



BubbleFeed: Visualizing RSS Information in Public Spaces

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Abstract. Public interaction displays contribute to upgrading the quality of public spaces since they attract many users and stimulate social interaction. In this paper, BubbleFeed is presented, a system for visualizing RSS news from multiple sources in public spaces. RSS news headlines are displayed inside virtual interactive bubbles ascending from the bottom of a vertical screen to the top, resembling the bubbles formed in a glass of soft drink. Besides touching the bubbles to expand and read the respective news stories, playful user interaction is supported to promote better engagement and motivate multiple users to participate. To support custom news feeds and Facebook posts in addition to RSS feeds, we have built a tool and a library that produce RSS files from the respective sources. BubbleFeed also supports displaying weather information, hosting media galleries and providing useful information such as Wi-Fi hotspot maps.

Keywords: Information visualization · RSS feed · Public spaces

1 Introduction

Public spaces are social spaces that are generally open and accessible to people. They have a social impact on people present by involving necessary, optional and social activities [1] and by hosting exhibits that provide public information. The latter include for example advertising stands and bus-routes as well as tourist information such as weather forecast data, shop and sightseeing open hours, shop offers, and city news and events. To improve the quality of the information provided, researchers propose to encourage user-interaction with the data in an aesthetic manner, instead of statically displaying them on stands or screens. In this sense, information visualization techniques can help towards conveying information without overwhelming the users and playful interaction can help towards arousing user interest and attracting the public.

This paper presents BubbleFeed, a system for visualizing RSS information in public spaces. To support custom news content provided from stakeholders, a tool and a library have been built which produce RSS files from user-provided data and public Facebook pages respectively. The title of each news item, along with a key thumbnail,

are displayed within a graphical color-coded bubble, called NewsBubble, which animates from the bottom of a large vertical touch screen to the top, resembling the bubbles formed in a glass of soft drink. Users who are interested in reading more about a topic can expand the related bubble into a bigger square-shaped one by touching it. The full news article also contains all the multimedia received from the RSS feed; however, they are displayed at the end of the news article instead of inside the text flow, so that users who are only interested in seeing the multimedia can find them more easily. Users can also interact with the bubbles in a playful manner, i.e., by dragging them around, colliding them together and bursting them. Additionally, the BubbleFeed system can display weather forecast information and can host image and video galleries as well as a WiFi hotspot map. A screenshot of the BubbleFeed display is shown in Fig. 1, while a video of the system is available on youtube¹.

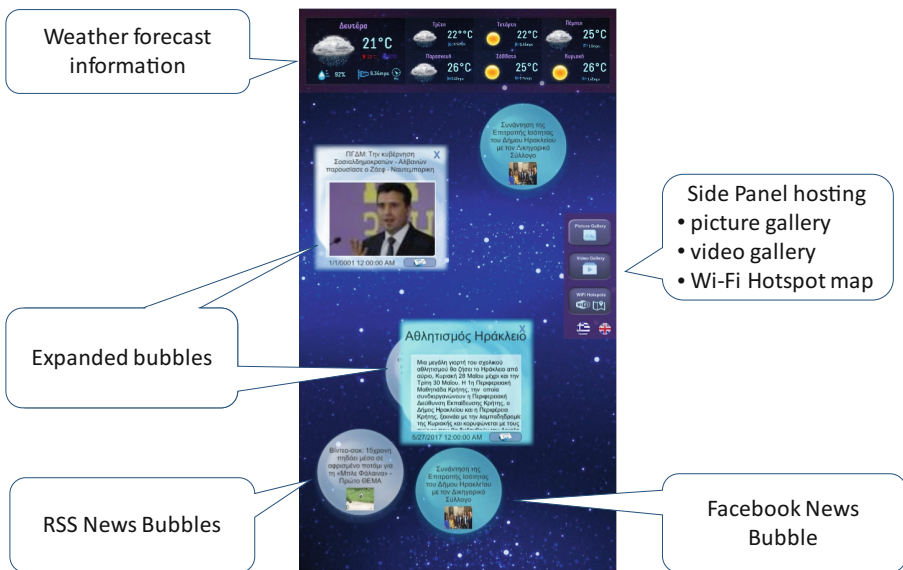


Fig. 1. A screenshot of the BubbleFeed system.

