A USABILITY EVALUATION AND CONTENT ANALYSIS OF VIZBLOG: AN ONLINE CONVERSATION DISCOVERY TOOL

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CONTENT ANALYSIS OF VIZBLOG: ANALYZING CITIZEN TO CITIZEN DELIBERATION ONLINE USING BLOGS

by

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(ABSTRACT)

Interested citizens use the Internet for, among other purposes, expressing their opinions and views about political issues and local concerns. There is much expression by citizens in web logs (or blogs). Blogs are a form of individual expression, publicly available and constantly updated. Blog entries may contain a variety of topics of discussion. Two topics are the focus of this thesis: political and local issues. Often blogs are aggregated into regional collections. These aggregated sites are a good source for local and regional discussions. However, because the discussions are only implicitly connected, tools are needed to identify similarity in otherwise individual blog entries. Blog visualizations can help address this problem. We have created a tool, VizBlog that supports the task of local blog discussion discovery. This blog visualization tool visually presents information in a way that helps users identify blog entry clusters of similar content, helps citizens find other citizens opinions, and also helps government officials identify local hot issues. This research seeks to: a) validate the accuracy of the automated similarity classification done by VizBlog; b) evaluate the usability of VizBlog; and c) study the characteristics of local conversations scattered in a series of regional blogs. The results of the evaluation showed that VizBlog did make it easy for users to identify topics of interest from the visualization, in addition to providing insight on ongoing discussion taking place in regional blogs. In addition, the automated similarity computation was validated when compared to classification done by humans. Finally, the thesis discusses the findings of the structure of the regional blogosphere.
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Chapter 1: Introduction

1.1 Problem Statement

Blogs are a form of personal expression, publicly available on the World Wide Web. Posts in blogs are updated on a regular basis and may contain various topics of discussion. The discussions could be in the form of other blog entries or comments posted on the original blog post. In addition blogs may also contain hyperlinks to other websites. All these interconnections help to create a form of online discussions. Among the topics of discussion found in blogs are political opinions in addition to expression of personal opinions.

We hypothesize that if we restrict a set of blogs based on location, the political opinions would group into local political discussions. Local discussions help local residents of a town (citizens) express their opinions about their concerns and needs. Such discussions also have the potential to help citizens in engaging in discussions about local news, events, happenings, in addition to expressing their thoughts and comments. Government officials would also benefit from such local discussions and they can use them as a way to identify some of the important issues that they would need to address. Kavanaugh et al. (Kavanaugh A., 2005) address how technology could strengthen the bonds between the citizens and government use of online resources. They identified cases of online discussion and found that tools such as blogs and wikis contribute more to local discussion than other centralized tools. This was because of the ease of use of such tools and also their highly interactive nature of these decentralized tools.

Because blogs are dispersed, unrelated and grow rapidly, identifying blogs with similar content is practically impossible. The vast volume of blogs online, makes exploring and analyzing content of interest very difficult (Jenkins, May 2003). These dispersed blogs could have a broad range of topics, which would make it even more difficult to explore content and analyze information. All of these factors together create a discovery problem. One way to address this problem is by using blog visualizations.
Fortunately, it is technically feasible to build tools that automatically process blog content. Blog content is often made available via syndication (e.g., RSS feeds) and software can process this content and build visualizations graphically depicting relationships from the blog contents. There are several visualization tools that already exist. For example, *Vizster* (Heer & Boyd, 2005) is tool for exploring online social networks like Friendster and Orkut. Using the force-directed layout, *Vizster* provides an ergo-centric view of a person’s social network. Anjewierden (Anjewierden, 2005) analyzed conversations in blogs and graphically presented these interlinked conversations taking place in a blogosphere. Noor Ali-Hasan (Ali-Hasan, 2006) analyzed social patterns and behaviors in blog comments and blogrolls using three blogging communities from different countries around the world.

We have created a tool, VizBlog, that supports the task of local blog discussion discovery. This blog visualization tool:

- Visually presents information in a way that helps users follow the threads of discussion.
- Helps citizens find other citizens opinions.
- Helps government officials identify local hot issues.

This research evaluates how well VizBlog addresses the discovery problem mentioned above. It also verifies whether the similarity between blog entries can be automatically computed or not. In addition, this research aims to identify the characteristics of local conversations that are scattered in a series of regional blogs.

**1.2 Growth of Blogs**

Blogs are online journals that are constantly being updated and promulgated on the World Wide Web. Though blogs have existed since the early days of the Web, people seem to have started using them widely as a means of online communication. Blood (Blood, 2002), claims that blogs have become omnipresent after the advent of “Blogger” ([www.blogger.com](http://www.blogger.com)), one of the many software’s released for automating blog publication.

The blog-tracking company Technorati, Inc. reported an increase in blogs, from 1 million in 2003 to 4.2 million in October, 2004 (Rosenbloom, 2004). The public nature of blogs, though
they are written in one’s own personal space, suggests a need to communicate with others (Mortensen, 2004). Posts trigger feedback in the form of comments or replies directly to the post itself or to other blogs linking to it (Efimova & de Moor, 2005). Although blogs are written in a chronological order, they are displayed in the reverse-chronological order and this sometimes makes it difficult for people to connect conversations, orient and understand information due to the fact that they have to search for posts that they are interested in or want to post replies to. The practice of replying to an original post, through links from a different blog creates confusion. Complex blog conversations are common in the blogosphere (Efimova & de Moor, 2004). Since new readers are drawn towards conversations through links from other web pages, they are often unaware of the original discussion and thus have a limited ability to track these conversations (Efimova & de Moor, 2005).

Due to the increase in the number of blogs, it has become increasingly difficult for users to find and explore content of interest and analyze the flow of information within blogs (M. A. Pérez-Quiñones et al., 2007). VizBlog is a recent addition to a large number of tools and studies that have analyzed the flow of information in blogs (Ali-Hasan, 2006; Anjewierden, 2005; Heer & Boyd, 2005). Many of these tools use visualization techniques to help users discover, explore and navigate the content of the blogosphere. VizBlog was designed to address the discovery problems caused by a large number of disconnected blogs, with a broad range of topics graphically showing the linkages among blogs addressing common topics.

VizBlog groups related or similar blog entries represented as nodes into clusters of local information. This makes it easier for citizens to navigate through a graph and find topics of interest using a search feature or a keyword cloud.

1.3 Research Questions

This thesis presents a summative usability evaluation of VizBlog, which tests the extent to which the goals of the tool are being met. This evaluation has employed quantitative techniques, content analysis, focus groups, and semi-structured interviews with citizens and town leaders. The blog entries used for the evaluation were blogs from the Southwest Virginia aggregator.
website (SWVA)\(^1\) for the period between February 21, 2007- March 21, 2007. This is a blog aggregator website which collects blogs from 41 different blogs in Southwest Virginia.

The primary research questions are:

a) Can the similarity between blog entries be automatically computed? From previous unpublished work on VizBlog (M. A. Pérez-Quíñones, Isenhour, P., Fabian A., Kavanaugh, A., Godara, J.), we learned that the similarity computation was relating blog entries that human participants did not consider similar. We need to evaluate with humans that blog entries deemed “similar” by VizBlog are indeed similar.

b) Can VizBlog support citizens and government officials in the discovery of local discussions taking place in regional blogs?

c) What are the characteristics of local conversations scattered in a series of regional blogs?

**1.4 Goals of the Research**

The main goal of this research is to study and evaluate if VizBlog can be used to help solve the discovery problem for local discussions.

The value of a tool like VizBlog for discovering local discussion is that it mediates between the needs of the citizens (discussion-producers) and government officials (discourse-consumers). Citizens prefer to choose or create their own "comfortable setting" for discussions. Government Officials would prefer that discussions and deliberation took place in a known setting, to allow discussions to be easily found. VizBlog has a potential value to both citizens and town government officials alike by connecting consumers with producers. It could help citizens keep track of other citizen’s opinions on local topics of interest and also help them stay up-to-date with local news, events, and happenings. The tool also has potential value to government representatives. For example, town government leaders want a way to hear from a broader population of citizens than those who usually attend face-to-face meetings or who communicate directly through letters, phone calls or email.

\(^1\) [http://www.swvanews.com](http://www.swvanews.com)
1.5 Overview of the Thesis

This thesis is organized as follows. Chapter 2 includes the review of the literature covering the areas of blogs, content analysis of blogs and information visualization. Chapter 3 presents an overview of VizBlog, a brief history of how the tool was developed, and the results of a prior evaluation. Chapter 4 presents the methodology used for validating the automatically computed similarity coefficient values generated by VizBlog, a summative usability evaluation of VizBlog and the analysis of local blog content to explore topics of discussion. Chapter 5 presents the results of the validation of the similarity ratings, the results of the usability evaluation and the results of the content analysis and validation of the global tagging done by human raters. I finish in chapter 6 with a discussion of the ease of use of VizBlog and how it helps citizens and town officials discover discussions taking place in blogs. This chapter also has a section on future work.
CHAPTER 2: Background and Related Work

This chapter contains a review of the literature in three areas. First, it discusses blogs and the work already done in the blogosphere. Blogs are a recent phenomenon, but their growth has been quick and research on them has followed closely. Second, this chapter discusses several methods of content analysis. This is used as a way to extract information out of the content of blog entries in this work. Finally, the chapter concludes with a discussion of information visualization as a way to present relationships in data.

2.1 Introduction of Blogs

Weblogs (also commonly known as blogs) are frequently updated web pages that have posts displayed in reverse-chronological order. They have become a popular and even mainstream form of online communication (Blood, 2004). The rise of automated blog publishing tools and growth in the blogosphere has been documented by Herring et al (S. C. Herring, Scheidt, Bonus, & Wright, 2004) and the Pew Internet & American Life Project (Rainie, 2005). By Spring 2003 the number of blogs that were publicly available has increased twofold (S. C. Herring et al., 2004). In November 2004, 27% of Internet users were reading blogs, which means that the readership increased to 58% from the 17% during February 2004. Rainie (Rainie, 2005) establishes that in 2005 about 7% of all Internet users in the U.S. had created their own blogs for personal use.

According to Wallsten (Wallsten, 2007), due to the overall growth in blogging, the number of people explicitly involved in political blogging has also increased in the recent years. Figure 2-1 shows that the number of “political” blogs has increased at a faster rate than the number of blogs about art, technology/computers, finance/business, music and sports ("http://portal.eatonweb.com/ , EatonWeb - The Blog Directory,"). There has been a dramatic increase in the number of political blogs between the period February, 2001 to June 2006. In 2006, there were 1.4 million blogs that contain purely political content, according to a telephone survey conducted by the Pew Internet and American Life Project in 2006 (Lenhart & Fox, 2006).
The simplicity of blog publishing software like “Blogger (www.blogger.com)” makes it easy to create blogging websites using the “push button technique.” Blood (Blood, 2004), claims that for a lot of people the term “Weblog” is now synonymous to “personal Website”.

The first blog in the present-day format first appeared in 1996 (Winer, May 2002): the term “Weblog” was coined by Jorn Barger, in 1997 who defined it as “A Web page where a Web logger ‘logs’ all the other Web pages she finds interesting” (Blood, 2002). The permalink feature introduced by Blogger gave each blog entry a distinct URL, which could be used to reference a blog. The trackback feature automated cross-blog talk (Schiano, Nardi, Gumbrecht, & Swartz, 2004). Figure 2-2 below gives a functional representation of trackbacks in blogs.
Blog entries, also known as posts or messages, are basic units of blogs content. The style of the entries may vary widely from an entry having only a single link, short passages, lengthy originally content or simply quotes from other websites or news sites. Blog posts may sometimes include photos and other multimedia content like videos in addition to textual information (Schiano et al., 2004). Usually blog entries consist of the following (Brady, 2005):

- **Title** – main title of the post
- **Body** – main content of the post
- **Permalink** – permanent link to the individual post
- **Post Date** – date that the post was written

Blog entries would optionally include comments (feedback) and trackbacks (notification mechanism to the author whose post has been referenced) located at the end of each post.

The series of blog conversations that are interlinked has been called the Blogosphere. According to Brady (Brady, 2005), permalinks, comments and trackbacks are the three components that together make the blogosphere a networked “community” of information. In the blogosphere, conversations are in the form of replies or comments posted in the context of some original post or discussion.
One difficulty in keeping track of discussions in the blogosphere is the lack of bi-directional links between posts (as most posts contain links pointing to an earlier one, but not vice-versa). The absence of bi-directional links prohibits bloggers from knowing who is reading or quoting them, since there is no easy way to find this information. Thus there is no easy way to know the impact of a blogger’s statement and the rebuttals that it may have generated. *Trackbacks* are a way to use technology to partly address this problem. Figure 2-2 shows how trackback works. When one blogger references another blogger’s post, the blogger whose post is referenced would get a notification about the reference.

The analysis of blog conversations is difficult because they are distributed and fragmented in the blogosphere (Efimova & de Moor, 2004). Lack of tracking technologies makes analysis difficult, as there is no tracking technology that can fully track a weblog conversation (Efimova & de Moor, 2005).

Kumar et al. (Kumar, Novak, Raghavan, & Tomkins, 2005) have studied and modeled sudden bursts of activity and connectivity within the blogosphere based on an analysis of the developing link structure. Their study showed noticeable increases in connectedness and local community structure in a blogosphere. According to their study local communities displayed increases in the occurrences of bursty link creation behavior. This was because dispersed individual bloggers come together to share their thoughts and opinions. This collective conversation then takes the form of a spike. Gruhl et al. (Gruhl, Liben-Nowell, Guha, & Tomkins, 2004) furthered the work of Kumar et al. (Kumar, Novak, Raghavan, & Tomkins, 2003) by focusing on dissemination of topics between blogs based on the actual text of the blog, rather than the hyperlinks. They point out that generally topics in blogs are composed of *chatter* (ongoing discussion whose subtopic flow is largely determined by decisions of the authors). These topics may also at times include *spikes* (short-term, high intensity discussion of real-world events that are relevant to the topic).

Bloggers link to other bloggers either by referring to them in their entries or posting comments on other’s blogs and this phenomenon causes interconnectedness in blogs (S. C. Herring et al., 2005). Ultimately, inter-linking of the sort required to get conversations started has the relatively invisible prerequisite of "inter-reading" (Gibson, Kleinberg, & Raghavan, 1998). In other words, given the huge scale of the blogosphere, why are any two people likely to be reading each other's
blogs, and, ultimately, writing about and sending their readers to each other's blogs? For this research, it was hypothesized that by restricting or constraining the set of blogs based on location, would result in interlinked conversations that were likely to be about regional issues. For example, a physical trainer, a semi-retired executive, a lawyer, and a firefighter probably read blogs from people in similar roles from other places, but they are also likely to read each other’s blogs if they are affected by the same civic/political issues, get the same daily newspaper, have kids at the same school, belong to the same church or civic organization, or have other real-world connections that are predicated on living in the same geographical region. It is also likely that different people might be writing about the same topic without having any kind of connection with each other.

Blogs are sometimes perceived as merely personal diaries. However, the collection of blogs can be seen as a place for discussion. One of the goals of this work is to study and evaluate if such a characterization is true for local political blogs. According to Herring et al. (S. C. Herring et al., 2005; S. C. Herring et al., 2004) blogs fall in between asynchronous discussion forums and standard web pages. They point out that although most blogs seem to be personal in nature, but they sometimes also have characteristics of offline discussion, such as newspaper editorials.

