); “The system is not self-explanatory, it should give autonomy to the user so we can understand how to use, how to group, rank, etc.” (U6).

DISCUSSION AND FINAL CONSIDERATIONS

In this work we presented an exploratory descriptive investigation to bring attention to the advantages and disadvantages of different visualization techniques used to display tweets. For this specific work, we decided to analyze the techniques available at the Spot tool [4].

Through the data gathered, our first findings show us that users have difficulties to fully understand some visualization techniques, even users that had already used similar tools before. Spot tools does not provide simple ways for users to understand the main purposes of each visualization technique. The lack of information regarding the interface behaviour and interaction were the main difficulty pointed out by users when using the tool. As an example, in the Word View, even though users enjoyed and thought that the visualization technique was very useful, they were unable to understand if the approximation of the bubbles had some influence in the disposition of the content. Another example is the difficulty to understand why in the Banner View and in the Source View, some tweets were not grouped but placed on the other side of the interface.

When comparing this tool to others introduced in the related work section, we identified some similar techniques, such as: the Timeline View, the possibility to visualize tweets of a specific user or group and the availability of seeing tweets by subjects/topics. One feature missing when comparing to these other tools is the sentiment analysis, which this lacks of and would be an interesting technique to be presented with the tool suite.

The main benefit of this tool is that it allows us to use those different techniques according to what best suits your needs. For example: if you are a media expert, it might interest you to use the Timeline View, to analyse when people are talking about your company, where are the spikes, etc. On the other hand, if you are a regular user, you might benefit from the word view if you are searching for candidates in politician campaigns and their main ideas.

Many of these emerging research areas may rely on advances in social network analysis, text analytics, and even economics modeling research [3].

REFERENCES

1. Tarek Azzam, Stephanie Evergreen, Amy A. Germuth, and Susan J. Kistler. 2013. Data Visualization and Evaluation. *New Directions for Evaluation* 2013, 139 (2013), 7–32. DOI : <http://dx.doi.org/10.1002/ev.20065>
2. Stuart K. Card, Jock D. Mackinlay, and Ben Shneiderman. 1999. *Readings in information visualization: using vision to think*. Morgan Kaufmann.
3. Hsinchun Chen, Roger H. L. Chiang, and Veda C. Storey. 2012. Business Intelligence and Analytics: From Big Data to Big Impact. *MIS Q.* 36, 4 (Dec. 2012), 1165–1188. <http://dl.acm.org/citation.cfm?id=2481674.2481683>
4. Jeff Clark. 2009. Neoformix Blog: Introducing Spot. (2009). <http://neoformix.com/2012/IntroducingSpot.html>
5. Carla M. Dal Sasso Freitas, Marcelo S. Pimenta, and Dominique L. Scapin. 2014. User-centered evaluation of information visualization techniques: Making the hci-infovis connection explicit. In *Handbook of Human Centric Visualization*. Springer, 315–336.
6. Muhammad Imran, Shady Elbassuoni, Carlos Castillo, Fernando Diaz, and Patrick Meier. 2013. Practical extraction of disaster-relevant information from social media. In *Proceedings of the 22nd international conference on World Wide Web companion*. International World Wide Web Conferences Steering Committee, 1021–1024.
7. Jonathan Lazar, Jinjuan Heidi Feng, and Harry Hochheiser. 2010. *Research methods in human-computer interaction*. John Wiley & Sons.
8. Philipp Mayring. 2000. Qualitative Content Analysis. *Forum Qualitative Sozialforschung / Forum: Qualitative Social Research* 1, 2 (2000). <http://www.qualitative-research.net/index.php/fqs/article/view/1089>
9. Markus Rester and Margit Pohl. 2006. Methods for the evaluation of an interactive infovis tool supporting exploratory reasoning processes. In *Proceedings of the 2006 AVI workshop on BEyond time and errors: novel evaluation methods for information visualization*. ACM, 1–6.
10. Guilherme Coletto Rotta, Vinícius Silva De Lemos, Ana Luiza Moura da Cunha, Isabel Harb Manssour, Milene Selbach Silveira, and André Fagundes Pase. 2013. Exploring Twitter Interactions through Visualization Techniques: users impressions and new possibilities. In *Human-Computer Interaction—INTERACT 2013*. Springer, 700–707.
11. Yingcai Wu, Shixia Liu, Kai Yan, Mengchen Liu, and Fangzhao Wu. 2014. OpinionFlow: Visual analysis of opinion diffusion on social media. *Visualization and Computer Graphics, IEEE Transactions on* 20, 12 (2014), 1763–1772.
12. Jian Zhao, Nan Cao, Zhen Wen, Yale Song, Yu-Ru Lin, and Christopher M Collins. 2014. # FluxFlow: Visual Analysis of Anomalous Information Spreading on Social Media. *Visualization and Computer Graphics, IEEE Transactions on* 20, 12 (2014), 1773–1782.
13. Torre Zuk, Lothar Schlesier, Petra Neumann, Mark S Hancock, and Sheelagh Carpendale. 2006. Heuristics for information visualization evaluation. In *Proceedings of the 2006 AVI workshop on BEyond time and errors: novel evaluation methods for information visualization*. ACM, 1–6.