Real-Time Nonverbal Opinion Sharing through Mobile Phones during Sports Events

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ABSTRACT

Even with the rise of the World Wide Web, TV has remained the most pervasive entertainment medium and is nowadays often used together with other media, which allow for active participation. The idea of connecting non-collocated TV viewers via telecommunication technologies, referred to as Social TV, has recently received considerable attention. Such systems typically include set-top boxes for supporting collaboration. In this research we investigate if real-time opinion sharing about TV shows through a non-verbal (non-textual) iconic UI on mobile phones is reasonable. For this purpose we developed a mobile app, made it available to a large number of users through the Android Market, and conducted an uncontrolled user study in the wild during the soccer world cup 2010. The results of the study indicate that TV viewers who used the app had more fun and felt more connected to other viewers. We also show that by monitoring this channel it is possible to collect sentiments relevant to the broadcasted content in real-time. The collected data exemplify that the aggregated sentiments correspond to important moments, and hence can be used to generate a summary of the event.

Author Keywords

Social TV, mobile phone, sentiment support, sports

ACM Classification Keywords

H5.2 [Information Interfaces and Presentation]: User Interfaces.

General Terms

Human Factors

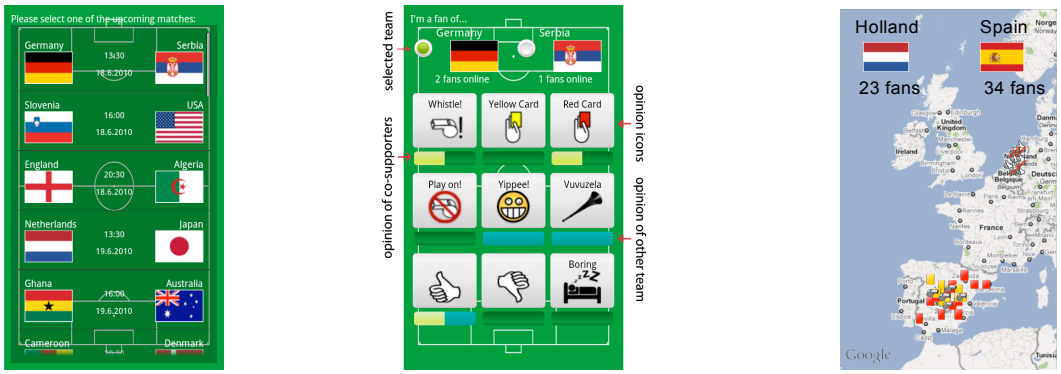
INTRODUCTION

This paper reports an analysis of the opinion-sharing behavior of the TV viewers during soccer matches. The television set is an omnipresent device and for many people still the most popular entertainment resource. Even the strong increase in Internet usage has not changed the popularity of TV. Nowadays, the majority of viewers usually watch TV alone [3]. However, watching TV does not necessarily have to be a solitary experience. It can foster multiple forms of sociability, as shown, e.g., in [12]. In recent years, the idea of connecting non-collocated TV viewers via telecommunication technologies has received considerable attention (cf. [2,10]), mainly referred to as Social TV. Typical social TV systems include presence of viewers, text, voice, and/or video chat. Basically, these systems enable viewers to actively share information about TV content in real-time.

With the ubiquity of interactive mobile devices, enhanced with continuous wireless connectivity and powerful user interfaces, connecting TV viewers via their phones is technically easy to accomplish. Mobile phones are almost always with their users and can serve as standalone platforms for collecting the user's emotional responses to TV-related experiences. The main research challenge lies in establishing a shared TV watching experience that is meaningful and engaging to users while at the same time does not distract viewers from the actual content.

In this research we investigate if mobile phones can be used as a communication channel for exchanging non-verbal information that represents emotional reactions to events shown live on TV. So, we developed a mobile application, called "World Cupinion", and conducted a large-scale field study by distributing the app for free via the Android Market and the Web. As the content domain we chose a sports event, namely the soccer world cup 2010 in South Africa. This particular event was chosen since it receives extremely high public attention all over the world and many viewers are highly emotionally involved. The matches are broadcasted live and in sync, allowing for real-time opinion sharing. For the whole period of the tournament (4 weeks) users could download and use the app during each match. After the tournament, we conducted a survey among the users and asked them about their motivations for using the app.