2.2 Content Analysis of Blogs

For this research, blog content was analyzed to study the characteristics of local conversations that are scattered in regional blogs. Blogs from the Southwest Virginia website were used for this analysis. It was hypothesized that analyzing a set of regional blogs the political discussions found there would group into local political discussions. Content analysis would help us classify blogs based on whether they are political, non-political, local and non-local.

Holsti defines content analysis as “any technique for making inferences by objectively and systematically identifying specified characteristics of messages” (Holsti, 1969). Content analysis has been also been defined as a organized, replicable methodology using which text can be compressed into fewer content categories based on specific rules of coding (Weber, 1990).

Generally most of the content analyses of the Internet have generally focused on how messages are presented as opposed to what is communicated (Hoffman, 2006). The specific type of
content analysis approach chosen by an individual depends on the his interests and also the problem being studied (Weber, 1990).

Content analysis methods have been employed in analyzing the structure, topics and purpose found in Weblogs (S. C. Herring, Scheidt, Kouper, & Wright, In press, 2006). Using content analysis on a random sample of 203 Weblogs, Herring et al. (S. Herring, Scheidt, Wright, & Bonus, 2005; S. C. Herring et al., 2004) were among the first to analyze blogs as a genre of Internet communication. According to their analysis blogs are comprised of a hybrid genre (drawn from various sources including Internet genres), which means they are neither unique nor reproduced in their entirety from offline genres. The parameters used for coding in this study included the primary reasons for blogging, structural (entire body features of a blog) as well temporal features of the blog as well as demographics of the blog authors. Their qualitative interpretation of the results showed that the demographics of the authors were not very different from other users who used forums or personal web pages for discussions. They also found that most blogs in their sample were personal journals, which shared characteristics with offline genres such as diaries and newspapers.

The results of a quantitative content analysis study of a random sample of 260 blogs that were hosted by Blogger.com (Zizi Papacharissi, 2007) were similar to that of Herring et al. (S. C. Herring et al., 2005; S. C. Herring et al., 2004). Papacharissi in his work classifies blogs as having more in common with personal diaries as opposed to independent journalism.

Another content analysis study (K. D. Trammell, Tarkowski, A., Hofmokl, J. and Sapp, A. M., 2006) was performed using coding structure similar to Trammell et al. (K. D. Trammell, 2004; K. D. Trammell, & Keshelashvili, A., 2005) and Papacharissi (Z. Papacharissi, May 2004) using 358 Polish language blogs from blog.pl (a popular Web-based blogging software program in Poland). This study employed webstyle content analysis methodology to find out how bloggers presented themselves through their blogs. The results of this study too were consistent with the English language blogs (S. C. Herring et al., 2004; Z. Papacharissi, May 2004; K. D. Trammell, 2004). This sample was classified as being more diary-like instead of being used for professional reasons.
Herring et al. (S. C. Herring et al., In press, 2006) conducted the first longitudinal content analysis on three random weblog samples collected (using blog tracking website blog.gs) at six-month intervals (total of 457 blogs) between March 2003 and April 2004. They conducted a Content analysis on active, English-language, text-based blogs to study the structural and functional properties of blogs. Coding categories included blogger characteristics, blog type, software used for blogging software used and the textual and interactive features of the most recent entry.

Nardi et al. analyzed blogs to discover the reasons for blogging amongst individuals. The table below summarizes the results of an ethnographic study of blogging practices by ordinary bloggers (Nardi, Schiano, Gumbrecht, & Swartz, 2004). The authors point out the five major motivations for blogging.

<table>
<thead>
<tr>
<th>Motivations</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Documenting one’s life</td>
<td>Blogging to record activities and events. Using the Blog as a public journal, photo album or a travelogue.</td>
</tr>
<tr>
<td>2. Providing commentary &amp; opinions</td>
<td>Using blogs to express opinions. Blogging on pertinent and important topics. Moving between the personal and the profound.</td>
</tr>
<tr>
<td>3. Expressing deeply felt emotions</td>
<td>Viewing blogs as an outlet for thoughts and feelings.</td>
</tr>
<tr>
<td>4. Articulating ideas through Writing</td>
<td>“Getting ideas out there” in a more constructive manner. Blogging helps some people test their ideas.</td>
</tr>
<tr>
<td>5. Forming &amp; Maintaining Community Forums</td>
<td>Expressing views to one another in community settings.</td>
</tr>
</tbody>
</table>

Table 2-1: Five major motivations for blogging (Nardi et al., 2004)

In another content analysis study the characteristics of blogs was studied using a set of 15 “topic oriented” weblogs (Bar-Ilan, 2004) for a period of two months. The content of these blogs were characterized using Krippendorf’s content analysis methodology (K. Krippendorf, 1980). Blog characteristics such as the number of postings and links per posting, posting topic, authorship,
and placement of links in postings were analyzed. Analyzing this content of blog posting provided information about the blogs.

In a telephone survey conducted by The Pew Internet & American Life Project (Lenhart & Fox, 2006) found that a majority bloggers mainly blog to express their creativity and share their stories. Only one-third of the bloggers mentioned that they saw blogging as a form of journalism. The results of this survey are summarized below.

<table>
<thead>
<tr>
<th>Reason for Blogging</th>
<th>Major reason</th>
<th>Minor reason</th>
<th>Not a reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>To express yourself creatively</td>
<td>52%</td>
<td>25%</td>
<td>23%</td>
</tr>
<tr>
<td>To document your personal experiences or share them with others</td>
<td>50</td>
<td>26</td>
<td>24</td>
</tr>
<tr>
<td>To stay in touch with friends and family</td>
<td>37</td>
<td>22</td>
<td>40</td>
</tr>
<tr>
<td>To share practical knowledge or skills with others</td>
<td>34</td>
<td>30</td>
<td>35</td>
</tr>
<tr>
<td>To motivate other people to action</td>
<td>29</td>
<td>32</td>
<td>38</td>
</tr>
<tr>
<td>To entertain people</td>
<td>28</td>
<td>33</td>
<td>39</td>
</tr>
<tr>
<td>To store resources or information that is important to you</td>
<td>28</td>
<td>21</td>
<td>52</td>
</tr>
<tr>
<td>To influence the way other people think</td>
<td>27</td>
<td>24</td>
<td>49</td>
</tr>
<tr>
<td>To network or to meet new people</td>
<td>16</td>
<td>34</td>
<td>50</td>
</tr>
<tr>
<td>To make money</td>
<td>7</td>
<td>8</td>
<td>85</td>
</tr>
</tbody>
</table>


Table 2-2: Reasons for Blogging

2.3 Information Visualization

Based in previous research (Rainie, 2005), (Dahlberg, 2001), (Gastil & Levine, 2005), (Rainie, 2005) it has been observed that citizens use discussion forums, message boards, newsgroups and most recently weblogs as a means to share information. However the vast volume of online blogs makes it fairly difficult to browse content and locate information of interest. Getting an overview of content that is fairly large in size is very difficult. Information visualization techniques aim to increase human cognition by leveraging human visual capabilities to make sense of abstract information (Card, Mackinlay, & Shneiderman, 1999), thereby providing a way for humans to cope with the increasing amount of data (Heer, Card, & Landay, 2005).
Shneiderman points out a basic principle for information visualization and summarizes it as the Information Seeking Mantra (Overview first, zoom in and filter, then details-on-demand) (Shneiderman, 1996). VizBlog broadly follows Shneiderman’s design guideline (Shneiderman, 1996) and provides techniques for information visualization tasks for overview, zoom, filtering, details-on-demand, and relations to support the user goals of discovery and insight.

The Prefuse visualization toolkit (Heer et al., 2005) was used for the development of VizBlog. Prefuse is a software framework for creating dynamic visualizations. The visualization consists of nodes and links and is animated using a modified version of the force-directed layout of Prefuse. The force-directed layout of Prefuse can be useful for spatially grouping connected conversations (Heer & Boyd, 2005). Prefuse has built-in components for navigating, searching and filtering. “Vizster” is an example of a visualization tool that was developed using the Prefuse visualization toolkit. Vizster (Heer & Boyd, 2005) is tool for exploring online social networks like Friendster and Orkut. Using the force-directed layout, it provides an ergo-centric view of a person’s social network. Vizster was tested for its usability and capacity for facilitating discovery using controlled studies.

Controlled studies are generally used to evaluate visualization tools (Chen & Czerwinski, 2000), (Plaisant, 2004). These types of studies involve observing the short-term usage of the tool by the participants on preselected data sets and benchmark tasks. Visualization tools are mainly used to provide insights into the data (Spence & Press, 2000), (Card et al., 1999). Saraiya et al. (Saraiya, North, Lam, & Duca, 2006) point out that visualization tools support interaction mechanisms in addition to providing data representations. We performed controlled studies to evaluate the usability of VizBlog.
Chapter 3: History and Functionality of VizBlog

This chapter contains a tour of VizBlog. The main goal of the chapter is to document the tool and to help the reader understand the research described in future chapters by introducing the tool, the terminology used by the tool, and the functionality and usability intent built into the tool.

3.1 History of VizBlog

The initial version of VizBlog was developed in C#. Alain Fabian, Philip Isenhour and Rene Ocasio were involved in this development process. The next version of VizBlog was converted to Java by Spencer Lee and Uma Murthy, Sameer Ahuja and myself. Alain et al. conducted a usability evaluation on the first version. The results of this evaluation is documented in an unpublished manuscript (M. A. Pérez-Quiñones, Isenhour, P., Fabian A., Kavanaugh, A., Godara, J.). The results show that the most of the functionality that was built in to the tool was easy to use. But the results also pointed out that VizBlog erroneously linked blog entries with different topics of discussion as similar. It was believed that improving the semantic content analysis of tool would make the visualization more understandable.

3.2 Why VizBlog?

The review of literature points out how information in blogs is dispersed and disorganized. Due to a vast volume of blogs online exploring content of interest and analyzing the flow of information within blogs is becoming more and more difficult (Jenkins, May 2003). Blog visualizations would help address the discovery problems caused by a large number of dispersed blogs. These dispersed blogs could have a broad range of topics which would make it even more difficult to explore content and analyze information.

VizBlog was designed to address the discovery problems caused by large number of blogs and also help citizens communicate with each other and keep track of other citizens’ opinions.
3.3 Overview of VizBlog

VizBlog is a blog visualization tool created using the Prefuse visualization tool kit (Heer et al., 2005). VizBlog reads a file, which contains blog URL’s and creates a network visualization of citizen deliberation. Through association and content analysis, blog entries are represented by nodes and are linked to each other to form clusters of related local content. The tool broadly follows the design guideline of Visual Information-Seeking Mantra (Overview first, zoom and filter, then details-on-demand) (Shneiderman, 1996), and provides techniques for Information Visualization tasks of overview, zoom, filtering, details on demand and relations to support the user goals of discovery and insight. The following sections describe the tool and its various features that aim at facilitating its use and information discovery.

3.3.1 Pre-Processing Blogs for VizBlog

The data used in the visualization is generated by a preprocessor that parses a set of local blogs and creates a GraphML\(^2\) document. The preprocessor uses the vector space model (Salton, Wong, & Yang, 1975) to determine the similarity coefficient between blog entries. The blog-blog similarity calculation (code and description adapted from that used in the Stepping Stones and Pathways project (Das-Neves, Fox, & Yu, 2005)) is performed using the vector space model's cosine similarity approach (Salton et al., 1975), by comparing the most frequent keywords of the blogs. For this, we make use of the Lucene Search API ("Lucene,"). There are three main steps involved in calculating the similarity weight between two blogs (Venkatachalam, 2008).

**Index creation:** The blog fields indexed are the title, the content and the blog URL. Only the terms in the blog title and content are tokenized (each term is indexed), and the blog URL is used as an identifier for each blog. The index that is created consists of unique terms, the term vectors, which contain term frequencies, and the document frequencies of terms.

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\(^2\) [http://graphml.graphdrawing.org/](http://graphml.graphdrawing.org/)
**Blog length normalization:** To handle the anomalies caused by the different blog lengths, normalization is performed before computing cosine similarity. This step takes appropriate information from the index performs normalization as specified by the vector space model.

**Blog-blog similarity weight calculation:** All distinct blog pairs are compared and the similarity weights are calculated. For the similarity weight calculation, the terms, term vectors, and the term frequencies are obtained from the index. Then, the Cartesian product of term vectors (of blog pairs) is computed to get the similarity weight between each blog pair, which is a number between 0 and 1.

In addition, it creates a list of top keywords from the content of the blog entries. We took the set of blogs for our case study from a regional blog aggregator (http://www.swvanews.com) that gathers a large set of blogs (about 40 and growing) discussing various local (and non-local) topics from SWVA.

Bloggers gathered on the aggregator site generally live in the area or have some other strong attachment to the region; these include local citizens, students, business-owners, elected officials and candidates, professors, retirees, and many others. There are numerous blog aggregator websites throughout the Internet. For example, greensboro101.com gathers blogs local to Greensboro, North Carolina.

### 3.3.2 Visual Representation

The visualization is made up of nodes and links, and is animated using a force directed layout of Prefuse. The animation can be paused or restarted using the right panel controls. Figure 1 shows the main window for VizBlog. The right panel provides features for navigating, filtering and searching the visualization.
3.3.2.1 Nodes

Each node in the visualization represents an individual blog entry, and is labeled with the title of the blog entry. The color of all nodes is blue, but it can change dynamically based on whether the node is selected, or is the neighbor of a selected node or if it is a search result. The size of a node is in direct proportion to the number of neighbors, i.e., the number of links it has. Since a link can represent citations or similarity with other nodes, the nodes with these characteristics are enlarged in the visualization. This form of coding stems from the observation that the blog entries that are central to a ‘conversation topic’ receive the most citations, and most of the peripheral blog entries in the conversation are similar to these central entries. The coding is a way to recognize these central nodes.

3.3.2.2 Links

The links between the nodes represent relationships – Two nodes can be linked if there is a citation from one to another, or if they are similar in content as determined by the preprocessing,
or both. This results in three kinds of links in the visualization. Figure 3 shows the three types of links and how they are depicted graphically in VizBlog.

**Figure 3-2: Visual representation of links. (A) and (B) represent weak and strong links respectively, (C) represents a hyperlink and (D) represents similarity + hyperlink.**

Similarity links represent the similarity calculated between the two nodes it connects, as per the vector space model (Salton et al., 1975). Similarity is represented visually as a gray-colored undirected line. The thickness of the line is directly proportional to the value of the similarity coefficient between the connected nodes. The more similar two entries are, the thickest the line connecting them (see link A and B in Figure 3-2).

Hyperlinks between blog entries are represented in the visualization via a dashed arrow that is pink in color (see C in Figure 3-2). The arrow points from the citing node to the cited node.

If two nodes are related by a citation and a similarity coefficient greater than some pre-specified cut-off value, then they are represented by a dark red arrow that points from the citing to the cited node (see arrow D in Figure 3-2). The thickness of the arrow is in direct proportion to the value of the similarity coefficient.
3.3.3 Information Seeking Mantra

3.3.3.1 Overview

The purpose of the overview in the Visual Information-Seeking Mantra (Shneiderman, 1996) is to provide a ‘starting point’ to the users, for them to be able to quickly recognize the major features of the visual space, and start exploration.

