StoneSoup: A Community driven Proactive Display

Gaurav Paruthi
School of Information,
University of Michigan
105 South State Street,
Ann Arbor, MI 48104, USA
gparuthi@umich.edu

Chuan-Che Huang
School of Information,
University of Michigan
105 South State Street,
Ann Arbor, MI 48104, USA
chuanche@umich.edu

Mark W. Newman
School of Information,
University of Michigan
105 South State Street,
Ann Arbor, MI 48104, USA
mwnewman@umich.edu

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Abstract
Proactive displays facilitate interaction and increase awareness in collocated communities. In this paper, we present a community driven proactive display system that allows its users to personalize content for the display. The system is designed to support the creation, appropriation, and discovery of content over different settings of appearance, social context and time. In addition, the system offers multiple ways of interacting with the content. Our main contributions in this work are the designs for content discovery, appropriation and reconfiguration in a collaborative system.

Author Keywords
Proactive displays, interactive public displays, collaborative configuration

ACM Classification Keywords
H.5.3 [Group and Organization Interfaces]: Collaborative computing

General Terms
Design, Human Factors

Video Link
http://www.youtube.com/watch?v=Nd1xIIDM8Mk

Introduction

Public displays are ubiquitous in our everyday life. From restaurants to airports, these displays serve many different social and temporal contexts. Adding sensors to these displays make them proactive and may even detect nearby people for displaying personalized content. An interesting subset of such displays is the community display system, which serves the needs of a collocated community. Research on community displays has focused on interpersonal awareness, social relationships, and media sharing around such displays. Researchers have provided many design guidelines and highlighted the importance of the community in the success of such systems [1,3].

In this work, we leverage existing research to design and build a community driven proactive display system called StoneSoup. The system is primarily designed for community building by increasing collaboration and awareness in a shared space. Towards this goal, StoneSoup collectively aggregates the content generated by the users in the space, based on each individual's preference. The design of StoneSoup heavily draws upon the findings and design principles articulated in existing research. We discuss these briefly in the following paragraphs. In addition we present novel designs for the appropriation, discovery and reconfiguration of content that has not been studied in detail yet.

Proactive displays serve a broad range of design goals, which are based on the context of their deployment. Some goals like enhancing communities and managing privacy are shared across all contexts. Other design principles are specific to the context. Context related applications of proactive displays have shown to succeed in increasing social interaction in conferences [7], social spaces in work environment [1,5] and in cafés [6].

Enabling the community to contribute content is an important design principle for increasing interaction in a community [1,3,5,6,7,8]. Attributing the shared content to its creator is a good way of felicitating these interactions and increase *social information flow* [1]. Community generated content also requires the proactive display system to manage the content along the dimensions of privacy, nomination and presentation [2]. We incorporate these design principles in our design of the StoneSoup system. In the following sections we highlight the main contribution of our work to the HCI community.

Design

The design of the StoneSoup system builds itself upon the PROD framework [2]. On a higher level it consists of- an interface over which a user interacts with the system; a display embedded with sensors for detecting presence and gestures; and a backend server to support these. An important design goal of our work was to democratize the control of content to users. This requires designs for the UI that support the creation, appropriation and reconfiguration of content. In the following paragraphs we briefly discuss some of the important aspects of this.

Content Creation

Previous studies have supported the creation of content by using simple forms to present content from online media sources [5] and user generated media [1]. We extend these designs to fit our implementation of the proactive display system. The user interacts with our

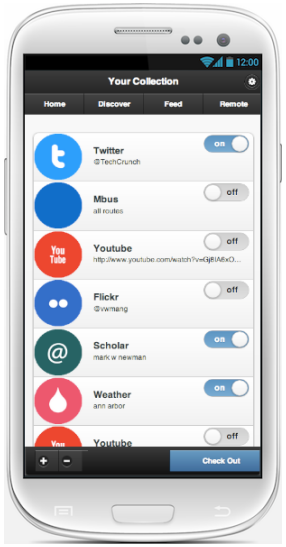

Figure 2. The mobile application interface shows the widgets of a user. Bottom right button is used for check-in and check-out.