2 Related Work

2.1 Information Visualization

Visual representations of data, i.e., information visualization, is generally agreed to reinforce human cognition. Today, researchers and users of Information Visualization are convinced that it has great potential [2]. Information such as news are often visualized to achieve better organization and understanding, allowing users to infer additional data. For example, TweetViz [3] offers visualizations that represent topic

¹ <https://www.youtube.com/watch?v=pjW2V7I4U6M>.

distribution in a set of tweets, while *TwitInfo* [4] uses visualization to highlight peaks of tweet activity regarding a given topic. Many systems have also been built to help users browse large amounts of news articles. For example, sentiment maps [5] help users determine distinction in sentiments among multiple web sites concerning a given keyword, while *Galaxy of News* [6] is an old tool that allows users to quickly understand a news base using abstract presentations that cover the entire information base and interactions that progressively refine the information details. Other Information visualization systems can integrate information in some kind of art displayed on digital screens. For instance, *Spark* [7] uses informative art to visualize physical activity, while Redstrom et al. use a composition similar to the style of an abstract painter to show weather information in six cities, and a piece of “landscape art” to give a view of recent earthquake activity [8]. Ferscha in [9] display information as specific parts of an existing painting e.g., the number of birds in the sky represent the number of unread emails. In the same context, Partarakis et al. use informative art to represent mailbox information encoded within a painting through the appearance and disappearance of items representing specific email categories (e.g. urgent, email from colleagues, etc.) [10].

BubbleFeed visualizes RSS items from various sources as bubbles ascending in a large vertical display. To provide extra information and facilitate users in locating news articles they are interested in, bubble colors are used to indicate the type (limited time offer, ferry route delay update, etc.) or the origin of information presented (RSS, Facebook, custom content provided by the stakeholders). In cases where the news article contains images, a key thumbnail is displayed on the bubble so that users can perceive at a glance what the contained news is about.

2.2 Visualization in Public Spaces

Visualizing news information on digital screens and multi-touch displays can encourage content sharing and user interaction [11]. More specifically, authors in [11] present the *CityWall*, a large multi-touch display installed in a public space, and show that it acted like a stage, where users at the display attract other users. To encourage content sharing, Churchill et al. [12] developed a network of digital, interactive, bulletin boards, called ‘Plasma Posters’, that can replace the traditional cork boards in a building. Another work in this direction is the *Notification Collage* [13], a groupware system where distributed and co-located colleagues can post media elements onto a surface that all members can see. To resemble physical public bulletin boards, NC randomly places incoming elements like desktop snapshots and vacation photos on its surface. Apart from collaboration screens and bulletin boards, visualization systems can also be used in public spaces to display information of common interest. For example, authors in [14] designed a real-time visualization of bus departure times and deployed it in a public space with very positive results. *MAGICBoard* [15] is another public display deployed in a university setting that solicits electronic votes and opinions of bystanders on trivial topics, while *EMDialog* [16] is an interactive information presentation that was part of a museum exhibition and visualized the diverse and multi-faceted discourse about an artist, aiming to inform and provoke discussion.

BubbleFeed installations in public spaces allow people to read news, see the weather forecast, browse through media galleries and find interesting information such as the location of the Wi-Fi hotspots. Visualizing such information in public spaces can stimulate interaction among the users accessing it, thus more users can be attracted.

2.3 Playful Interaction with Information

Playful interactive interfaces (instead of merely interactive interfaces) are often proposed especially for exhibits installed in public places. Play and playfulness encourage exploration and creativity and stimulate social interaction [17], while in the context of public displays it is found that a large portion of the people interacting with them seem to be more concerned about playing ‘with’ the display rather than exploring its content [18]. In this vein, more and more work featuring public interaction displays make use of playful characteristics. For example, FizzyVis [19] is a playful multi-touch interface for information browsing, which visualizes information as animated interlinked bubbles reacting to touches. Other examples include Ubinion [20], a service that allows young people to interact with large interactive displays in urban spaces in order to provide feedback on municipal issues to local youth workers, and the playful installation presented in [21] which features a spherical display at the center of a circle made of interactive light-boxes that encourages users to “enter the circle” to explore it.

BubbleFeed enables user interaction with the bubbles in a playful manner, allowing users to expand them, drag them freely around the display, collide them together to “push” them away and burst the small ones. The colors used for indicating the type and/or the origin of news in the NewsBubbles are also carefully chosen so as to give an extra playful note to the overall installation.

3 Iterative Design

An iterative User Centered Design process using high-fidelity prototyping was followed in the development of the BubbleFeed system. Firstly, a high-fidelity prototype was built that was initially evaluated in-lab and after reaching a mature state installed in three different locations. The reason for choosing the high-fidelity prototype methodology was to enable both end-user and stakeholders’ evaluation and to get actual usage statistics within different contexts of use, as well as collecting useful comments from the client stakeholders. The evaluation results along with the comments received were carefully analyzed, and a final system was built to replace the prototype.