Figure 3-1 shows VizBlog’s initial overview screen. A one month data set for the SWVA contains about 1000 blog entries. With such high number of nodes, cluttering and occlusion become significant problems at the overview levels. The individual nodes in the layout repel each other slightly, so that the overview is spread out, preventing occlusion. Semantic zooming reduces the visual representation of nodes at overview levels by decreasing the length of the node title, further reducing clutter and occlusion (Figure 3-3).

![Semantic zooming example](image)

**Figure 3-3:** Semantic zooming – varying title length as the zoom value increases from views A to C.

The overview provides easy identification of clusters of inter-related posts. In general, the posts in a cluster revolve around one or two central topics of interest, and the largest nodes in the cluster are the ones closest to the central topic (Figure 3-4).
3.3.3.2 Zoom and Filter

From the overview, the tool provides for zooming into areas of interest to the user via zoom and pan interactions. A user can right click-drag on any point on the display to zoom in or out the display centered at that point. The application also supports scroll-wheel based zooming. In addition, users can zoom into a particular area of interest by pressing the middle mouse button.
(or scroll-wheel) and drawing a rectangle over the area. Panning is supported via left-click drag on an empty area.

The user can, at any time, zoom out to the overview level by clicking on the “View All” button on the right panel of the main window (see Figure 3-1).

To aid exploration of the visual space, VizBlog provides several features meant to aid filtering of data items in the visualization. These provide the user mechanisms to perform directed exploration of the visual space for the topics or entries of their interest.

3.3.3.2.1 Filter by similarity
The similarity slider (shown in the middle of the right panel of Figure 1) lets the users filter off edges based on their strength. This strength is determined by the value of the similarity coefficient for the two nodes connected by the edge. The coefficient values vary between 0 for least similar to 1 for identical. By default, VizBlog displays only those similarity links that have a coefficient of 0.1 or more. By moving the slider, the user can modify this system cut-off. This has an effect of changing the density of the clusters. An example of this change is shown in Figure 3-6.
Further, the tool provides an option to filter off nodes that are not connected to any other node in the current view. The presumption behind this feature is that while exploring the clusters, the user might not be interested in unlinked nodes that are not a part of any cluster. Furthermore, since we are interested in deliberation in the wild with an emphasis on citizen-to-citizen deliberation, blogs that are not connected to other entries are not as relevant to our purposes.

The filtering significantly reduces the number of visible visual items, and increases the visibility of clusters. Figure 3-7 shows an example of this. By increasing the similarity filter in combination with filtering of unconnected nodes, the user can quickly reduce the number of visual items to view only the most similar entries. These nodes provide the general themes of the clusters they are part of, and for more details, the user can reduce the filter to show the other related nodes.
Figure 3-7: Identifying clusters is significantly easier after hiding unconnected nodes (B).

3.3.3.3 Details on demand

Eventually, users would want to explore further details of particular entries. In VizBlog there are three ways to obtain more details as needed. First, right clicking on a node opens the particular
A user can mouse over a node to view its full title via a tool-tip. The mouse-over also causes the particular node to change its color to red, and its immediate neighbors are highlighted in orange (Figure 3-8). Upon left-clicking the node, the relevant blog entry opens up in the default system web browser.

Figure 3-8: Mouse-over of a node reveals its title and highlights its neighbors
3.3.3.1 Search

Often users are interested in particular topics or keywords. The search feature in VizBlog highlights nodes that match a search string (see Figure 3-9 for an example). A typical problem with search in visualizations is providing context. If, for example, the user is in a zoomed-in view and performs the search, he may not see all the results. The search in VizBlog, along with the visual feedback of color change, provides a textual feedback prompting the user to switch to the overview to view all results.
Chapter 4: Methodology

The main goal of this research is to study and evaluate if VizBlog can be used to help discover local discussions in a regionally-restricted version of the blogosphere.

The value of a tool like VizBlog for discovering local discussion is that it mediates between the needs of the citizens and government officials/other citizens. Thus VizBlog has a potential value to help citizens keep track of other citizen’s opinions on local topics of interest and also stay up-to-date with local news, events, and happenings. The tool also has potential value to government representatives. Town government leaders want a way to hear from a broader population of citizens than those who usually attend face-to-face meetings or who communicate directly through letters, phone calls or email.

This chapter presents the methodology used for validating the automatically generated similarity coefficient values generated by VizBlog. It also presents methodology used in the summative usability evaluation of VizBlog to assess the ease of use of the functionality built into VizBlog. This chapter also presents method used for the content analysis of local blogs to study the characteristics of these aggregated blogs.

4.1 Validation of Similarity Ratings

Any pair of blog entries connected by the similarity link in VizBlog has a similarity coefficient associated with it. The similarity coefficient is calculated using the Vector space model (Salton et al., 1975).

A previous usability evaluation of VizBlog conducted on an older version of VizBlog (M. A. Pérez-Quiñones, Isenhour, P., Fabian A., Kavanaugh, A., Godara, J.), showed that the tool linked as similar blog entries that users did not consider to be similar at all. So, for this latest version of VizBlog, the researcher validated the automatically computed similarity ratings generated by VizBlog.

A total of 3 human raters were recruited for this validation, one male and the two females. Two of the raters were from the town of Blacksburg and the other one was a student at Virginia Tech.
The raters were colleagues of the researcher that had little knowledge of VizBlog similarity computation.

The researcher picked 30 blog entries randomly from the set of entries being used in this research. Each rater was asked to evaluate them all in sets of 3 blog entries. For each of the 10 sets of three, the raters were asked to compare blog entries 1 and 2, 2 and 3, and 1 and 3 and assign each pair of entries a similarity value between 0 and 3. The meaning of the values was explained as: 0 = Not similar; 1 = Somewhat similar; 2 = Similar; 3 = Very Similar.

The similarity coefficients in VizBlog were also translated to fit this scale. Blog entries with the similarity coefficients between 0 – 0.09 would be interpreted as 0 (not similar), blog entries between 0.1 – 0.3 would be interpreted as 1 (somewhat similar), blog entries between 0.31- 0.6 would be interpreted as 2 (similar) and finally, blog entries with similarity coefficients between 0.61 – 1.0 would be interpreted as 3 (very similar).

Wilcoxon’s signed ranks test for categorical data was performed between the ratings of each of the raters and the VizBlog coefficients. The results of this test would prove whether or not the human raters and VizBlog’s similarity rating agreed on their similarity assessment. The results are presented in the next chapter.

4.2 Summative Usability Evaluation of VizBlog

4.2.1 Goals of the Evaluation

A summative evaluation of VizBlog was performed to accomplish the following goals:

1. To verify whether citizens are able to identify different points of view on a particular conversation from a regional portion of the blogosphere.
2. To verify whether citizens and town leaders are able to identify the current and most popular topic in the regional portion of the blogosphere.
3. To verify whether citizens who did not visit the SWVA website on a regular basis are able to search for a topic that is of interest to them (may be some event taking place in the town) amongst other blog entries.
4. To verify whether citizens who visit the SWVA website on a regular basis are able to get up to speed with most recent topics.
5. To verify whether town leaders are able to identify 5 important issues that the town should address.
6. To verify whether town leaders are able to analyze the largest topic of discussion and summarize citizens’ opinions on that topic.

4.2.2 Scenarios of Use

The goals of the evaluation, enumerated above, helped motivate the scenarios described in this section. These scenarios of use, in turn helped build the benchmark tasks for the evaluation. These scenarios of use served as a realistic description of how the tool would be used by a user. These scenarios helped us identify whether the functionality of the tool did help citizens find other citizens’ opinions and whether government officials were able to identify local hot issues that needed to be addressed.

Scenario 1: This first scenario below describes how a citizen of the town would go about identifying different points of view on a topic of interest.

Michelle is a Blacksburg town resident and a full time mom of two kids who are in elementary school. She is interested in keeping track of the community events and discussions around town. She is particularly keen on the issue related to Wal-Mart super center coming up in Blacksburg. She is against this decision since this site is minutes from her daughter’s school and does not want the school nor the sales at Kroger a local grocery store she always shops at, to be affected by this. She decides to use VizBlog, which she has downloaded and installed on her desktop computer. She clicks on the VizBlog icon to start it. She then pause’s the animation when the visualization reaches a comfortable level. She types the keyword “Wal-Mart” in the Prefix search box located on the panel on the right and hits the Enter key. All the blog entries that are related to “Wal-Mart” are highlighted in magenta. She then clicks on the blog entries that she is interested in, which open up in a new browser that displays the full story, she reads it to follow up on the discussion. Once she is done she quits the browser. Michelle then calls her friend, Laura who also has kids going to the same school and is eager to know the latest on this issue. Michelle informs Laura over the phone about what she read on the blogs and what people had to say about this issue.

Scenario 2.1 and 2.2: The scenarios 2.1 and 2.2 describe how a citizen or town official would go
about identifying the current and the most popular topics of discussion.

**Scenario 2.1: Citizen**

Brian is a senior citizen in the town of Blacksburg and likes to keep himself updated with the current and most popular topics discussed by other citizens in the town. He visits the town website and clicks on the VizBlog link. Once VizBlog opens up, Brian clicks glances over the Keyword Cloud in the right panel. Since, Brian wants to know more on the most current and popular topic, he looks for the keyword with the largest font size. He then clicks on the keyword “Bush” and all the blog entries with that contain the keyword “Bush” are highlighted in magenta. Brian browses through those blog entries to update himself about that popular topic by clicking on each blog entry individually, which open up in individual browser windows. Once he is done he decides he wants to post his comments to one of the blog entries he just read. He opens the blog reply page and types in his comments and posts it to the blog. He then returns to the VizBlog interface and continues to read other blog entries.

**Scenario 2.2: Town leader**

John is a town leader and is involved in making certain town policies. He wishes to identify the recent and most popular topic. John visits the town website and clicks on the VizBlog link. Once VizBlog opens up and the animation reaches a comfortable level, he clicks the “Pause” button on the right-hand panel. He glances through the entire visualization to find out the largest clusters. He then finds the largest cluster, which talks about the opposition to the “Big Box” in Blacksburg. He clicks on one blog entry in that cluster and then wants to know what other people are saying about the “Big Box”. He then notices a strong grey similarity link between the blog he is reading and another blog entry. Noticing the other blog entry also talks about the Big Box, John clicks on that link to reads the other blog entry as well. Once he reads that blog entry he finds that this blog entry also talks about the opposition to the Big Box and the person writing the blog has a similar view like the previous author. This leads him to explore more blog entries on this topic in a similar fashion. Once he was done navigating through all the entries, he decided to summarize all the citizens’ opinions about the Big Box and send it to other town officials to get them updated with what citizens’ opinions about the “Big Box” were.

He pulls up another browser and logs into his Inbox and sends out an email to all his colleagues summarizing citizens’ opinions about the “Big Box”.
**Scenario 3:** The scenario 3 below describes how a citizen would search for an event that was going to take place in town in the next few weeks.

Emily is a mom and works part-time at the Christiansburg Library. In her free time she checks out the town website. She finds out from the Calendar of events that there is a Steppin’ Out event taking place in town soon. She is interested in the event and wants to find out what other peoples’ opinions about this event are. Since she is not very familiar with the Southwest Virginia blog aggregator website, she decides to use VizBlog to find out about more about this event.

Emily clicks the VizBlog link and once VizBlog opens, she waits for the visualization to reach a comfortable level. Once she can see all the nodes clearly she chooses to pause the animation by clicking the “Pause” button on the right panel. She then uses the prefix search and types in the words “Steppin’ Out”. All the nodes in the visualization with the words “Steppin' Out” are highlighted in magenta. She decides to ‘zoom in using the zoom to fit rectangle’ feature of VizBlog. She is now able to see all the blog entries in the “Steppin’ Out cluster”.

Emily clicks on a blog entry titled “Steppin’ Out in Blacksburg this August”. Clicking on this blog entry opens it in a new browser window. She reads the blog entry and then closes the browser. She reads other blog entries related to Steppin' Out in a similar fashion. She then decides that this event sounds really interesting and calls her husband to discuss if they could make it to this event this upcoming year.

**Scenario 4:** The scenario 4 below describes how a citizen would update himself with the most recent topics.

Nathan works full time at a Bank and visits the SWVA news aggregator website on a regular basis. From the front page of this website a post on Global Warming catches his eye. He notices that there are quite a few posts on this topic. He decides he wants to find out if this is the most talked about topic of discussion and also find out what people are saying about this issue.

Nathan clicks the VizBlog icon on his laptop. When the animation has reached a comfortable level, he pause’s the animation. He then glances over the keyword cloud to see if this is the most talked about topic today. Since “Global Warming” was not the top keyword, Nathan decides to zoom into the largest clusters to see what they were about. Once zoomed in he finds out the largest and most discussed topic is “Southwest Virginia could have a big future in Tourism”. He then clicks on the blogs entries in this cluster to find out if this was a most recent discussion. The
date and the time on the posts did in fact show that this has been an ongoing discussion over several months but a lot of people had posted their views on this topic today.

Nathan finds out what other people had to say about this topic and then summarizes this in an email and sends it to his brother who also lives in the Southwest Virginia area.

Scenario 5: The scenario 5 below describes how a town leader would identify and address the 5 most discussed issues.

John is a town leader and works a public administration and policies officer. His duty as the town leader is to identify and address the most discussed issues around town. John visits the town website and clicks on the Vizblog link. Once the animation has reached a comfortable level, he pauses the animation using the “Pause” button. John then decides that he wants to find out the 5 most discussed issues, so he glances at the visualization and locates the 5 largest clusters.

He identifies the largest cluster and notices that the main topic of discussion is the “Virginia Tech Concert”. Noticing that there are too many unconnected nodes in the visualization, John checks the “Hide unconnected nodes” checkbox. He then resets the animation using the “Reset” button in the right panel. Now that he can see all the clusters more clearly, John picks the largest cluster and zooms in to identify the topic of discussion. He clicks on the other connected entries in the cluster to read more about the “Virginia Tech Concert”. He jots down points about what people said about the concert. Once he is done reading this cluster, he zooms out of the visualization to the overview level by clicking the “View All” button in the right panel.

He then looks for the other four popular clusters in a similar fashion and jots down information about them.

Once he is done reading and summarizing all the blog entries he then emails this to other colleagues in his group and also prints out a couple of copies of this document. The top 5 topics were then discussed at the town meeting later in the day.

Scenario 6: The scenario 6 below describes how town leaders would identify the largest or most popular topic of discussion and then summarizes citizens’ opinions on that topic.

Sharon works for the town of Blacksburg, and wishes to identify the largest topic of discussion and summarize citizens’ opinion on that topic. She first clicks on VizBlog link on the town website. Once VizBlog opens up and the animation has reached comfortable level, Sharon clicks
the “Pause” button in the right panel. She then glances through all the clusters in the visualization window to identify the largest cluster. Once she identifies the largest cluster, Sharon mouse’s over the entries in that cluster. A tool tip appears every time she mouse’s over an entry, she then clicks on an entry that she is interested in. She zooms in using the scroll button on the mouse and identifies the topic as “Tom’s Creek Interchange project”. This opens up the blog entry in a new browser window. She then reads about what others had to say about the Tom’s Creek Interchange project. She reads other connected blog entries in a similar fashion and as she is reading, she notices that some people really didn’t like the whole idea.

