Tangible Anchoring: Grasping News and Public Opinion

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ABSTRACT
Tangible Anchoring explores potential practices for news reporting and analysis afforded by the convergence of tabletop computing forms, broadcast media, and user-generated content via mobile, interactive television, and online technologies. Our system applies these technologies in a novel combination to support new forms of dialogue for broadcast television, with a focus on polling, and the techniques prototyped are also applicable for webcasts, meetings, and art installations. The system enables tabletop computing users (e.g. television anchors or moderators) to receive and mix for redistribution both quantitative and qualitative data, i.e. viewpoints, from participants in remote locations or face-to-face settings.

Our design scenario for the television studio assumes multiple camera angles, two or more discussants, multiple displays, and issues-based polls using mobile phones. Our current prototype features viewer viewpoints presented on a tangible tabletop broadcast anchor desk. In this paper, we present our design rationale and feedback on the application from industry professionals and colleagues.

Categories and Subject Descriptors
H.5.1. [Information Interfaces and Presentation]: Multimedia Information Systems---*Video*; H.5.2. [Information Interfaces and Presentation]: User Interfaces---*Input devices and strategies, Interaction styles, Screen design*; H.5.3. [Information Interfaces and Presentation]: Group and Organization Interfaces---*Collaborative computing.*

General Terms
Design, Human Factors

Keywords
Tangible interaction, tabletop, mobile, visualization, participatory media, news.

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1. INTRODUCTION
News has always been a social activity, and recent research regarding consumers of news indicates a growing segment of people want to actively participate in news making. In one US survey, 37% of internet users have either posted links on social media sites, tagged content, created their own news information, or micro-blogged (e.g. Twitter) about news [8]. This presents an opportunity to create new types of news experiences that enable audiences to engage with topics of the day.

The Tangible Anchoring project explores ways in which the broadcast news experience can be enhanced by the use of tangible tabletop computing forms, which feature large shared displays capable of continuous input. Because such displays could enable moderators to present and analyze viewer-generated content in new ways, Tangible Anchoring has the potential to enhance live television by providing a new performance stage for user-generated content, the interactive anchor desk.

Our application, which focuses on opinion polling, was designed with the primary goal of overcoming some of the performance challenges in the use of multi-touch vertical surfaces for live television. Large displays are best viewed from a distance, yet multi-touch interaction requires the broadcaster to be up close; this makes it difficult for a person to view the effects of actions. Another challenge is that news talent who use these screens must manage their appearance on camera while manipulating information on vertical screens. Horizontal surfaces such as tabletops offer more naturalistic interaction, and desks and tables are a common feature of news sets. Another design goal is to overcome barriers in traditional news formats to viewer participation, in line with current trends in news consumption, and with a focus on public and governmental affairs.

To these ends, we make use of the following strategies: first, we combine multi-viewpoint tabletop and tangible interaction with information visualization techniques to showcase viewer viewpoints than are normally represented in traditional graphics, such as bar charts and pie charts. We use these techniques to explore minority opinions and biases, as well as intersections among opinions that might be considered unlikely, e.g. points on which conservatives and liberals agree. Secondly, we use the context of polling on public affairs to advance practices of participation. Polling data, which is primarily quantitative, but can also contain qualitative data, is a type of content that lends itself to the juxtaposition of viewpoints and spatial visualizations.

2. RELATED WORK
Our design context required that we consider issues and related work across a set of disciplines, including broadcast practices,

computational news, and mobile journalism. We observed overall in our review that while a number of works have challenged traditional notions of how news is produced and consumed, none have the novel form factors we introduce in our prototype.

In the broadcast field, recent commercial advances in multi-touch technology have resulted in the use of vertical multi-touch surfaces in television studios, such as CNN's "Magic Wall," used in the 2008 US presidential election, as seen in Figure 1. The use of vertical surfaces mimics the broadcast convention of keying graphics into the broadcast video feed. However, talent must their appearance to the studio cameras while interacting with the device, which can involve awkward twisting movements, and the screen is easily occluded by discussants and guests.

Figure 1. CNN 2008 U.S. election coverage.
Courtesy of Perceptive Pixel.