3.1 BubbleFeed Prototype

The BubbleFeed prototype was designed to facilitate large interactive displays both for tabletop usage and as a wall mounted information point. To this end, tangible interaction with real objects in the context of a multi-touch surface device was initially considered. The initial design iteration was conducted by exploiting the Microsoft Surface 2.0 SDK and a Microsoft Surface 2.0 device. The first prototype was build using the Windows Presentation Foundation (WPF) and specific controls of the



Fig. 2. Design approaches followed in each of the installations: Heraklion port authority (left), Info-point at the municipality of Hersonissos (middle) and Vikelaia municipality library (right)



Fig. 3. The BubbleFeed prototype installation at the Hersonissos info-point

3.2 Prototype Evaluation

During the pilot period of the permanent installation of the prototype, several modifications have been made to the system to automatically record usage statistics, while at the same time informal interviews with the stakeholders have been organized so as to gather their feedback and suggestions for improvement.

Usage Statistics Analysis

Usage statistics essentially measure user engagement, and include user interaction time and number of users attracted. More specifically, the statistics tracked include: (a) usage of the main sections of BubbleFeed (photos, videos, news, bubble items),

(b) time spent in each section, (c) amount of information browsed per sessions (heuristically indicated by pauses larger than five minutes between subsequent usages), (d) number of emails send per day and per session (e) number of POIs of the Wi-Fi hot spots and location map accessed, number of user simultaneously accessing the prototype (through detection of multiple touch inputs). As expected, in all the installations user engagement was quite high. In the case of the library, users were more relaxed and read more news than in the other two setups, mainly due to the fact that the library attracts mainly local citizens who have more time to spare during a library visit than a passing by visitor of a cruise stop or at an info point. However, tourism information users spent an average of 2.3 min in front of the installation as they read a few news bubbles and navigated through the map to find the Wi-Fi hotspots. The security and emergency information available in the BubbleFeed versions that were installed at the port were not as commonly used as expected by the port authority (only an average of 2 times per day for the emergency and 5 times per day for the security).

Stakeholder Feedback

Although BubbleFeed generally received positive comments from stakeholders, there were a few short-comings reported that resulted in the reengineering of the design and enhancement of several features in the final version of the system.

- *News from Facebook pages.* The BubbleFeed prototype supported showing news items extracted from posts on public Facebook pages using the Facebook Public Feed API². However, this API stopped working and is not available anymore (since API V 2.0). Maintaining this functionality is extremely important for stakeholders that have active engagement in the social media.
- *Custom news content.* The prototype system only supported publicly available RSS feeds; however, all three stakeholders requested a way to also display custom news items as well. For example, the library asked to display current book offers and discounts of the library's bookstore, the municipality asked to announce emergent traffic reroutes and the port authority asked to display ferry delays, ticket availability, and offers at the port shopping center.
- *Playfulness.* After analyzing the statistics kept during the evaluation period, it was clear that the users had just the expected interaction with the BubbleFeed prototype for accessing information. Each user stayed in front of the screen for about 2 min accessing maximum three news and there was no interaction among users that were simultaneously accessing the prototype. Although this was expected, it was decided that the updated version should be more playful to incite users to spend more time with the system.
- *Limited weather information.* BubbleFeed screens received many clicks onto the weather icons, meaning that end-users wanted to get more weather information than the displayed ones. This also indicated misinterpretation of the design, as users conceived parts of the weather display as interactive controls.

² https://developers.facebook.com/docs/public_feed.

4 BubbleFeed Implementation

After consolidating the evaluation results of the pilot installations and taking into account the comments received from the stakeholders, a new enhanced version of the BubbleFeed system was built. This final version is based on Unity3D, a well-known cross-platform game engine that allow supporting a playful interface in order to achieve better user engagement and promote user-to-user interactions. The new version of BubbleFeed features all the functionality of the prototype, plus:

A playful interface: The NewsBubbles do not ascend in a straight line but follow a sinusoidal one. Also, extra decorative bubbles have been added with transparency values to enhance the feeling of screen depth.

Playful user interaction: NewsBubbles can interact with each other; more specifically, they can collide with each other like billiard balls. Moreover, users can freely drag them around the screen or force them to hit other bubbles. Users can also break the decorative bubbles on touch.

Displaying news from a public Facebook page. The Facebook Graph API was used to build a library that accesses public Facebook pages and produces RSS feeds from their posts. These RSSs are then loaded and displayed normally in BubbleFeed.

Displaying custom news content. A common request among the stakeholders was to display extra news that do not exist in any publicly available RSS feed, nor have been posted on a Facebook page, such as limited time offers or updates for short ferry delays. To this end, we developed a tool called MaRSS (Make RSS) that essentially enables stakeholders to produce tailor-made RSS feeds. Figure 4 shows a screenshot of the tool: users can add news items by pressing the “Add” button and by filling in the news details on the form shown at the right hand side. MaRSS produces a valid RSS feed that can be read by all RSS readers, thus the fields “title”, “link” and “description” are mandatory. Images can include both image links and local images, while videos support local videos, video links and YouTube video links. Local resources are copied in a specific folder on the computer where the system is installed, along with the RSS xml file and BubbleFeed reads it periodically in the same way it reads a publically available RSS to get the fresh news.