CHI 2011, May 7–12, 2011, Vancouver, BC, Canada.



(1) (2) (3)

Figure 1: *World Cupinion* screens: (1) Initial Screen "Match List" (2) Second Screen "Arena" (3) Map View.

Our hypothesis is that if TV viewers are able to share their opinions about TV content in real-time through this additional channel without being distracted, then they should experience higher enjoyment and feeling of connectedness with other viewers. Through deploying the app widely we aim at understanding more about this collaborative experience. Another motivation is to investigate in how far important events are reflected by user inputs and can be annotated by log analysis. The work described here is, to the best of our knowledge, the first attempt at using non-textual iconic communication on mobile phones for sharing opinions in real-time and connecting TV viewers (virtually) while watching sport events.

RELATED WORK

The idea of allowing additional communications in parallel with watching TV has been investigated in different setups. "AmigoTV" was an early social TV system that combined broadcast TV with voice chat communication and provided a buddy list with online status, and emoticons [2]. The "Social TV" system (STV) allowed users to engage in spontaneous communication with their buddies through text or voice chat while watching TV [8]. It also included an additional display to convey comments of the current TV-watching users. A comprehensive overview of social TV systems is available in [7]. Further, various user studies were conducted which compared the communication modalities [1, 6, 9, 14]. Geerts *et al.* [6] used the "AmigoTV" system and compared the voice communication to other modalities in a within-subjects lab setting. They reported that most users thought that voice chat was more natural and easier to use than text chat. Huang *et al.* [9] conducted a similar study, but in the field, using the STV system and reported that participants preferred text chat to voice chat, often communicated about topics unrelated to the TV content. Weisz *et al.* [14] investigated the effect on the social relationships of friends and strangers in text chatting while watching online videos. In [5] a set of comprehensive sociability heuristics for social TV systems is reported.

Media annotation and sharing while watching TV has been studied, too. Miyamori *et al.* [11] proposed a method for generating views of TV programs based on viewer's opinions collected from live chats on the Web. In [4] the sentiments of tweet annotations for a presidential debate were analyzed to understand their relationship to discussed topics and performance of the opponents in the event.

All the aforementioned social TV systems require the installation of set-top boxes for supporting collaboration that are only available in certain locations. Hence, users are restricted to particular environments. We tried to overcome the limitation by offering a free mobile phone application that can be used in any context in which watching the event is possible, even in bars, the stadium, or at public places. tvChatter[1] is a web and mobile app that mines Twitter for commentaries on TV shows and presents them in a (primarily one-way) text-based tweet stream. Our work, in contrast, focus on iconic (non-textual) real-time communication.

WORLD CUPINION DESIGN

The "World Cupinion" app is mainly designed for soccer fans (viewers) to share their opinions while watching a match in real-time. The design of the system takes various aspects into consideration: since the users' focus of attention is mainly on the match, simplicity of the user interface is crucial. Providing feedback and visualizing aggregated opinions of the competing teams' fans is also essential. Thus, the app should convey how the collected opinions evolve even if the user is a "lurker" and not actively interacting with the system. Furthermore, the system should be able to handle a large number of worldwide users simultaneously. Hence, supporting multiple languages is important – we offered the app in English, German, French, and Spanish. To reach the widest possible audience, we implemented "World Cupinion" as an Android app and a Web interface. The former provides better responsiveness and uses more features of the device, while the latter is available for every phone with a Web browser.