She then pulls up a Word Document and summarizes some of the negative opinions that citizens had about the Interchange project. Some of them said they had more traffic flowing through their neighborhood, which was only a by-road but now as a result of this new construction was open to through traffic. Some others said they had to go through too many stoplights before they could actually hit the bypass.

She then saves the file so that she could refer to it when needed or email it to her friends who were also interested in the Tom’s Creek Interchange project as an attachment.

4.2.3 Benchmark Tasks

Benchmark tasks were developed for identifying the ease of use of the tool’s functionality. Benchmark tasks are a set of tasks designed to cover all the functionality of the tool. These tasks followed Hix and Hartson’s guidelines (Hix & Hartson, 1993), namely that the tasks specified what the user should do rather than how the user should do it. All the tasks were designed to test a majority of the tool’s features: the keyword cloud, the similarity feature, and identify topics of discussion represented in clusters. It was also made clear to the participants that they would not be timed on any of the tasks as the tasks were designed to test the functionality of the tool and not participants.

The participants were asked to perform the following 6 tasks, which covers most of the functionality of the tool. The tasks used were:

1. Pick the largest cluster and identify the topic of discussion.
2. Identify the top 3 keywords in the visualization.
3. Can you find a blog entry that talks about topic “Marsh fork arrests”?
4. Find a blog that talks about “Chief Vinson’s retirement” and that discusses “house fires”.

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5. Identify a blog entry that cites more than two other blog entries.
6. Pick any blog entry that you find interesting.

4.2.4 Selection of Participants

We recruited citizens and government officials from the town of Blacksburg as participants for our evaluation. The evaluation used three different groups of users. The three groups can be characterized as a student group, the citizen’s group and the town officials group. The town officials were selected because of their interest in the use of information technology for government purposes. The graduate students and town officials were invited via email to participate in the study.

Participants for the citizen group were selected from a pool of participants who had previously participated in a focus group interview in Fall of 2005 and had agreed to be contacted again. We called them and invited them to participate for this study. The participants in the citizen group received $25 for participation in the study.

The student group consisted of Computer Science Graduate students, most of whom had experience using advanced computational tools such as VizBlog. The graduate students were selected because they are experts in technology use. Findings within this group can help us identify serious failures in the tool. If some functionality cannot be understood by them, there is really no hope that the citizens or town officials would find it easy to use.

Our evaluation included a total of 23 participants from different user groups. The participant ages ranged from 20 yrs to 71 yrs.

VizBlog helps users discover discussion on topics of interest. Without VizBlog, there are just too many individual blog entries to be able to make much sense of the overarching topics of discussion taking place among them. For this study, we used a one-month snapshot from the Southwest Virginia blog aggregator (SWVA). The month used spans from February 21st till March 21st 2007 and it includes 994 blog entries from set of 41 different blogs. (refer to the Appendices for the list of the 41 blogs aggregated by SWVA at the time of the study).
4.2.5 Usability Lab Setup

The usability evaluation was setup in a closed lab in the Corporate Research Center at Virginia Tech. This room was not accessible to the general public when the study was in session. The evaluator and the participant were both present in the room at the same time. Once the tutorial was completed, communication between the evaluator and the participant occurred only in an event when the participant had questions or comments. In general, there was no communication between the evaluator and the participant, during the time of the actual tasks.

The setup included the following:

1. **Computer with VizBlog installed:** A computer with VizBlog installed and an Internet connection was used for the evaluation. Participants also used this system to browse through the blog entries specified in the benchmark tasks and filled out online pre-evaluation and post-evaluation questionnaire using this system.

2. **Camtasia recorder:** Camtasia was used as the screen capture and voice recording software to record the users’ on-screen activity and their comments about the system. This data helped us in getting feedback about the participants’ task completion and their feedback about the tool.

3. **Microphone:** A microphone was connected to the computer system on which the evaluation was being conducted. This aided in the capture of user’s comments as they used the system.

4.2.6 Summative Usability Evaluation Protocol

Summative evaluation is an evaluation that is carried out at the final stage of development. Robert Stake (Stake, 2004), a well known evaluator differentiates between formative and summative evaluation as “When the cook tastes the soup, that’s formative; when the guests taste the soup, that’s summative.” Summative evaluation provides direct feedback from representative users. It is evaluation of the interaction design wherein the level of usability is assessed, after the development of the software is complete. This evaluation is performed with randomly selected participants.
When the participants arrived in Room 1133 (Project Room) at Department of Computer Science Building, Knowledge Works II they were first greeted and explained the main purpose of the evaluation and the approximate time it would take to complete the evaluation. They were also briefed about the evaluation setup and the tasks to be performed. They were then handed the Informed Consent Forms to read and sign if they were willing to participate in the evaluation. Once the participants signed the Consent forms they were instructed to keep one copy for their records. Once the participants signed the Informed Consent forms we asked them to fill out an online pre-evaluation survey. This questionnaire included a demographic survey and also a survey about the participants’ experience using the Internet and reading/writing blogs.

After completing the questionnaire, each participant was given a brief tutorial. The tutorial had explicit instructions on how to perform a series of tasks with VizBlog. The goal was that the participants would learn how to use the system by focusing on how to use the different features of VizBlog.

In addition, we provided the participants with a reference sheet and asked them to read it before continuing. This reference sheet had a glossary of terms used in the software and also included screen shots with explanations about its functionality.

Following the tutorial we handed the participants a sheet that contained a set of pre-designed benchmark tasks. These were a set of 6 tasks that covered most of the functionality of the tool. The tasks used were as specified in Section 4.2.3. The users were not timed on any of these tasks. We informed them that there was no right or wrong way of performing the tasks and that this evaluation was to test the tool and not them. During the evaluation we encouraged the participants to “think aloud” while performing the tasks. Following these tasks, we asked the participants to fill out an online post-evaluation questionnaire. The post-evaluation questionnaire was designed to provide feedback about the tool and the evaluation procedures. This questionnaire form helped us get information about the participants experience using the tool with respect to usability. The participants also put forth their likes and dislikes about the tool and they also gave us their suggestions about changes they would make the tool easier to use.
4.2.7 Summative Evaluation Measures

According to Preece et al. (Preece, Roger, & Sharp, 2002), usability evaluations measure the performance of a product in terms of success rates, number of errors and time to complete specific tasks.

VizBlog was evaluated to test the following:

- **Ease of use** – The main purpose of the study was to determine whether citizens and government representatives were able to identify topics of discussion with ease. We also wanted to determine whether the visualization gave them the ability to follow conversations of interest easily and identify the most discussed topics easily.

- **Task Completion** – Another major goal of our usability evaluation was to identify if participants can complete the tasks enumerated in section 4.2.3.

- **User satisfaction** – A secondary goal was to evaluate the ease of use of the functionality built into VizBlog.

We did not measure the following:

- **Memorability** – For the purpose of this evaluation we did not intend to call the participants again for another round to check if they remember what they did and how they did it the last time around.

- **Learnability** – We assume that this tool would have a steep learning curve and the user’s would need to have to know all about RSS feeds, atoms and blogs.

- **Time on task** – The participant’s were not timed on any of the tasks as we were testing our tool and not the participants.

4.3 Content Analysis of Blogs

For the purpose of this evaluation we used a set of blogs from the SWVA that gathers a large set of blogs (refer to the Appendix for the list of the 41 blogs gathered at the time of the study). These blogs discuss various local and non-local issues from Southwest Virginia. Aggregators are web applications that collect blogs, pod casts, and news feeds in a single location for easy viewing. They reduce the time and effort needed to regularly visit different websites for
information, news and updates. There are several such local aggregators available. Some examples are We101 (news, information and opinions from the people of Greensboro, NC), Knoxville Blog Buzz (Blogs from East Tennessee region).

Blogs that are collected by the Southwest Virginia aggregator site generally are written by people who live in the geographical area of interest or have some other strong attachment to the region. Often these bloggers include students, local citizens from the town, business owners, professors, retirees, government officials and many others.

4.3.1 Criteria for Tagging

The 994 blogs for the period starting February 21st 2007 – March 21st 2007 from the SWVA website were individually tagged by the author of this thesis using the following criteria.

- **Author of the blog**
  The name of the author of the blog entry was one of the tags used in the coding.

- **Political/Non-Political/Both**
  Each blog entry was also tagged as Political based on whether the content of the blog entry was mainly political (Blog entry contained mainly content related to National or International Politics), Non-Political (Content of the blog entry is not related to politics), and Both (Blog entry contained political content as well as contained personal content).

- **Local/Non-Local/Both**
  Each blog entry was tagged as “Local” based on whether their content was related to local events taking place in Southwest Virginia. Blog entry was tagged as “Non-Local” if the content was not related to Southwest Virginia and “Both” if the content discussed local events/happenings as well as content not related to Southwest Virginia.

- **Main topic of discussion**
  Each blog entry was tagged based on the topic of discussion in that entry.

The tagging helped us identify discussions of local issues or local politics were present and how prevalent they were.

---

4.4 Validation of Global Tagging

To avoid any biases introduced by the tagging done by the researcher, the global tags were validated using 2 coders who coded the content as per Krippendorf’s content analysis methodology (K. Krippendorf, 1980; K. Krippendorf, 2004).

The coders were recruited from the population of Computer Science graduate students at Virginia Tech. An email was sent to the grad student listserv asking for volunteers and two were selected based on schedule availability. Each coder was given a random sample of 25 blogs from the 994 blog entries. The coders were also given a set of instructions to be followed for the coding. Each coder was asked to read each blog entry from the sample and assign two tags to each entry. The tags that the coders had to assign were: Political/Non-Political/Both and Local/Non-Local/Both. The coding was done independently by each of the coders.

According to Neuendorf (Neuendorf, 2002), a good sample size for coding in order to obtain good reliability levels would depend on many factors, but should not be less than 10% of the actual sample size; larger reliability samples are required when the full sample is very large and/or the expected intercoder reliability is low. We did not use 10% of the sample as our actual sample size was not very large and we also expected a high intercoder reliability.

The intercoder reliability between the coders was calculated. There are several indices that are used for intercoder reliability (Popping, 1988) like Krippendorf’s alpha, Cohen’s Kappa, Scott’s Pi and Holsti’s method. Cohen’s Kappa (k), one of the most widely used index, was used for the intercoder reliability. The results of the intercoder reliability are described in chapter 5.

The global tagging (Political versus Local) also helped us identify the characteristics of local conversations scattered in a series of regional blogs.
Chapter 5: Results and Discussion

This chapter presents the results of the three evaluations done in this thesis. The first set of results shows that the similarity of blog entries can be automatically computed, as evidenced by strong statistical results of the inter-rater evaluations. The second set, shows the result of the usability evaluation as well as a discussion of the usability problems encountered. Overall, VizBlog was easy to use and all participants were able to successfully complete a large portion of the tasks. Finally, the chapter presents some observations about the structure of discussions in the regional blogosphere studied in this thesis.

5.1 Validation of Similarity Ratings

To validate the similarity ratings computed by VizBlog, its similarity coefficients were compared with ratings obtained by human raters using Wilcoxon’s signed ranks test. Wilcoxon’s signed ranks test is similar to paired $t$-test. This test was used to measure whether or not there was significant difference between the ratings of VizBlog and those assigned by each of the three raters.

Table 5-1 shows the results of Wilcoxon’s signed ranks test. This is a non-parametric test for two independent samples. The p values between VizBlog each of the three raters are 0.96, 0.157 and 0.102 respectively. Since the p values are not less than 0.05, we cannot reject the null hypothesis. Thus we conclude that there was no significant difference between the ratings given by each of the three raters and the ratings that are automatically generated by VizBlog.
The tables below present the results of the intercoder reliability between pairs of raters.

### Table 5-1: Wilcoxon Test Statistics\(^b\)

<table>
<thead>
<tr>
<th>Measure of Agreement</th>
<th>Asymp. Value</th>
<th>Asymp. Std. Error(a)</th>
<th>Approx. T(b)</th>
<th>Approx. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kappa</td>
<td>.820</td>
<td>.082</td>
<td>7.707</td>
<td>.000</td>
</tr>
</tbody>
</table>

N of Valid Cases 30

\(^a\) Not assuming the null hypothesis.

\(^b\) Using the asymptotic standard error assuming the null hypothesis.

### Table 5-2: Cohen’s Kappa between Rater 1 and Rater 2

<table>
<thead>
<tr>
<th>Measure of Agreement</th>
<th>Asymp. Value</th>
<th>Asymp. Std. Error(a)</th>
<th>Approx. T(b)</th>
<th>Approx. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kappa</td>
<td>.909</td>
<td>.061</td>
<td>8.361</td>
<td>.000</td>
</tr>
</tbody>
</table>

N of Valid Cases 30

\(^a\) Not assuming the null hypothesis.

\(^b\) Using the asymptotic standard error assuming the null hypothesis.

### Table 5-3: Cohen’s Kappa between Rater 1 and Rater 3

<table>
<thead>
<tr>
<th>Measure of Agreement</th>
<th>Asymp. Value</th>
<th>Asymp. Std. Error(a)</th>
<th>Approx. T(b)</th>
<th>Approx. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kappa</td>
<td>.909</td>
<td>.061</td>
<td>8.361</td>
<td>.000</td>
</tr>
</tbody>
</table>

N of Valid Cases 30

\(^a\) Not assuming the null hypothesis.

\(^b\) Using the asymptotic standard error assuming the null hypothesis.
### Table 5-4: Cohen’s Kappa between Rater 2 and Rater 3

Cohen’s Kappa coefficient was calculated to assess the reliability of these similarity ratings between each pair of raters. The analysis yielded a Kappa coefficient (k) of 0.82 between coder 1 and coder 2, k= 0.91 between coder 1 and coder 3, and k= 0.91 between coder 2 and coder 3. Landis and Koch’s interpretation of Kappa (Landis & Koch, 1977) values is shown in the table below.

<table>
<thead>
<tr>
<th>Measure of Agreement</th>
<th>Value</th>
<th>Asymp. Std. Error(a)</th>
<th>Approx. T(b)</th>
<th>Approx. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure of Kappa</td>
<td>.910</td>
<td>.061</td>
<td>8.578</td>
<td>.000</td>
</tr>
<tr>
<td>N of Valid Cases</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*a* Not assuming the null hypothesis.

*b* Using the asymptotic standard error assuming the null hypothesis.

### Table 5-5: Interpretation of Cohen’s Kappa values (Landis & Koch, 1977)

Thus we conclude that our values of Kappa indicated almost perfect agreement between raters 1 and 2, raters 2 and 3 and raters 1 and 3.

The previous two results provide evidence that the ratings of the raters were no different than the similarity coefficient values generated by VizBlog. Thus, the computation of the similarity coefficient, and thus automatically determining that two blogs are “similar” in content, is possible and provides reliable results.
5.2 Summative Usability Evaluation Results

This section presents the results of the summative usability evaluation. These results include results from the pre-evaluation questionnaire, post-evaluation questionnaire and the average task completion rates by group.

5.2.1 Pre-evaluation Questionnaire Results

We used an online pre-evaluation questionnaire to gather demographic information about participants (e.g. job, age) and to assess their use of the Internet. This section describes the results from this questionnaire. Figure shows the Internet and blog use for all three groups.