In considering these basic ergonomics, if interaction with graphics is desired in the studio, a move towards multi-touch on a more naturally suited surface, the desk or tabletop, is a logical step. It offers an advantage in that the desk is already a set convention of most news, talk, or hybrid programs. Further, tabletops better lend themselves to multi-touch by more than one person, as at least three sides, from the camera's point-of-view, are afforded reach onto the surface. A disadvantage, however, is the difficulty of having tabletop graphics easily seen by studio cameras, as the plane of the table does not face the floor camera positions. To address these issues, we undertook detailed studies of how programs like The Situation Room, produced by CNN, present their programs through studio configuration and multiple camera angles. This prompted key design decisions, the first being the introduction of tangibles to the multi-touch surface that can be seen by studio cameras as markers for interaction, and the coupling of the tabletop display with a vertical screen surface that can be seen in conventional studio camera angles.

In the news media field, computational media offers the potential to address shortcomings in the mechanisms of traditional news media by enabling people to engage in new ways with news content. Given our focus on opinion polling as a form of news, which presents comparisons of multiple views on a topic, the work most relevant to our interests explores how computational media might be used either to represent multiple viewpoints or enable viewers to examine bias, analyze opinions, and develop a balanced perspective. Examples of work in this area include: the NewsCube application, which parses online text articles using keywords and weights, arranging differing viewpoints on a topic in an online browsing structure with careful attention to layout [7], and the *Videolyzer* application, which enables consumers and journalists to annotate online videos and to augment automated content analysis in order to further assess information quality, including level of bias [2]. Outside of the news realm, work has been done in the opinion mining field on visualizing the range of opinions in order for comparisons of opinions on a topic to be easily performed [1].

As we selected the mobile phone as our primary interaction device for use by participant viewers, a third area of related work we examined was the use of mobile cell phones to create news content by non-professionals and journalists. In a recent field study, researchers noted that mobile phones were currently well-suited for producing short or small-sized news pieces, in real-time, opportunistic situations, with visual material in video format as opposed to pictures [3]. Further, the use of the phone for the collection of quantitative data related to current events, i.e. polling data, in conjunction with broadcast presentation, has yet to be explored.

3. SCENERIO AND SYSTEM

Our scenario calls for a new type of program in which polling data is discussed and viewer participants may influence real-time on-air content. The overall flow of the program is to move from overviews of opinions, presented visually, to details of particular data points, made up of user-generated videos, or other forms of qualitative content. On the broadcasting side, we envision a general studio set-up similar to that seen for CNN's *The Situation Room.* The anchor selects topics to discuss using a tangible control on the anchor desk tabletop, and can play out viewer submissions on studio screens by manipulating anchor desk tangibles on top of various graphical representations, including a map graphic and novel information visualizations. On the viewer side, we envision contributions in the form of polling data and videos submitted via a mobile phone application, the Web, or cable television device. In our scenario, viewers engage with the programming by downloading an application to their mobile phone, on which they receive invitations to take polls and submit videos about why they hold particular opinions. These polls are pushed to viewers in advance of programs, and may be tied to topics for which viewers have indicated they have an interest. The polling application presents choices and Likert scale items along with an interface to attach 30 second videos to particular items.

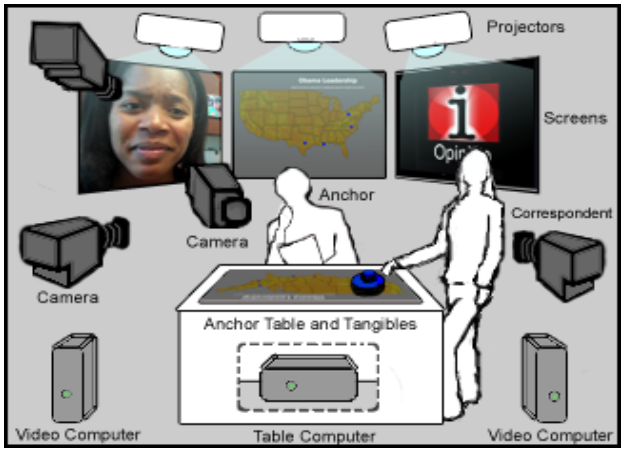

Figure 2. Prototype studio configuration.

As seen in Figure 2, the central component of the studio environment is the Tangible Anchor Table, where discussants interact with the system via multi-touch and tangibles. The anchor desk's graphical display is output onto the center screen above the anchor, so that it is easily visible to studio cameras and thus program viewers, and provides an unobstructed view of the graphics. The two side screens receive output from separate computers that house viewer submitted video content. To explore various broadcasting perspectives, we set up cameras on key angles in the studio and used TokBox (www.tokbox.com), to create a composite of the different camera angles.