The app consists of three screens (Figure 1). The initial screen shows the list of upcoming matches with their time details in the phone's local time zone (Figure 1.1). The

[1] http://www.tvchatter.tv (accessed January 2011)

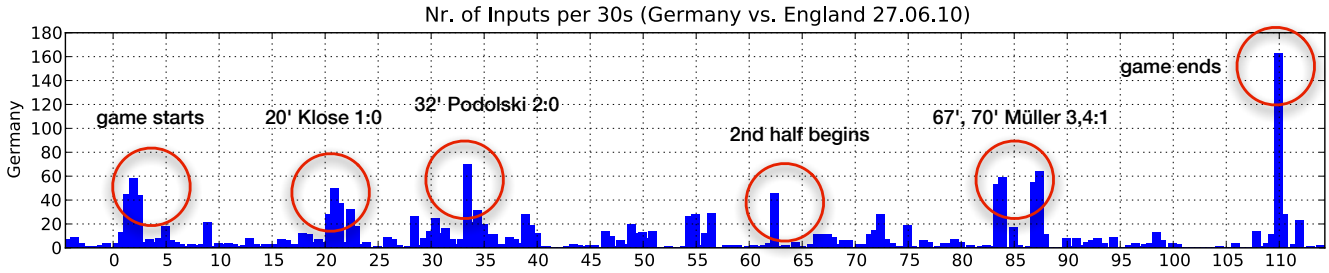


Figure 2: The input histogram for *World Cupinion* users that were fans of Germany in the match Germany vs. England.

second screen (Figure 1.2) is the "arena" for a selected game where users are able to share opinions. To enter this screen the user has to select a match from the initial screen and choose a team before sharing opinions. The users can then input their opinions through 3x3 icon buttons. We provide these icons to lower the cost of interaction and decrease the space between "Readers" and "Leaders" [13]. We generally divided the icon design into icon types either representing factual events (e.g., whether the referee should give a yellow/red card or let the game goes on) or opinions/expressive assessments (e.g., thumb up/down). Moreover, the Vuvuzela button is added to introduce an additional modality – a horn sound is played when the button is pressed and the sound is amplified when more than 75% of a fan group had input within the last 15 seconds. The second screen also conveys the aggregated opinions of the opponent teams. Below each button there is a horizontal bar that indicates the overall statistics with regard to that input category for the competing teams. The length of the bar indicates the momentary percentage of users giving this type of feedback. The feedback for the own team is shown in green and for the other team in blue. The bars are frequently updated based on the last 30s of inputs. The third screen shows the geographical distribution of opinions for both teams overlaid on the Google Maps (Figure 1.3). The maximum zoom level is restricted for privacy reasons.

SYSTEM ARCHITECTURE

The system is implemented as a client-server architecture. The mobile client sends three request types: *input requests* to send users' opinions to the server, *update requests* to poll the current state of aggregated feedback, and *map requests* to show the locations at which sentiments are shared. The server logs all inputs to an SQLite database and maintains statistics of the opinions received in the last 30s. Also, an important issue regarding the mobile client is energy consumption. There is a tradeoff between the interface update rate and energy consumption. In pilot tests we realized that one update per 3s is sufficient. A significant amount of energy is consumed by the display, which continuously shows the feedback stated based on aggregated community inputs, even when the user does not interact with the app.

EXPERIMENT

To evaluate the "World Cupinion" app on a larger scale, we distributed the app and recruited users via the Android Market. The conducted study was an uncontrolled long-term (4 weeks) study in the wild. It was crucial to conduct the study this way to be able to observe natural user behavior (which is problematic in tightly controlled experiments). The app was released a week before the tournament started and was downloadable for free until the last day of the event. The web-based version was also available during that time. After the last match in the tournament an update containing a questionnaire about the app was released.

Usage Statistics

Based on the Android Market portal, at the end of the tournament the app had been downloaded 1645 times. Based on our database, 71% of inputs were from the Android client and 29% from the Web-based client. In total 21205 inputs from 925 unique users (71% Android users) were collected during the 64 matches of the tournament (an average of 331 inputs/match). There was a significant difference in the number of actively followed (session length $\geq$ 15 minutes) matches between the mobile and web-based client. Mobile users followed an average of 2.31 matches whereas web-based users followed 1.03 matches. An ANOVA showed the difference to be significant ($F(1,257)=30.890$, $p<0.001$). The top four inputs were the vuvuzela (22.8%), foul (19.3%), thumb up (14.9%), and thumb down (10%). The average number of fans per match sharing opinions was 18 and per team 10. The match with the highest number of fans was Germany vs. England (on June 27th 2010).