The age for all participants ranged from 20 to 71 yrs. We had 10 participants in the citizen group, 10 in the students group, and 3 town officials. The data shows that about 65% (15 out of 23) of the participants read news online using a web browser. Only about 17% (4 out of 23) of the participants use an RSS reader, the remaining users do not regularly read news online.

![Average Internet and Blog Use](image-url)

**Figure 5-1:** Average Internet and blog use. Choices were: 6 = Several times a day, 5 = At least once day, 4 = Several times a week, 3 = Once a week, 2 = Several times a month, 1 = Once a month, and 0 = Never
5.2.1.1 Citizen Group

There were a total of 10 participants in the citizen group. Their ages ranged from 40 to 71 yrs. From the survey, we learned that participants from the citizen group overall used the Internet regularly. They use it more for personal reasons than for work. Most of the participants read political blogs a few times a month and local blogs less than once a month. These participants have almost never written blogs; only 2 of them do it at all. One of them writes a blog once a week and the other one several times a month.

5.2.1.2 Town Officials

A total of 3 town officials participated in this evaluation. Their ages ranged between 38 to 58 yrs. The data shows that town officials use the Internet on a regular basis for work and personal reasons equally. They read blogs on an average more than once a week and read more political blogs than local blogs. They also visit the Southwest Virginia aggregator once a month. Town officials wrote blogs less than once a month.

The only characteristic that differentiates the citizen group from the town official group is in the use of the Internet at work. Both use the Internet equally for personal reasons. The other attributes are closely matched. Since we were able to recruit only 3 participants from the town, and because their profiles do not differ much, we lump them together for the rest of the analysis done in the paper.

5.2.1.3 Computer Science Graduate Students

A total of 10 graduate students participated in this evaluation. These graduate students are considered experts in this evaluation. Their ages ranged from 22 to 27 yrs. Most of the Computer Science students used the Internet, both for work and personal reasons on a daily basis. They read blogs more than once a week but not so much of Political or even less local blogs. These participants wrote blogs a little more than once a month, with two of them writing several times a week.

5.2.2 Results of Task Completion

A major goal of our usability evaluation is to identify is participants can complete the tasks enumerated in section 4.2.3. Overall and across all users and tasks, 85% (117 out of 138) of
tasks were completed successfully. The completion rate among different tasks and groups varied a little, but in general users were able to use VizBlog to do the work requested.

The graph in Figure 5-2 shows that on an average 93% of all the participants were able to identify a particular cluster. 76% of the participants were able to identify the discussion topic in a cluster. About 86% of the participants were able to identify the top three keywords in the visualization. 87% of the participants were able to find a cluster that discussed a given topic. 73% were able to identify a particular blog entry (e.g., talked about “house fires”) that was part of a larger cluster (e.g., “Chief Vinson’s retirement”). All participants were able to find two blogs that cited each other.

However, when we break up the completion rates by groups, we found that the student group performed strong in all tasks (at least 80% completion in all tasks) but the citizen and town group did not fare well in a couple of the tasks. Figure 5-3 shows each group’s performance for each task. Task 2 and 5, in particular, were difficult for the citizen and town group. Task 5, in our opinion, was the most difficult task in the study. The next section provides some insights as to why some users had trouble completing some tasks using VizBlog.
5.2.3 Post-evaluation Questionnaire Results

The post-evaluation questionnaire helped us gain insight about the usability of the tool and the participants experience using the tool.

*Ease of use:* Citizens and town officials were mostly neutral about the ease of use of VizBlog. But most of the graduate students agreed that this tool was easy to use. One of the student participants said “this tool provided a global view of all the blog entries and VizBlog really made it easy for me to look for information I was interested in.” Another participant mentioned, “It was so easy to navigate through the information, though the number of blog entries was large.” A participant from the Citizen group said “VizBlog brings many voices together and provides a way of managing them and navigating among them.”

*Features were intuitive:* Half of the citizens group and 67% of the town officials agreed or strongly agreed that VizBlog was intuitive. One town official said “Sense of Overview was great. I felt I zoomed in mentally on a topic even as I zoomed in visually, sense of knowing where I was and being oriented to an organized set of information as opposed to wandering around randomly on the Internet in the dark.” The graduate students, on the other hand, agreed unanimously that the features of VizBlog were intuitive.

![Figure 5-3: Percentage of participants that completed each task broken up by group.](image-url)
**Easy to identify blogs with similar content:** All students (100%), 90% of the citizens and 100% of the town participants strongly agree/agreed that it was easy to identify blogs with similar contents. One of the graduate students said “This tool gave me a view of the entire blog space, and highly important components by forming clusters”. A participant from the citizen/town group said “The graphic representation of the relationship between articles could be useful for someone trying to locate threads and linking to articles of their interest or posting their on entries at these points.”

**Easy to identify blogs quoting or citing other blogs:** Ninety percent of students strongly agreed/agreed that it was easy to identify blogs citing other blogs. 80% of the citizens and 67% of the town group agreed that it was easy to identify blogs citing other blogs. The agreement level was lower among the town official group. A participant from the graduate student group said “I liked the citation relationships; it made it very easy for me to see how various blogs are connected, which is good considering that if you read a lot of blogs you may be going back and forth.”

**Easy to identify the top keywords:** The student group agreed (80%) that is was easy to identify the top keywords in the visualization using the keyword cloud. One of the participants said “I liked the keyword cloud the most. It showed the hot topics clearly.” The citizen group agreed (80%), that identifying keywords was easy but the town official group agreement was a little lower at 67%.

**Easy to use search:** Using the search is where the difference between the students and the citizen/town was the most pronounced. 100% of the students found the search easy to use. However, only 60% of the citizen and 67% of the town officials found it easy to use. Four participants were neutral and one disagreed that it was easy to use. It seems that participants in the citizen and town group did not understand how the search worked, and thus had trouble figuring out what happened when they searched for keywords. Our current design for the search might be more appropriate for experienced computer users. We have to rethink how to better present the search and the search results for novices.

**Easy to find specific blog entries using search:** Although some participants had problems with the search, all participants were able to find specific blog entries using the search feature.
Nevertheless, only 80% of the student group and 80% of the citizen and 67% of the town group agreed that it was easy to do.

![Post-Evaluation Results](image)

**Figure 5-4:** Usability of VizBlog. Scale used: 1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly agree.

### 5.3 Discussion of Usability Evaluation

Overall the participants found the VizBlog interface intuitive and easy to use, as discussed in the previous section. We asked in the post-questionnaire three general questions: What did you like most and least about VizBlog, and what changes would you suggest to make it easier to use. This section summarizes these results organized around Shneiderman’s Information Visualization Mantra (Shneiderman, 1996).

It is worth noting that the large amount of information managed by VizBlog can be overwhelming. Organizing 1000 nodes in a way that users can make sense of its structure is a challenging task. We feel that our design has done a good job at handling the amount of
information. Nevertheless, there were a couple of people who mentioned that the large amount of information was overwhelming and they were stressed out when performing the tasks. Some users were disappointed that they could not maximize the visualization to fit the screen. For VizBlog to be truly effective, we need to do a better job addressing the handling of the large volume of data in future iterations of the tool.

5.3.1 Overview

The participants liked how the visualization provided a central place to find blogs of similar content. They also mentioned how the graphical representation of blog entries was useful in locating threads of discussion and helped them link to articles of interest or post their comments on entries of interest. Most of the participants pointed out that this tool was easy to navigate and that it saved time and reduced the frustration involved in looking for specific topic of interest. Majority of the participants from all the groups liked how VizBlog provided a global view of all the blogs as it gave them the ability to see discussions at a glance. They also mentioned that the similarity links and hyperlinks between entries made it easier to identify relationships between entries. Also the color-coding made easier to distinguish blog entries that were connected to other blog entries, search results and the top keywords.

Overall the users thought that the various clusters of related topics of discussion offered valuable insight in identifying the most discussed topics and other topics of interest. The similarity links and hyperlinks between blog entries made it easier to identify similar topics. Zooming out to the overview level in the visualization, helped users distinguish the denser clusters more clearly from the others. Also the similarity slider and the filter to view clusters only helped filter out blog entries that were not related for that particular value of similarity.

Keyword Cloud: Most of the participants said the keyword cloud would help users of this tool identify the most talked about topics of discussion. Others added that the cloud makes it easy to search for topics of interest. Some said the cloud helped as a cross-reference, where they could verify if the most talked about topic was in fact the largest cluster. One participant suggested that when a keyword is clicked, the visualization should zoom in to the heaviest cluster of that contains that keyword. Most participants liked it because it displayed the top 20 keywords from the visualization and in one glance they were able to identify the most discussed topics.
The very term “cloud” was confusing to some users, particularly those that were not “computer savvy”. They were actually looking for something in the shape of a cloud. These participants suggested that there should be a popup in the keyword cloud that points out to them that these are the top 20 keywords in the visualization.

5.3.2 Zoom and Filter

Panning the interface, zooming in and out and also moving the nodes around seemed intuitive to most users. Filtering, however, raised a few questions. They suggested that a filter to turn off clusters that are not of interest would be useful in reducing screen clutter. Also checkboxes could be used to filter out blog entries based on author and/or subject. One participant suggested having a filter that filters blog entries based on the date of publication of the entry so they can easily focus on recent entries.

The similarity slider was possibly the most problematic feature in the tool. Users found the similarity slider counter-intuitive. It seemed to them like a similarity value of zero would display no links as opposed to all links being present. They were unsure of how this slider worked. The value associated with the similarity projected an inverse relationship to the users. Users expected that a value of 0 should show no relationships and a value of 1 would show all relationships. The reality was that a value of 0 set the threshold to show all relationships greater than or equal to 0, thus showing all similar links. We plan to remove the value from the interface and change the wording and possible the directionality of the slider to address this problem.

Search: Several of the users did not like the way the search results were highlighted. They suggested that the search results should be highlighted in a different color and also be enlarged in size. They were not able to distinguish between the “magenta” color used to highlight the search results and the purple color used for the nodes in general. Some users pointed out that they would like only the search results to be visible for a particular search, and all the other unrelated nodes should be made invisible. Others also suggested having a separate list containing the search results. Some pointed out that the search box should have a white background as opposed to grey. Some suggested that a search history would be helpful to frequent users of this tool.
5.3.3 Details on demand

Right clicking on a node to open a blog entry in the web browser was a little confusing at first to some users. Users sometimes inadvertently pressed the right mouse button down, opening a node in a browser when they did not intend to do so.

Some participants did not like how the nodes displayed only 10 characters of the entire title and they had to zoom in to see the rest. Though the tooltip displays the entire title when you mouse over the node, but the tooltip does not last more than 3 seconds and users found that annoying. The participants suggested displaying the entire title of the blog entries and to provide some mechanism where in the tooltip would stay visible longer. Some even suggested having the name of the author and timestamp appear in the tooltip in addition to the blog title.

Two of the participants asked whether this tool provided support for color-blind as well as blind people. Since one of our participants was color blind, it was very hard for the user to differentiate between the colors when searching for a topic. They suggested using different bold shapes and enlarging the search results to differentiate the results. This is clearly a problem that we must address in future versions of our tool.

5.4 Structure of Local Conversations on the Regional Blogosphere

The tagging done on all 994 blogs provides a quick glimpse at the structure of local discussions on these regional blogs. The tagging focused mostly on identifying local and political discussions. Every blog was classified along two dimensions. One dimension represented content of local relevance: Local, Non-Local, Both (combination of local and non-local in the same blog posting). The other dimension represented content of political nature: Political, Non-Political, Both (combination of political and non-political content in the same blog posting). The results shown below present the reliability of the tagging and the structure of the contents of the regional blogs.

5.4.1 Intercoder Reliability Results

The intercoder reliability between all the three coders (2 graduate students and the researcher) was calculated. Cohen’s Kappa (k) was used for the intercoder reliability. The tables below include Cohen’s Kappa (k) calculated between coders for the selected sample of 25 blog entries.
Intercoder reliability measures the internal consistency between coders and Cohen’s Kappa is the most common test performed for intercoder reliability with categorical data.

<table>
<thead>
<tr>
<th>Measure of Agreement</th>
<th>Value</th>
<th>Asymp. Std. Error(a)</th>
<th>Approx. T(b)</th>
<th>Approx. Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kappa</td>
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<td>.101</td>
<td>8.764</td>
<td>.000</td>
</tr>
<tr>
<td>N of Valid Cases</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a Not assuming the null hypothesis.
b Using the asymptotic standard error assuming the null hypothesis.

Table 5-6: Cohen’s Kappa between Coder 1 and Coder 2

<table>
<thead>
<tr>
<th>Measure of Agreement</th>
<th>Value</th>
<th>Asymp. Std. Error(a)</th>
<th>Approx. T(b)</th>
<th>Approx. Sig.</th>
</tr>
</thead>
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<td>.000</td>
</tr>
<tr>
<td>N of Valid Cases</td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a Not assuming the null hypothesis.
b Using the asymptotic standard error assuming the null hypothesis.

Table 5-7: Cohen’s Kappa between Coder 1 and Coder 3

<table>
<thead>
<tr>
<th>Measure of Agreement</th>
<th>Value</th>
<th>Asymp. Std. Error(a)</th>
<th>Approx. T(b)</th>
<th>Approx. Sig.</th>
</tr>
</thead>
<tbody>
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<td>.000</td>
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<tr>
<td>N of Valid Cases</td>
<td>25</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a Not assuming the null hypothesis.
b Using the asymptotic standard error assuming the null hypothesis.

Table 5-8: Cohen’s Kappa between Coder 2 and Coder 3

Cohen’s Kappa coefficient was calculated to assess the reliability of these codings between each pair of coders. The analysis yielded a Kappa coefficient of 0.68 between coder 1 and coder 2. The intercoder reliability on the 25 blog entries was acceptable as indexed by Cohen’s kappa: $k=$
0.72 between coder 1 and coder 3, and k= 0.95 between coder 2 and coder 3. According to Landis and Koch (Landis & Koch, 1977) interpretation of Kappa (Table 5-5 shows the interpretation for Kappa values).

According to this interpretation, the kappa values for coders 1 and 2 and coders 1 and 3 indicated full agreement and Kappa value for coders 2 and 3 indicated almost perfect agreement.

5.4.2 Structure of Regional Blogosphere

Out of a total of 994 blog entries, there were 362 Political blogs, 602 Non-Political blogs, 30 blogs with both political as well as non-political content (Both), 355 local blogs, 632 Non-Local blogs and only 7 blogs with local as well as non-local content (Both). This shows that a majority of the blogs were Non-Local blogs (64%) and Non-Political blogs (62%). 37% of the blogs were Political and 36% were Local blogs. Only 3% of the blogs contained both political as well as non-political content and 1% contained both local as well as non-local content.

![Local Content in Regional Blogs](image-url)
The table below shows the blog count by category. To simplify the understanding of this data, the “Both” column was added to the “Local” column, and the “Both” row was added to the “Political” row, producing a new data set shown in Table 5.10. Figure 5-7 shows a pie chart for this new dataset.