Three different types of tangibles are used for interaction with tabletop graphics: a Topic Tangible, Viewpoint Tangibles, and a Mode Tangible. The Topic Tangible, prototyped on a Motorola Droid, enables the anchor to select topics for discussion from a list using fingertouch, e.g. "Obama's Leadership," or "Mandatory Insurance." The Viewpoint Tangibles are used to represent viewpoints on different topics, and currently filter and control the submissions by political party affiliation: Republican, Democrat, or Independent. The Mode Tangible is used to change between the Map View and Debate Circle graphic representation modes. We coined the categories of "fixed" and "changeable" tangibles; the changeable aspect being the ability to change the text displayed on the tangible (as with the Topic Tangible), thus changing how the underlying database is queried and the resulting display. For our prototype, we used low-fidelity tangibles.

In terms of tabletop graphics, our current prototype features one familiar and one unconventional representation: a geographic map representation, the "Map View", and a "Debate Circle," respectively. The Map View, shown in Figure 5, displays the submissions from viewer participants on a geographic map in the form of colored graphic markers, representing party affiliation, according to the latitude and longitude from which they were submitted, using location data from our mobile iOpinion application. When the Debate Circle visualization is used (see Figure 7), submissions are rearranged into concentric circles around the Topic Tangible according to the degree to which the polling respondent agreed or disagreed with the item, with agreement closer to the center.

Figure 3. Map View showing prototype viewpoints (political parties) and Topic Tangible.

From our mobile polling application, submissions are comprised of both numerical polling data and short videos, in which viewers can explain their choice on a particular polling item; the video portion of the submission is optional, in consideration of privacy issues. Studio discussants can distinguish which submissions have videos by the type of graphic marker, and can select to play out the videos on the screens behind the anchor desk using finger touch or IR pens.

Figure 4. Debate Circle showing submissions in range of agreement with topic statement.

The Tangible Anchoring software, built on the KinoPuzzle story engine [9], runs on the Tangible Tracking Table [10], and uses the reacTIVision computer vision framework [4] to manage finger touch and interaction with objects. The engine contains an XML reader class that takes in and stores a list of submission objects containing data from the submission database, which includes GPS data, political affiliations, and polling data. Submission data is stored in a relational database that utilizes MySQL as its querying language. The reader also parses scene data to set up different types of display scenes; a scene manager switches between map and debate scenes. The Topic Tangible runs on an Android application which connects to the Tangible Anchoring application on the table through a wireless network.

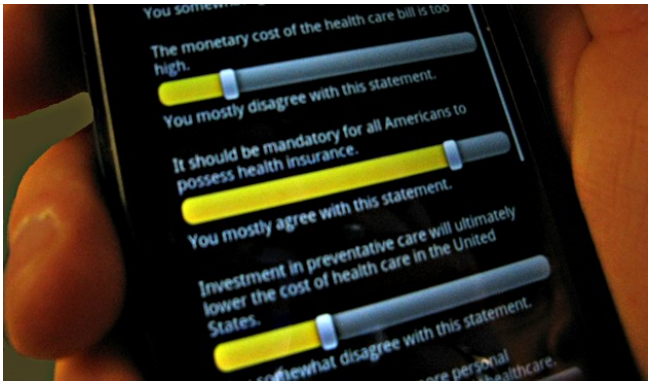

Figure 5. Participation through polls and comments.

The studio tangible anchoring system relies on viewer participation via a mobile application as the source of displayed data. Our application, dubbed iOpinion, allows for user login and verification, selection of a viewpoint (such a political party affiliation), and participation in quantitative polls. For example, in our current demonstration, participants receive the statement "Health reform should include a public option insurance plan," with sliders for them to indicate agreement or disagreement. Feedback is dynamically printed beneath each statement in Likert scale fashion, e.g. "somewhat agree." After submitting his/her

opinions, viewers are prompted to confirm or correct a GPS-detected location (geo-coded to a city name). The feature enabling viewers to attach 30-second video viewpoints to each item was tested using Wizard of Oz techniques in our prototype and is being implemented.