Sentiment Relevancy

To examine whether the aggregated sentiments were relevant to actual events in a match, we analyzed the sentiments of more than 5 matches in detail. The analysis showed that there is a relation between the collected sentiments and events in the chosen ground truth, i.e., Y! Sports ticker[2]. Figure 2 depicts one of the input histograms. It is clearly visible that the inputs correspond to important moments of a match such as scored goals and goal kicks. Thus, generating a summary of important moments of a match based on the collected sentiments appears feasible.

Questionnaire Results

Demographics & World Cupinion Usage

In total 46 users (mean age = 20.1 years, STD = 9.2) replied to the questionnaire, of whom 37% followed the world cup

[2] http://g.sports.yahoo.com/soccer/world-cup (accessed January 2011)

matches frequently and 50% watched occasionally. 55% of the participants considered themselves as knowledgeable fans and 30% as experts (know players' details). 73% of them stated that they normally watched the matches at home and 65% watched with the family or buddies. Based on the replies, 18% of participants stated that they used the app for most matches, 40% used it regularly, and 42% occasionally or just once. Also, those who considered themselves as knowledgeable or expert fans used the app more frequently. 60% of those who watched the matches in a group (with family, buddies, or crowd) still used the app regularly or for most matches. Participants also rated the app using a 5-point Likert scale. The average rating was 3.6 (MED=4, STD=1.1). Those who used the app more regularly rated the app higher (Spearman's $\rho = .422$, $p \leq 0.004$).

Connectedness vs. Fun

In the questionnaire users are asked to rate on a 5-point Likert scale (1=completely disagree, 5=completely agree) in how far the app changed their fun level and feeling of connectedness to other fans. 11% mentioned that the fun level did not change at all. 30% believed that it increased sometimes and 59% reported to have more fun most of the time or always. None of the responses indicated that the app reduced the fun of watching TV. Also, 7 out of 46 participants (15%) did not feel connected to other fans at all. 32% felt strong connection and 53% average or little connection. Those who had more fun felt more connected to the other fans (Spearman's $\rho = .636$, $p < 0.00$).

DISCUSSION & CONCLUSION

The main goal of this research was to investigate if real-time opinion sharing about TV programs through a non-verbal (non-textual) iconic UI on mobile phones is reasonable. The motivation for iconic interactions was to enable instant reactions to the live events and minimize user distraction when operating the mobile phone. Since text input requires more time and cognitive resources, we deliberately chose to explore iconic communication. To achieve this, we conducted an uncontrolled user study in the wild. As our results reveal, the iconic approach is reasonable and aggregated sentiments correspond to the events that were also highlighted by a commercial sports service. However, for individuals we do not have any ground truth regarding the relevance of certain moments during the game and official reports do not always reflect the viewers' sentiments. Thus, there is no obvious reference data available which we could compare our data against.

Furthermore, the TV viewers' sense of connectedness and enjoyment increased by sharing opinions. Remarkably, even those users who watched the matches in groups still used the app to virtually connect to non-collocated fans. Anecdotal evidence showed that the implicit action of an ambient vuvuzela sound – amplified sound when the majority of fans had pressed the Vuvuzela button – resulted in an "aha" reaction in viewers and promoted the conscious experience of connectedness between viewers. It should be mentioned that the post-experiment questionnaire might have been biased due to the characteristics of our field study. In such studies it is inevitable that users who do not like the app delete it or do not answer the questionnaire. However, some of the responses were negative which shows that these users were not biased in favor of the approach. The type of application proposed and evaluated here can be useful for other types of events, e.g., election debates, quiz shows, contests, etc. We believe that providing real-time feedback directly on the TV while watching events encourages users to contribute even more.

ACKNOWLEDGMENT

This work was partially supported by the Deutsche Forschungsgemeinschaft (DFG) in the Embedded Interaction project.

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