<table>
<thead>
<tr>
<th></th>
<th>LOCAL</th>
<th>NON-LOCAL</th>
<th>BOTH</th>
</tr>
</thead>
<tbody>
<tr>
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<td>329</td>
<td>3</td>
</tr>
<tr>
<td>NON-POLITICAL</td>
<td>320</td>
<td>280</td>
<td>2</td>
</tr>
<tr>
<td>BOTH</td>
<td>5</td>
<td>23</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 5-9: Blog Count by Category

<table>
<thead>
<tr>
<th></th>
<th>LOCAL</th>
<th>NON-LOCAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>POLITICAL</td>
<td>40</td>
<td>352</td>
</tr>
<tr>
<td>NON-POLITICAL</td>
<td>322</td>
<td>280</td>
</tr>
</tbody>
</table>

Table 5-10: Adjusted counts for Blog counts by Categories
As seen in Figure 5-7, most of the content on the regional blogosphere is of non-local nature. Nevertheless, there is local and political discussion in the regional blogosphere, even if it is a small percentage (only 4% of local-political discussion). Identifying this content is difficult and a tool like VizBlog should help citizens and government personnel alike in that task.

5.4.3 Discussion

Analysis of the clusters formed in VizBlog showed that VizBlog does cluster information based on the topic of discussion, but the entries in each cluster were mostly by the same author who was updating his blog periodically on that same topic. Hence even if the topic of the blogs in the cluster were about local issues or events, the entries in the cluster were still by the same author.

For example there was one cluster that contained entries about a local fire chief who was about to retire in January of 2007. All the entries in that cluster were written by the same author, but on different days in the month of January. In of the entry the author talked about the fire chief’s lifetime achievements, in another he told people that this was their last chance to post their comments to the chief. One other entry showed pictures and information of the chief’s retirement party. There was this other blog about “house fires on 6th Street” in which the author mentioned the fire chief’s retirement party was the day before in addition to mentioning that there was a house fire on 6th street. All these blog entries were written by the same author and
were clustered together in VizBlog, not because they had the same author, but that they had the same topic of discussion.

Another example is of a cluster that talks about mountain top removal. Again almost all the blog entries in this cluster are by the same author and came from the same blog. The author here, however, does refer to posts on other websites and provides snippets as well as links of those posts on his blog. In one of the entries he talks about Google’s release of a new feature content in the popular Google Earth program that includes mountain top removal coal mining and how this feature can be accessed by 200 million users of Google Earth around the world. He has a more information about the press release on his blog and also has links to the Google blog. In another entry from this cluster the author writes about the fight against mountain top removal mining and points to another article that talks about Mountain top removal activist world. In a third entry linked to this cluster, the author points out a magazine that talks about mountain top removal along with a link to the article in the magazine.

This again shows that VizBlog clusters blog entries based on the topic of discussion, but most of the blogs come from the same author instead of different people writing or commenting on the same topic, which was the assumption that different people would write on the same topic whether or not they knew each other. One of the reasons for this could have been the reason that VizBlog currently does not show comments posted on the blog entries. So it could be possible that there could have been an ongoing conversations taking place in the blog, but it was not visually presented in VizBlog. Another reason could be that the set of blogs chosen for the evaluation did not have any ongoing conversations or discussion.

One way to help users distinguish between entries from the same author would be to either color code the blog entries by the same author. This would let them know at a glance that whether the blogs entries in the cluster are from the same author or different authors.
Chapter 6: Conclusions and Future Work

6.1 Conclusions

Since information in blogs is dispersed and growing rapidly, analyzing this content becomes difficult, especially when there are a large number of blogs. These dispersed blogs could have a broad range of topics, which could make it even more difficult to explore content and analyze information. Blogs have also become a means for online discussion for citizens and town leaders and a visualization tool like VizBlog would make exploration of this content easier.

The evaluation results of VizBlog proved that the tool did make it easier for users to identify topics of interest from the visualization. This visualization could also help interested citizens discover discussion on topics of interest and also help them communicate with other citizens and join in discussion online. VizBlog could help government officials and staff to ‘see’ what a broader and more diverse public is expressing about local issues and concerns. Without this visualization, there are just too many individual blog entries to be able to make much sense of the overarching topics of discussion taking place among them.

The results of the usability evaluation of VizBlog also suggested that the tool was easy to use and did provide insight into ongoing discussions in blogs. This usability evaluation was a spot test to verify whether users were able to identify topics of interest from the visualization. Nevertheless, a number of usability problems were found in this study. For the tool to be used by the population at large, we need to make it easier to use for computer novices. We found that most of the people who had difficulty using the tool were the computer novices, those that use computers for personal reasons and not necessarily for work.

The validation of similarity ratings did prove that the automatically generated similarity coefficient values in VizBlog were correct as the tool did link blog entries with similar topics of discussion.

Content analysis and the validation of the global tagging of the 994 blog entries used for the analysis, proved that the set contained local and political blogs, however, local political
conversations were not found in the sample month data. Most of the clusters in the visualization had entries posted by the same author although they were on the same topic of discussion.

6.2 Future Work

In a future version of VizBlog, we plan to enable citizens to select which groups of blogs to visualize. That way, users can select the blogs of their choice and our tool will gather the entries, and provide the interactive visualization to allow users to explore the online deliberations. The goal is to release VizBlog as an open source project, once it has reached a stable point in its usability and development cycle. Though VizBlog has been used and tested with blogs, but is not limited to visualizing information flow across blog entries. VizBlog could be extended to visualize other types of information for example, new stories and technology blogs. A visual representation of the comments posted on the blog entry and also a way to see which clusters in the visualization come from different authors would be helpful.
References


at the Proceedings of the 38th Annual Hawaii International Conference on System Sciences.


http://en.wikipedia.org/wiki/Aggregator


Appendix A: IRB APPROVAL

DATE: November 1, 2007

MEMORANDUM

TO: Andrea L. Kevanaugh
Philip L. Isenhour
Daniel R. Dunlap

FROM: David M. Moore

SUBJECT: IRB Amendment 1 Approval: "Modeling Online Participation in Local Governance", OGP FA/7222, IRB # 05-504

This memo is regarding the above referenced protocol which was previously granted approval by the IRB on September 24, 2007. You subsequently requested permission to amend your IRB application. Since the requested amendment is non-substantive in nature, I, as Chair of the Virginia Tech Institutional Review Board, have granted approval for requested protocol amendment, effective as of October 31, 2007. The anniversary date will remain the same as the original approval date.

As an investigator of human subjects, your responsibilities include the following:

1. Report promptly proposed changes in previously approved human subject research activities to the IRB, including changes to your study forms, procedures and investigators, regardless of how minor. The proposed changes must be initiated without IRB review and approval, except where necessary to eliminate apparent immediate hazards to the subjects.

2. Report promptly to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

3. Report promptly to the IRB of the study's closing (i.e., data collecting and data analysis complete at Virginia Tech). If the study is to continue past the expiration date (listed above), investigators must submit a request for continuing review prior to the continuing review due date (listed above). It is the researcher's responsibility to obtain re-approval from the IRB before the study's expiration date.

4. If re-approval is not obtained (unless the study has been reported to the IRB as closed) prior to the expiration date, all activities involving human subjects and data analysis must cease immediately, except where necessary to eliminate apparent immediate hazards to the subjects.

As indicated on the IRB application, this study is receiving federal funds. The approved IRB application has been compared to the OGP proposal listed above and found to be consistent. Funds involving procedures relating to human subjects may be released. Visit our website at www.irb.vt.edu for further information.

OC: File
Appendix B: INFORMED CONSENT FORM

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Informed Consent for Participants
in Research Projects Involving Human Subjects

Title of Project: CONTENT ANALYSIS OF VIZBLOG: ANALYZING CITIZEN TO CITIZEN DELIBERATION ONLINE USING BLOGS

Investigator(s): Dr. Manuel A. Pérez-Quiñones, Dr. Andrea Kavanaugh, Candida Maria Tauro.

I. PURPOSE OF THIS RESEARCH/PROJECT

You are invited to participate in a usability study of VizBlog, a tool for visualizing blog conversations. VizBlog was designed to address the discovery problems caused by large number of blogs and also help citizens communicate with each other and keep track of other citizens’ opinions.

II. PROCEDURES

Each participant will be asked to perform a set of 6 tasks which would cover most of the features of VizBlog. The study would take at most hour. The study will be conducted in Room no. 1133 in Knowledge Works II (Department of Computer Science), in the Corporate Research Center at Virginia Tech. Minimum experience using computers is required. The study will be audio recorded.

III. RISKS

The risks associated with participation in this study are minimal. However, whenever audio recordings are made, there exists the possibility that such recordings might be heard, resulting in your identity being recognized by someone.

IV. BENEFITS

Your participation in this study will provide information that would be used to improve the functionality of VizBlog. You will be rewarded $ 25 for your participation in this study.
V. EXTENT OF ANONIMITY AND CONFIDENTIALITY

The results of this study will be kept strictly confidential. Your written consent is required for the researchers to release any data identified with you as an individual to anyone other than personnel working on the project. The information you provide will have your name removed and only a subject number will identify you during analyses and any written reports of the research. Only the transcriptions of your replies will be used in the research. At no time will the direct use of your original audio recordings be made of. The recordings will be held under lock and key in the office of Dr. Manuel A. Pérez-Quiñones, Room No. 1125, Knowledge Works II. All the recordings will be destroyed once it has been assessed that the transcriptions have yielded the required data.

Data will be stored securely and will be made available only in the context of research publications and discussion. No reference will be made in oral or written reports that could link you to the data nor will you ever be identified as a participant in the project. All data gathered will have your name removed and only a user number will identify each user during analyses and any written reports of the research.

VI. COMPENSATION

By participating in this project you will be rewarded $25.

VII. FREEDOM TO WITHDRAW

You are free to withdraw from this study at any time for any reason and without penalty.

VIII. APPROVAL OF RESEARCH

This research has been approved, as required, by the Institutional Review Board for projects involving human subjects at Virginia Polytechnic Institute and State University, and by the Department of Computer Science.

IX. PARTICIPANT’S RESPONSIBILITIES

I voluntarily agree to participate in this study, and I know of no reason I cannot participate. I will keep the activities and information discussed confidential, since others will be participating in this research.

X. PARTICIPANT’S PERMISSION

I have read and understand the informed consent and conditions of this project. I have had all my questions answered. I hereby acknowledge the above and give my voluntary consent for
participation in this project. If I participate, I may withdraw at any time without penalty. I agree to abide by the rules of this project.

_____________________________________          ____ ___________________
Signature                                                                     Date

____________________________________            ___ ___________________________
Name (please print)                                                    Contact: Phone/Email (Optional)

Should I have any pertinent questions about this research or its conduct, I may contact:

Candida Maria Tauro
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Chair, IRB
540-231-4991 / moored@vt.edu
Telephone/e-mail
Appendix C: TUTORIAL TASKS

Instructions:

a) Double click the tutorial.bat file on the desktop to start the visualization. Watch how the nodes explore from the center of the visualization. Below, are some sample tasks for you to perform, to get used to the functionality of the tool.

b) Please think out loud when performing these tasks.

TUTORIAL TASKS:

1. First **Pause** the animation by clicking the Pause button in the right panel.

2. Set the **Similarity Slider** value to 0.0. To do this move the similarity slider to the extreme left. This slider is located just below the Legend and Animation panel on the right.

3. Next, **zoom out** to get an overview of the visualization, by right clicking once on an empty space in the visualization window.

4. Place a checkmark by clicking on the checkbox in the “Show only clusters” checkbox located below the similarity slider to filter out blog entries that are not similar for the current value of similarity.

5. Now **Reset** the animation by clicking the Reset button in the panel on the right.

6. Wait for about 10 seconds and then **Pause** the animation by clicking the Pause button in the panel on the right.
7. **Zoom out** again to a comfortable level by moving the scroll button on the mouse backwards.

8. Identify the largest cluster from the visualization and **zoom in** to identify the topic of discussion. You can zoom in to the visualization by moving the scroll button on the mouse forward.

9. **Reset** the animation by clicking on the Reset button in the panel on the right and wait for a few about 10 seconds till the animation reaches a comfortable level. Now **Pause** the animation.

10. Using the Search box, type in **Global Warming** and press Enter, to find a blog entry that talks about **Global Warming** and open this blog in a Web browser by *left clicking* on that blog entry. Close the browser to return to the visualization.

11. Using the **Keyword cloud** from the right panel, identify the **most** talked about topic. The most talked about topic would be the one with the largest font size.

12. **Zoom out** to a comfortable level.

13. Identify a blog entry that **cites and is similar** to another blog entry and identify their topics of discussion. Use the **Legend** on the right panel for explanation about what the arrows and their colors indicate.

14. Pick any blog entry and **zoom in** till the entire title is visible.
Appendix D: PRE-EVALUATION

QUESTIONNAIRE

1. Do you use the Internet?
   □ Yes
   □ No
   If no, skip to 5.

2. How often do you use the Internet? (Check one that applies)
   □ Several times a day
   □ At least once a day
   □ Several times a week
   □ Once a week
   □ Several times a month
   □ Once a month
   □ Never

3. I feel confident using the Internet.
   1: Strongly Agree  5: Strongly Disagree
   1  2  3  4  5
4. How often do you use the Internet for your work or other personal reasons?

<table>
<thead>
<tr>
<th>FOR WORK</th>
<th>FOR PERSONAL USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Several times a day</td>
<td>□ Several times a day</td>
</tr>
<tr>
<td>□ At least once a day</td>
<td>□ At least once a day</td>
</tr>
<tr>
<td>□ Several times a week</td>
<td>□ Several times a week</td>
</tr>
<tr>
<td>□ Once a week</td>
<td>□ Once a week</td>
</tr>
<tr>
<td>□ Several times a month</td>
<td>□ Several times a month</td>
</tr>
<tr>
<td>□ Once a month</td>
<td>□ Once a month</td>
</tr>
<tr>
<td>□ Never</td>
<td>□ Never</td>
</tr>
</tbody>
</table>

5. How often do you read blogs?
   □ Several times a day
   □ At least once a day
   □ Several times a week
   □ Once a week
   □ Several times a month
   □ Once a month
   □ Never
6. How often do you read political blogs? (Political blogs are blogs that comment on Politics)
   □ Several times a day
   □ At least once a day
   □ Several times a week
   □ Once a week
   □ Several times a month
   □ Once a month
   □ Never

7. How often do you read local blogs? (Local blogs are blogs that comment on news and happenings in your local area)
   □ Several times a day
   □ At least once a day
   □ Several times a week
   □ Once a week
   □ Several times a month
   □ Once a month
   □ Never

8. How often do you visit the Southwest Virginia website (www.swvaneWS.com) to read blogs?
   □ Several times a day
   □ At least once a day
   □ Several times a week
   □ Once a week
   □ Several times a month
   □ Once a month
   □ Never

9. How often do you write blogs?
Several times a day
☑ At least once a day
☐ Several times a week
☐ Once a week
☐ Several times a month
☐ Once a month
☐ Never

10. What are your reasons for writing blogs?
☐ For fun
☐ To meet new people
☐ Just a Hobby
☐ To share personal experiences with people
☐ To stay in touch with family & friends
☐ Other
Specify other: ______________________________________________________

11. Do you use RSS reader software (like Google Reader or SharpReader for Windows) to keep up with news sites (e.g. CNN, Fox News, Roanoke Times, etc.)?
☐ No, I do not regularly read news online
☐ Yes, I read news online, but do so using a web browser like Internet Explorer, Firefox, Netscape, or Safari.
☐ I sometimes use an RSS reader, but usually read news websites directly.
☐ I primarily use an RSS reader for keeping up with news.