4. FEEDBACK AND FUTURE WORK

The Tangible Anchoring working prototype system was demonstrated in two separate sessions to over 150 broadcast television industry guests, and academic and high tech industry guests and colleagues. Broadcast professionals working in the area of audience experience gave positive feedback on the selection of the anchor desk form factor combined with the displays, gave positive comments on the seamless blending of polling data and video viewpoints, and confirmed that tangibles on the surface might play better to the studio cameras than finger touch alone. They expressed interest in the design motivation of presenting the range of polling data and viewpoints versus limited yes/no, up or down ranges of opinion, noted that unconventional representations of data are appealing to viewers, and commented that the set-up could make for an entertaining program. We also received some critical feedback: first that the tangibles should serve not only as filters but add value in terms of function when moved and that the limited meta-data preview displayed when initially touching the submissions should be expanded. Also people expressed a desire to see in graphical form both location information and indicators of an opinion's value at the same time, and in general, that the graphical quality of the presentation, including submission markers should be improved beyond prototype.

Because our design scenario is highly contextualized, we hope to collaborate with researchers working in audience experience in conventional and enhanced television to refine our scenarios. On the studio side, we want to assess how such a program might be produced, as working in an actual prototyped studio reminded us of the constraints of the television medium; it is by nature a medium of less depth and resolution than print and the Web, therefore, while our application could accept thousands of entries, realistically a limited number may be presented at any given level of analysis (e.g. nationwide or state-level) in order for patterns in the viewpoints to be seen on television.

Based on feedback, we are currently experimenting with better methods to visualize the submissions, different ways to display a submission's meta-data to enhance previews of viewpoints, and aesthetics for both the graphics and tangibles. On the viewer participant side, with the mobile application, we look to enhance our data collection by enabling users to also provide demographic information such as age, gender and nationality, or add tags to their video submissions. Such refinements could drive corresponding enhancements on the studio presentation side, for example, the use of additional viewpoint-related tangibles or perhaps changeable tangibles allowing for combinations of viewpoints. Our current implementation uses mobile technologies as the primary mechanism for viewer participants to submit content and interact with broadcasters, but we envision cross-platform solutions for viewer participant content in the future; following our initial deployment, we developed a similar submission application for a television widget platform.

While our current scenario focuses on the broadcast environment, we recognize that the system has potential for any type of activity in which people may wish to gather participant viewpoints and media. Contexts for participatory media that are gathered in advance or in real time, and explored and displayed, either for retransmission or for a face-to face experience include public debate settings, museums, art happenings, community planning, and group documentary work. We remain deeply interested in how these technologies can be used to increase the sense of participation in the experience of situations and current events through co-discovery of how viewpoints differ.

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REFERENCES

[1] Carenini, G. and Rizoli, L. 2009. A multimedia interface for facilitating comparisons of opinions. In Proceedings of the 13th international Conference on intelligent User interfaces, 325-334.

[2] Diakopoulos, N., Goldenberg, S., and Essa, I. 2009. Videolyzer: quality analysis of online informational video for bloggers and journalists. In Proceedings of CHI, 799-808.

[3] Jokela, T., Väätäjä, H., and Koponen, T. 2009. Mobile Journalist Toolkit: a field study on producing news articles with a mobile device. In Proceedings of Mindtrek, 45-52.

[4] Kaltenbrunner, M. 2009. reacTIVision and TUIO: a tangible tabletop toolkit. In Proceedings of the ACM Intl Conference on Interactive Tabletops and Surfaces, 9-16.

[5] Koponen, T. and Väätäjä, H. 2009. Early adopters' experiences of using mobile multimedia phones in news journalism. In European Conference on Cognitive Ergonomics, 45-52.

[6] Lindstedt, I., Lowgren, J., Reimer, B., and Topgaard, R. 2009. Nonlinear news production and consumption: A collaborative approach. ACM Computer Entertainment. 7, 3, (Sep. 2009), 1-17.

[7] Park, S., Kang, S., Chung, S., and Song, J. 2009. NewsCube: delivering multiple aspects of news to mitigate media bias. In Proceedings of CHI, 443-452.

[8] Purcell, Kristen et al. 2010. Understanding the Participatory News Consumer. Pew Internet & American Life Project, March 1, 2010, http://www.pewinternet.org/Reports/2010/, accessed May 10, 2010.

[9] Robinson, S.J., Razza, D., Christensen, B., Wu, C.S., Mazalek, A. 2009. KinoPuzzle: Grasping Realities through Tangible Tabletop Documentaries, 15th International Symposium on Electronic Art (ISEA '09).

[10] Wu, C.S., Mazalek, A. 2008. "Tangible Tracking Table: an interactive tabletop display" IEEE Workshop on Tabletops and Interactive Surfaces '08 Posters. Amsterdam, the Netherlands, October 1-3.