Color-coded information visualization. The newer version of BubbleFeed supports assigning colors to bubbles containing certain type of information, such as emergency information, limited time offers, ferry delays etc. Different colors can also be applied to NewsBubbles that origin from different sources, e.g., facebook or RSS. Color-coded bubbles actually play a dual-fold role: they serve more information to the users without overwhelming the display, and also they make the interface more interesting and playful, arousing the curiosity of people passing by and thus attracting more users.

Displaying more weather information for the 7-day forecast. More specifically, additional to the weather description, wind speed and temperature displayed in the prototype version of BubbleFeed, wind direction, humidity levels as well as

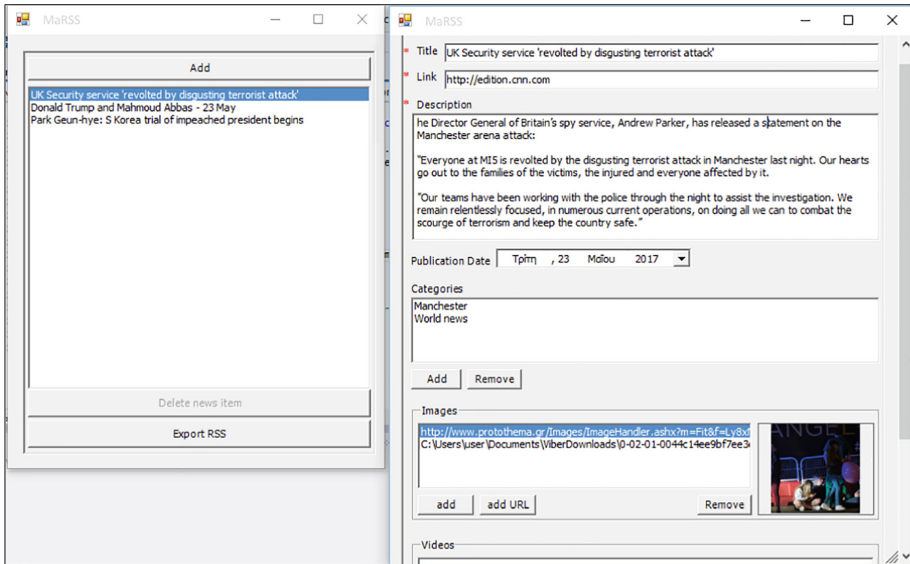


Fig. 4. A screenshot of the MaRSS tool. On the left, the news library is displayed. On the right, the news item editor is shown.

minimum and maximum day temperature are displayed. To display weather data, we use small icons instead of text, essentially achieving both displaying more information in the same screen space while keeping the interface clean for users to read and understand.

5 Conclusions and Future Work

This paper has presented the BubbleFeed system for visualizing RSS information in public spaces. In order to build BubbleFeed, an iterative process was followed based on a high-fidelity prototype that was installed in three public spaces: a public library, a public square and a port. Depending on the installation site, the information content and the overall system appearance were adapted to meet the needs of the respective stakeholders. Although all three installations attracted many users and received positive comments, a careful analysis of the usage statistics data collected along with the feedback provided by the stakeholders led us to some redesign of the BubbleFeed system in its final version. The latter enables the display of more information while adding playful notes that help engaging more users and lead to better information visualization.

The next step is to replace the prototypes with the renewed version of the BubbleFeed system after a new evaluation cycle is conducted to assess the impact of the new features and especially of the playful interaction. We will also contact other stakeholders such as the airport, hotels and local stores and adapt BubbleFeed to target

their specific needs. We consider adding news filters and a news browser (possibly voice activated) that will enable users to find the news they are interested in more quickly, or view only the ones they are interested in. As BubbleFeed is designed to be installed in public places where many people can use it, such filters should be deactivated as long as users walks away or after a predefined time period. Other applications could also be supported by the BubbleFeed setup; for example, it could be easily turned into a public guestbook of a tourist-destination, either by letting users create their own bubbles or by reading posts from a public Facebook page where visitors would lay their experiences. The bubbles can also be color- highlighted depending on the review rate given by the commenters.

Thanks to advances in display technologies, it will soon be possible to have electronic information displays virtually everywhere [14]. Thus, systems like BubbleFeed seem very promising for visualizing RSS news or other kind of information in public spaces to upgrade their quality via attracting more people and encouraging their social interaction, resulting in upgrading their overall social experience.

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