12. In trying to understand numerical data do you prefer to use
☐ Graphs
☐ Pie Charts
☐ Tables
☐ Scatter Diagrams
13. I prefer pictorial representation of data because it makes the presentation more eye-catching, easier to see the salient information and easier to interpret.

    1: Strongly Agree                     5: Strongly Disagree
    1                         2                        3                         4                           5

Demographic Information


15. Occupation: ____________________________________________________________

16. Education

    □ Some High School
    □ Some College Degree
    □ Bachelors Degree
    □ Master’s Degree
    □ PhD
    □ Other: _______________________________

17. Do you work for the Town of Blacksburg?

    □ Yes
    □ No

18. Do you hold a leadership position in any local civic organization?

    □ Yes
    □ No
Appendix E: FINAL TASKS

Instructions:

1. We would now like you to perform the tasks listed below. You may write down the answers to these tasks in the space provided below.

2. Please think out aloud as you perform each task.

3. To begin, double click the vizblog.bat file on the desktop to start the visualization. Now, Pause the animation and zoom out to the overview level.

TASKS:

1. Pick one of the largest clusters from the visualization and identify the topic of discussion.

   Topic: ____________________________ __________________

2. Identify the top 3 keywords in the visualization.

   Topic: ____________________________ __________________

3. Find a blog entry that talks about the “Marsh Fork Arrests”? Write down the topic of this blog entry as displayed in the visualization.

   Topic: ____________________________ __________________

4. Find a cluster that talks about “Fire Chief Vinson’s retirement” and also discusses “House Fires”. Pick one blog entry from this cluster that talks about both “Fire Chief Vinson’s Retirement” and discusses “House Fires”. Write down the topic of this blog entry as displayed in the visualization.

   Topic: ____________________________ __________________

5. Identify a blog entry that cites more than 2 other blog entries. What is the topic of this blog entry?
6. Identify a topic that you find **interesting** from this visualization?
Topic: _______________________________________________ ___________________
Appendix F: POST EVALUATION QUESTIONNAIRE

1. VizBlog was easy to use.
   1: Strongly Disagree                  5: Strongly Agree
   1                       2                       3                           4                            5

2. Most of the features of VizBlog were intuitive.
   1: Strongly Disagree                  5: Strongly Agree
   1                       2                       3                           4                            5

3. I found it easy to identify blogs with similar content.
   1: Strongly Disagree                  5: Strongly Agree
   1                       2                       3                           4                            5

4. I found it easy to identify blogs quoting or citing other blogs.
   1: Strongly Disagree                  5: Strongly Agree
   1                       2                       3                           4                            5

5. I found it easy to identify top keywords.
   1: Strongly Disagree                  5: Strongly Agree
   1                       2                       3                           4                            5

6. The prefix search was easy to use.
   1: Strongly Disagree                  5: Strongly Agree
   1                       2                       3                           4                            5
7. The prefix search was useful since it made it easier to find specific blog entries by highlighting the nodes when there were too many blog entries.

    1: Strongly Disagree                                      5: Strongly Agree
                    1                       2                       3                           4                            5

8. Why are the keywords (cloud) good for Political Bloggers?

9. Do you think it would be helpful for frequent users of VizBlog to have a separate list of new blogs entries?

    □ Yes
    □ No

10. Do you think it would be helpful to frequent users of VizBlog to mark blogs that have been read?

    □ Yes
    □ No

11. Do you think infrequent users of VizBlog would use the Cloud of keywords feature to read blogs of their interest?

    □ Yes
    □ No

12. What did you like most about VizBlog?

13. What did you like least about VizBlog?

14. What changes would you suggest that would make VizBlog easier to use?
Appendix G: VIZBLOG REFERENCE SHEET

GLOSSARY OF TERMS

1. **Blog Entry:** Each node in the visualization represents an individual blog entry.

   ![Node in VizBlog](image)

   **Figure 1.** Node in VizBlog

2. **Cluster:** Blog entries form a clusters when the entries have the similar topic of discussion. Similar blog entries are connected to each other via links.

   ![Cluster](image)

   **Figure 2.** Cluster
3. **Similarity**: Two blog entries would be similar if both entries have similar content. The thickness of the link between the two entries represents the level of similarity. The similarity slider can be used to filter out entries based on the value of their similarity coefficient.

![Diagram showing similarity between blog entries](image)

**Figure 3.(a & b).** Blog entries with different similarity coefficient values.

**Cite /Hyperlink**: Pink dotted directed link between two blog entries indicates a hyperlink. Solid red directed link represents a combination of hyperlink + similarity link. The direction of the arrow indicates the direction of the hyperlink. The thickness of this arrow indicated the level of similarity between the two entries.

For example in Fig. 4. a below, the dotted pink link between the two blog entries represents a hyperlink.

For example in Fig. 4. b below, the solid red link between the two blog entries represents a hyperlink and similarity between the two entries.

For example in Fig. 4. c below, the solid red link between the two blog entries represents a hyperlink. Also the thickness represents of the arrow here indicates that the two entries have a lesser value of similarity than the similarity value of the blog entries in Fig. 4.b.

![Diagram showing hyperlink and similarity](image)

**Fig. 4.a.** Only Hyperlinked. **Fig. 4. (b & c)** Hyperlinked & Similar with different Values of similarity
4. **Keyword Cloud:** The top 20 keywords from the visualization are shown in the Keyword Cloud. The font size of the keyword indicates its popularity. The font size of the keyword increases, if that keyword appears more frequently in the blog entries and vice versa.

![Keyword Cloud](image1)

**Figure 5. (a & b):** Keywords with different Font sizes.

5. **Legend:** The Legend below gives a visual description of what the arrows indicate.

**Bold Red Arrow:** The *bold red* arrow between two blog entries indicates that one blog cites (hyperlinked to) and is similar to the other blog it is pointing to. The direction of the arrow indicates the direction of the hyperlink. The thickness of the bold red arrow indicates the level of similarity between the two blog entries. The thicker the arrow between two blog entries the more similar the two blog entries are to each other and vice versa.

**Dotted Pink Arrow:** The *dotted pink arrow* between two blog entries indicates that one blog cites (hyperlinked to) the other blog it is pointing to.

**Grey Line:** This line between two blog entries indicates that one blog is similar to the other blog entry. The thickness of the line indicated the value of similarity. The thicker the line between two blog entries the more similar the two entries are to each other and vice versa.

![Legend](image2)

**Figure 6: Legend**
6. **Tooltip:** When you mouse over a node a tooltip which displays the entire title of that blog entry is displayed briefly for a few seconds. This tooltip displays the entire title of discussion even when one is completely zoomed out.

![Figure 7: Toolti](image)

1. **Zooming In:**

Zooming can be achieved using one of the following methods:

   a) *Click* and *hold* the **scroll button down** on one corner of a rectangle (initial point), and then *drag* the mouse to the opposite corner and releasing the scroll button (final point). This results in the selected area being zoomed.

   b) Point the mouse in the area to be zoomed and *click* the **right mouse button** and *drag it down* to zoom into the area of interest and bring it into focus.

   c) Move the **scroll button upwards** to zoom into the visualization.

2. **Zooming Out**

   a) To zoom out to the overview, *click* the **right mouse button** once.
b) To zoom out move the **scroll button** on the mouse *downwards*.

3. **Panning**

   a) To *pan* the visualization, *hold* the **left mouse button down** and *drag it* in the desired direction.

4. **Similarity Filter**

   The similarity filter can be increased to a maximum value of 1 and decreased to 0. This can be done by moving the slider to the right to increase the similarity value or moving the slider to the left to decrease the similarity value. The default value of the similarity slider is 0.1.

![Figure 8: Similarity Slider](image-url)
5. **Show Only Clusters Checkbox**

The checkbox for showing only clusters can be used to eliminate all nodes that do not have links for the current value of similarity. This can be achieved by placing a check in the **Show Only Clusters Checkbox**.

![Figure 9: Hiding Unconnected Nodes](image)
6. Start Animation

Click the **Play button** in the panel on the right to start the animation.

![Figure 10: Play Button](image)

Figure 10: Play Button
7. Pause Animation

Click the **Pause button** in the panel on the right to stop the animation.

![Figure 11: Pause Button](image)
8. Reset Animation

Click the **Reset Animation button** in the panel on the right to reset the animation.

![Figure 12: Reset Button](image)

Figure 12: Reset Button
9. Search

Entering a word in the *prefix search field*, searches for all words that begin with the given prefix. All the blog entries containing that word are highlighted in magenta. The **View All** button, located below the search field *zooms out* the visualization to the overview level and brings all the search results into view.

![Search Feature](image)

*Figure 13: Search Feature*
10. Top Keywords

The keyword cloud shows the top 20 keywords from the visualization. Clicking on a keyword highlights all the blogs that have that keyword in pink.

Figure 14: Keyword Cloud
11. Legend

The Legend gives a visual description of what the different arrows indicate.

**Bold Red Arrow:** Indicates that a blog cites and is similar to another blog it is pointing to.

**Dotted Pink Arrow:** Indicates that a blog cites another blog.

**Grey Lines:** Indicate only similarity.
Appendix H: Unpublished Manuscript on

VizBlog

Deliberation in the Wild:
Tools for Discovery and Participation
Manuel Pérez-Quiñones Philip Isenhour Alain Fabian
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ABSTRACT
Web logs (or blogs) have become a means for citizens to share opinions and deliberate on local issues. However, the large number of blogs makes finding and exploring content of interest relatively difficult. This discovery problem presumably also limits participation by interested citizens. We are designing a tool to display citizen-to-citizen discussion in blogs and to reveal some similarity across blog entries. Through association and content analysis, blog entries, represented and summarized into nodes, are linked to each other to form clusters of related local content. Users can navigate and explore online discussions by manipulating the graph, filtering content, and clicking on a blog title to go directly to a given blog in order to read further and possibly join these ongoing conversations. The visualization of online discussion can promote participation by highlighting ‘the buzz’ of popular topics and laying out the structure of conversations. The literature review and fieldwork have revealed some interesting contrasts seen in the usage of discussion forums and blogs for online discussion. There are numerous politically active individuals and groups discussing civic issues and exchanging information online. Typically, the online systems they use aim to aggregate public deliberation within a centralized site or forum. While these centralized online discussion forums have been successful in stimulating deliberation, they have several limitations. These include the tendency to attract the usual activists, difficulties in scaling up beyond this core group and limited breadth of information exchanged [9, 12].

1. INTRODUCTION
Online deliberation is a term associated with an emerging body of practice and research dedicated to fostering purposeful discourse over the Internet. This process of online deliberation includes both knowledge acquisition and knowledge transfer from one participating unit to another.

Categories and Subject Descriptors

General Terms

Keywords
Visualization, blogging, online discussion, local community.
Rules, such as limiting users to two posts per day, may further inhibit the free flow of opinions and other political talk. Instead of trying to find a centralized site where conversation is directed, bloggers set up their own sites (blogs), usually at no cost and with relative ease, and just start writing about various topics (typically, “my life and experiences” although political opinions, observations and information are scattered throughout many of the “my life” kinds of blogs). When interlinked, these scattered users exhibit a self-organizing social system that allows individuals to interact and share ideas and information among themselves [10]. Ironically, these very characteristics that make blogs attractive to a broad and diverse set of voices from politically less active citizens, are also fundamental to the problems associated with using blogs for citizen-to-citizen deliberation (what we call deliberation in the wild), are structure which makes discovering content and joining discussions of interest difficult. To address these problems of an overwhelming number of blogs full of a wide array of topics, we have designed a tool to help find and participate in citizen-to-citizen discussion and deliberation that takes place in blogs.

2. Background and Related Work

A blog is a web-based publication technology consisting primarily of periodic articles, most often in reverse chronological order. Blog is the most recent application in the domain of computer mediated communication technologies that enables user to publish content online with ease. Blogs can be hosted by dedicated blog hosting services, or they can be run using blog software on regular web hosting services, such as the aggregator site for southwest Virginia blogs (see Figure 1).

The blog entry (also called a post or a message) is the basic unit of a blog’s content. The style of entries varies widely, from short passages that simply link to other content, to analysis of quoted content from a news article or other blog, to lengthy segments of original content. The most recent entry, displayed first on the page, is what a visitor is most likely to see at the first glance and to read first. The writer of these blog entries is normally called a blogger. Besides the entry text itself, entries usually have both a header and footer with additional pieces of information [7, 14]. A blog entry usually consists of the following: Title - main title, or headline, of the post. Body - main content of the post. Permalink – the URL of the full, individual post. Post Date - date and time the post was published.

The social network of blogs (world of bloggers) is usually called the blogosphere. The growth that the blogosphere has been enjoying was detected early on by the Pew Internet & American Life Project [17]. It establishes that in November 2004 27% of internet users were reading blogs, a 58% jump from the 17% users who were reading during February 2004 survey. About 7% of all internet users had their own blogs to publish information and exchange ideas. Blogosphere comprises of a few densely connected weblog groups, however, majority of weblog groups are only partially inter-connected [8]. Herring and colleagues further argue that blogosphere is sporadically conversational in nature. Other studies on weblog networks and blogosphere, however, reveal the self-organizing characteristics of weblog networks that results into highly connected groups around particular topics and themes.

Kumar et al. have studied and modeled sudden bursts of connectivity within blogosphere over based on an analysis of the evolving link structure [13]. Their study shows that dispersed individual bloggers come together to discuss events. This collective conversation gets bigger to take the form of a spike. Gruhl et al. furthered the work of Kumar et al. and found that discussion in blog communities was generally composed of chatter (ongoing discussion whose subtopic flow is determined by decisions of the authors), although, at times spikes (short-term, high-intensity discussion of real-world events that were relevant to the topic) appeared and a large number of bloggers were exposed to this spread (Das-Neves et al.).

Kumar et al.’s very large-scale study of interlinking among blogs found that the phenomenon of dynamic conversations across small micro-communities (virtual, not physical) is extremely widespread, and correlated with sustained blogging activity [13]. They also address a possible counter-explanation by showing that such interlinking is not simply a function of the size of the blogosphere as a whole.

Ultimately, inter-linking of the sort required to get conversations started has the relatively invisible prerequisite of “inter-reading”[4]. In other words, given the huge scale of the blogosphere, why are any two people likely to be reading each other's blogs, and, ultimately, writing about and sending their readers to each other's blogs? We believe that if we constrain the set of blogs based on location, and if the set of bloggers is sufficiently diverse, then interlinked conversations are likely to be about regional issues. A physical trainer, a semi-retired executive, a lawyer, and a firefighter probably read blogs from people in similar roles from other places, but are more likely to read each other if they are affected by the same civic/political issues, get the same daily newspaper, have kids at the same school, belong to the same church or civic organization, or have other real-world connections that are predicated on living near each other.

Although blogs are sometimes perceived as merely “personal diaries” rather than places for "deliberative practice", we believe that this distinction is simply not meaningful. Herring et al. [7, 8] places weblogs somewhere between asynchronous discussion forums and standard webpages to emphasize that although most blogs seem to be personal in nature, these blogs share characteristics with other genre of offline discussion, such as newspaper editorials. Deliberative activity, taken to mean something broader than rigid, formal deliberation, is more likely to occur in the context of a more personal online space (where there are fewer rules and constraints), in the same sense that real-world civic and political talk is more likely to take place around the water-cooler, at the dinner table, or in the stands at a little league game than at a town council meeting [11].

Our visualization tool’s goal is to allow the discovery of online discourses that take place in blogs. The value of a tool for discovering this discourse is that it mediates between the needs of the discourse- producers (citizens,
who would prefer to choose or create their own "comfortable setting" for discourse) and discourse-
consumers (other citizens, government officials, and researchers), who would prefer that bloggers discussed and deliberated in the same setting, to allow discourses to be found with ease.

3. VIZBLOG TO VISUALIZE BLOGS
We have evidence from previous research that public discussion forums, message boards, newsgroups and most recently blogs are means for citizens to share information (and misinformation), views and opinions [1, 2, 3, 8, 17]. However, the vast volume of blogs accessible online render exploring content and locating discussions of interest fairly difficult. Our visualization tool, VizBlog, scans blogs of local origin and creates a network visualization of citizen discussions. Through association and content analysis, blog entries are represented by nodes and linked to each other to form clusters of related local content. The following sections describe the tool and its various features that aim at facilitating its use and its knowledge sharing capabilities.

3.1 Visualization
We designed a parser that scans a predetermined set of blogs and creates an access database consisting of individual blog entries that are used as input for our visualization. We took the set of blogs for our case study from the local blog aggregator (http://www.swvanews.com) that gathers a large set of blogs (about 40 and growing) discussing various local (and non-local) topics from southwest Virginia (see Figure 1). Bloggers gathered on the aggregator site generally live in the area or have some other strong attachment to the region; these include local citizens, students, business-owners, elected officials and candidates, professors, retirees, and many others. Anyone can ask to have their blog linked to the regional aggregator site. There are numerous such blog aggregator websites throughout the Internet, for example, greensboro101.com gathers blogs local to Greensboro, North Carolina in the United States.

![Figure 1: swvanews.com blog aggregator.](image)

The visualization tool can be seen in Figure 2. We created it using the Heer’s Prefuse visualization tool kit [6]. An individual node represents each blog. Each node from the visualization is labeled after the title of the blog it represents. There are 4 different views that can be accessed through the controls near the top of the active window. Each view represents the same set of blogs, but the links in between them vary.

3.2 Blog Linking View
The linking visualization draws html links in between blogs. The content of each blog entry is parsed for html links. These links can either be internal links to other blog entries from the same original set of blog entries or external links to other blog entries and websites. If a link to an external blog or website is found, the visualization creates new nodes for these link targets. These nodes can be easily distinguished from the original nodes. Their color is constrained to light green and their label is a URL instead of a title. When a blog poster inserts an html link to another blog or website, a link is drawn in between the nodes that represent them. This linking view shows the structure of conversations. Bloggers using this view can follow conversations that link from one blogger to another. It can also be used to identify which blog entries or websites are most commonly linked to. These sources can be identified as authorities from which discussions originate.

3.3 Blog Similarity Views
Low, medium and high similarity visualizations display similarity links in between the blogs. When a blog entry is linked to another blog entry in this visualization it means its content is “similar” to the one it is linked to. Similarity was determined using the search engine Lucene which calculates similarity scores in between two text entries. Similarity scores are calculated in between each two pair of blog entries and links are drawn based on the degree of
similarity the user
sets (i.e., low, medium, high similarity). The low similarity
view displays a large number of links, but the content
similarity may be weak. The high similarity view may draw
gerew links in between the blog entries, but the text
similarity in between these blog entries is greater.
These similarity views were designed to outline the most
popular topics that are discussed in a regional blogosphere.
If a blogger wants to know the “buzz”, identifying the
densest regions of the graph should be sufficient. The linking view may also give similar information, however,
blogs discussing the same issue do not necessarily link to
each other. The similarity view should outline the most
discussed topics with more precision.

3.4 Blog (Node) Title
Blog entries are represented by nodes labeled with their
title (see Figure 3). Although a title usually outlines the
topic that is being discussed, it may not be sufficient to get
an accurate sense of its content. We implemented a single-
click function on the nodes that opens a browser and allows
the user to access the full blog entry. The few words of
blog summary in the node allows users to get a quick sense
of the blog content without having to go to the full entry in
their browser.
We implemented the few words of blog summary through
keywords that appear in tool tips when mousing over a blog
(see Figure 3). The set of keywords for a blog were
calculated using statistical probabilities. Words that appear
in a blog and which are statistically improbable are
considered keywords for that entry. We believe that this set
of keywords is accurate enough to give users a sense of the
main topics discussed in an entry without having to read a
full and sometimes lengthy blog entry.

3.5 Blog Origin
We noticed that many bloggers linked to some of their
previous blog entries. In order to allow users to distinguish
between these links and links to other sources from other
authors, we decided to color code the nodes in the
visualization. Blog entries are color-coded based on the
blog site they came from. Blog entries from
the same blog site are displayed with the same color. The
only exceptions are the blog entries in light green
previously discussed that are labeled with URLs instead of
titles and which represent links to external blog entries or
website sources.

3.6 Blog Filtering
The number of displayed blog entries for the South West
Virginia region over a period of one month is close to 500
(a subset of which is shown in Figure 1). We have
implemented two ways for users to sort blog entries.
A search box allows users to sort blog entries by entering a
keyword in the delimited field. In the search view resulting
from a keyword search, only the blogs that explicitly
here, with clusters representing where discussion is
occurring among bloggers. Denser areas have more
linkages among blogs, thereby indicating more
interaction on similar content (i.e., discussion).
mention that keyword are displayed (see Figure 4). We are developing the keyword search to allow users to concentrate on specific topics once these have been identified as clusters of interest in the linking and similarity overviews. It also allows users to search for specific topics when they know what they are looking for. The first version of our software only created graphs based on keyword searches. However, we noticed that allowing users to “listen” to what is being discussed and to discover popular topics and issues without having a concrete idea of what they are looking for was more appropriate for the purpose of this visualization.

Figure 4: Blog filtering through keyword. The graph show here is the resulting graph from the keyword search for “fire”. Only those blogs which have fire as a keyword are displayed.

We also noticed that a fair number of blog entries did not link to, or have similar content to, any other blog entry. These unconnected blog entries may not be useful to find relevant topics and may reduce the visibility of the visualization unnecessarily. We are planning to provide users with the option to filter out blog entries that are unconnected to other blogs or websites. In any view, users can decide to only display linked blog entries in the graph by pressing a button. This option may increase visibility without impacting the search for popular topics.

3.7 Graph Visibility and Interaction
As a new view is created, nodes are animated with a physical force simulation engine that dynamically lays out nodes [6]. The animation expands the graph, keeps connected nodes together, and avoids occlusions. It allows ensuring a graph with maximum visibility. However at any point in time users may want to stop the animation to focus on a cluster of interest. For this purpose we allow users to stop the animation at any time pressing a button at the top of the application window. The user can restart the animation by pressing the same button again. Even if this animation improves the visibility of the graph, some dense regions with many nodes linked to each other may be hard to interpret. This issue is addressed with a mouse over interaction. Mousing over a blog entry turns its color to red. Every other blog entry that is linked to it turns orange. This allows users to see where the connections to a blog entry are, even when the graph’s density makes distinguishing the links difficult (see Figure 5). Nodes can also be moved throughout the graph by clicking on it and dragging it to the desired location. All the nodes connected to the node being moved are dragged along with it. This function allows users to separate clusters of interest from the rest of the graph. Graph panning and zooming are also supported through mouse left click and right click on the background followed by mouse movements. These functions allow for easier blog exploration.

Finally, as mentioned earlier, right-clicking on a node, opens a browser with the full online blog entry. This ensures that users can fully access blogs they are interested in reading but it also allows them to access a page were they will be able to enter comments and participate in conversations.

Figure 5: Mousing over a blog entry (St Patrick’s Day Parade)

Figure 5 shows that when the user runs the mouse over a specific blog entry (node), that blog is highlighted in red. All other entries that link to it (or from it) directly are highlighted in orange to distinguish them from other indirectly linked blogs in dense clusters (see also Figure 3, where indirect links remain in blue).

4. A LOOK AT LINKED BLOG CONTENT
In order to assess some of the basic functionality of the tool we examined the content of blogs that were linked together in the two largest node clusters. The largest cluster had nodes that – as with the most of the other clusters – had direct and indirect linkages among the nodes (i.e., blog entries). As noted earlier, the linkages among blogs may be from a node or to a node (specific direction
is not indicated by the tool). In the largest cluster in the set of aggregated blogs we examined, among the nodes was the one summarized with the words: Over My Head. Going into the blogs that linked directly to this node, we see that some of the linkages reflect a kind of discussion between blogs, but other links are simply to related websites. For example, there are ten nodes that link directly to the selected node “Over My Head.” Of these ten, eight are entries in the same blog, one is a link to a Washington Post article, and one is a link to a friend’s website with no obvious topical similarity.

For the eight entries within her own blog, the author clearly has linked to related content. There are numerous blogs linked indirectly to “Over My Head” in the same cluster. In these indirectly linked blogs are diverse points of view, including politically progressive and conservative. For example, there are links to a political endorsement event of a national politician by local artists and musicians, complete with photos and commentaries; linked from this are other blog entries with dissenting and agreeing points of view on the candidate.

In the subset of blogs that form the cluster shown in Figure 5, the blogs that are linked together have the common topical themes of politics and music. As a result, they are connecting bloggers from such otherwise disparate sites as ‘draft jim webb’, the ‘bristol speedway’ race track and the old time fiddlers convention.

Nonetheless, the common topic of the political candidate links the participants together in this exchange. In the case of the keyword similarity displayed in Figure 4, using ‘firefighter’ as the keyword, so many results appear as to be less closely related than if there were a more focused keyword. This is also the result when keywords with many references in blogs are used, such as “Bush” or “Jim Webb” for example.

5. PRELIMINARY TOOL EVALUATION
We conducted a preliminary evaluation of our first prototype by giving the tool to five graduate students who commonly used blogs to read and sometimes comment on various local issues online. We asked them to use the tool for as much time as they wanted and to answer a set of questions once they felt comfortable with the tool’s main features. The questions revolved around three main points of interest: general use, tool usability and ability to provide insight of on-going conversations in the blogs (see Table 1). The tool represented over 500 blog entries from a pre-selected set in the Southwest Virginia blog aggregator website.

Table 1. Tool Evaluation Questionnaire

1. General Questions:
   a. What did you like/dislike about this tool?
   b. Do you use blog aggregations? How do you think this tools compares to a standard web-based blog aggregator?

2. Usability:
   a. Did you find the interface intuitive?
   b. What would you add or change to make it easier to use?

3. Insight:
   a. Do you think this tool made it easier to get an overall understanding of what is being talked about in the southwest Virginia blogsphere? If so, why?
   b. Can you find the most popular topics? If so, how did you find them? Which are they? How easy was it to find them?
   c. Which view did you prefer and why?
   d. Do you think the keywords useful? Do you think they represent the blogs accurately enough to give you an overall sense of its content?
   e. If you wanted to locate and participate in online discussion, would you use this tool rather than a blog aggregator?
   f. What features do you think might improve the tool’s ability to locate popular issues and discussions?

5.1 General Use
Overall, users found that the visualization offered an easier way to discover and explore aggregated blog content. They said it gave them the ability to follow conversations as well as readily identify the most discussed topics (“the buzz”). They especially appreciated the ability to see discussions at a glance.

On the down side, they found the similarity views non-intuitive. In principle, they said, the similarity views would be their preferred views because the linking visualization only showed explicit links. They thought the similarity views should make it easier to follow a trail of information, but that they did not get a good mental model of how the similarity was calculated. At times, they did not accurately understand how two blog entries were shown as related.

They also found that although it was possible to stop the animation, the default behavior made it hard to know where the center of the of the visualization was and how to keep track of items that become temporarily overlapped or that fell off the main screen view.

Finally, the evaluators were confused by the color coding of the blogs. We color coded blogs based on the blog website that they came from. For the most part, blogs on a website are created by a single blogger, however some blogs do allow multiple users to post. Users thought making this distinction and allowing them to see which blogs were created by the same blogger would be useful.

5.2 Tool Usability
Overall, the visualization was found fairly easy to manipulate. Moving nodes around and zooming in or out seemed very intuitive. Using right-click to open a blog was not obvious to all users at first but it became more natural after a few minutes of use. All the other functions available in the application interface were found fairly
straightforward and easy to use. However, they noted a few changes that they thought would make the tool easier to use. They thought the mouse-over should show the text in a narrow box instead of a single line of text to make it easier to read. They also noted the need for a function that would allow them to click on a node and have that node and all of its liked nodes stay color-coded even when mousing to another region of the visualization. They thought tagging could make it easier for them to look at related information. They also suggested changing the default zoom to a higher level zoom, slowing the animation speed, and maybe creating an overview window.

5.3 Insight Generation
Overall they thought the aggregation and density offered valuable insight with respect to the identification of popular topics being discussed as well as following paths around the blogosphere. Zooming out and observing the relative density made some aggregates clearly stand out. The five evaluators generally preferred the linking visualization because it showed the explicit links between the blogs and articles. They sometimes did not have a good understanding of how the similarity visualizations worked. They discovered a number of entries that were linked together, but that seemed to talk about completely different topics. They believed that improving the semantic content analysis would make the visualization more understandable. The evaluators noted that the keywords and the keyword search could prove useful, but that these functions were not essential to provide insight. They thought however, that the ability to flag keywords might enable a useful monitoring about topics of interest. We made improvements in the similarity calculations based on this feedback. Finally, the evaluators reported that many blog (node) titles were uninformative and that sometimes the sheer number of nodes and links made it hard to get an overview of the information.

5.4 Evaluation Summary
The VizBlog tool was found to be fairly easy to use and seemed to provide insight about ongoing online discussion in blogs. The linking view seemed to be the preferred view and the one that provided the most insight. However, we received negative feedback on the initial similarity views that seemed far less intuitive, mostly because of the algorithm we used to find text similarities. Users believed that this feature was potentially interesting and that redesigning and using a more efficient algorithm to find text similarity could lead to better insight into the most popular topics. We made improvements in the algorithm as a result, and are conducting some follow up testing of this similarity feature. The small number of usability testers is a limitation, and we are expanding the pool of users as revisions are implemented. Another early limitation of the tool was that not all of the blogs that link to each other do in fact share a common theme or topic. Sometimes bloggers link to each other simply because they are friends [16, 19]. The improvements in the similarity function should be helpful in minimizing unrelated linkages as well as improving the blog titles to make them more meaningful to users.

6. CONCLUSION
We are designing a visualization tool to improve the discovery and exploration of blogs that are publicly accessible online. Our visualization tool summarizes blog entries into nodes that link to each other to form clusters that generally indicate related content. By navigating through the nodes, users can discover and explore online discussions and engage in ongoing yet ever-changing conversations. The preliminary evaluation of our tool suggested that it was fairly easy to use and could provide insight into ongoing discussions in blogs. It also provided ground for some future work in terms of improving the consistency of blog linking. We believe that by providing a quick visualization of popular topics and of the structure of conversations the tool has the potential to serve the interests and needs of citizens in finding and joining discussions on topics of interest. Moreover, the tool can assist local government in becoming aware of the views and opinions on local issues of a broader and more diverse population than the vocal minority with whom government is typically in more regular contact.

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8. REFERENCES
Press.