Figure 1. The StoneSoup Display provides a tiles based view for the widgets. The checked-in users are shown on the top-right of the display. Widget allows interactivity via the mobile application and Kinect sensors.

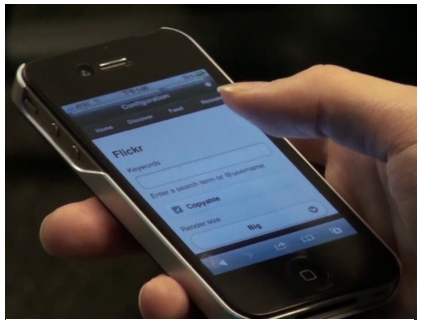

Figure 3. A widget can be created on the mobile UI.

system via the StoneSoup web application accessible from multiple computing interfaces (mobiles, desktops and tablets.) The created content can be configured over multiple dimensions of social context [2], content, time, and layout.

Content Appropriation

An important aspect for making usable collaborative systems is to ease users' burden in creating content. Supporting the appropriation of existing content is a good way to do this, and is one of our contributions in this work. It is also essential that these mechanisms be designed for users with no programming experience [4]. The appropriation of content requires three reconfiguring it and then publishing the content.

Content Discovery

Users discover content shared on proactive displays in two ways. First, they can directly observe content shared on the display and then choose to appropriate. For this our design embeds the identification of content and its attribution along with the content displayed on the display. Secondly, they can discover content by browsing through the web interface of the system. We provide intuitive features to support both these scenarios.

Reconfiguring Content

We have designed the UI for content reconfiguring and publishing to closely match the UI for content creation. It allows the use of existing content created by other users and let users modify it as if they were creating new content without the need for setting all its input parameters and context rules from scratch.

Appropriation as information staging

Appropriating content for community displays can be seen as "information staging" [1], where the display is a public stage on which each user is represented by the content they share. Our design for the appropriation of content supports this aspect and tries to prevent unintended representations. The user interface provides

Figure 4. StoneSoup lets users to interact with the system via gestures identified by Kinect.

Figure 5 Nearby Users being displayed on the top right corner of the screen.

a "backstage" feature that allows users to test widgets on their local system before sharing it with the community. Users can create their set of widgets and then press the Backstage button. Users can appropriate and reconfigure their widgets

Implementation

StoneSoup consists of three main modules: The web interface is coded in HTML and Ajax, the backend in Python, and the display renderer in HTML, Javascript and it utilizes WebSockets for instant updating. All parts of the system have been programmed in a modular manner to support extensibility in the sensors, displays, clients and features. The prototype display is currently deployed in the student space on a 2560x1440 resolution display, with its backend server hosted on Amazon EC2.

Before StoneSoup can show personalized content, users first need to register and appropriate content using the mobile web interface for StoneSoup. The display utilizes Bluetooth sensors for detecting nearby users (Figure 1). In addition, users can manually tell the system that they are nearby. StoneSoup fetches the content and configuration of registered nearby users from the backend, and then displays it on the screen. In the rest of this section we highlight the implementation of our designs.

Content Creation and Appropriation

Users can create and appropriate widgets they would like to see when they are around a display (Figure 1). The mobile web interface allows users to easily add and configure these widgets (Figure 2). We utilize multiple APIs provided by online services to allow users to display content of their interest. Each type of widget can be configured in the content that's being displayed; the appearance of the widget; the time and social context of when the widget should be visible.

Real-time Interactions

The StoneSoup system detects postures, gestures and other events to allow multiple ways of interacting with the system. The system is flexible in its design for allowing the addition of new sensors and to be deployed in multiple locations simultaneously. Users can use Kinect gestures like left and right swipe for browsing through multiple widget screens (Figure 4). Moreover, users can activate the widgets on the display by using the mobile app and then control them via the web app or by using other physical gestures. For instance, users can play or pause content using the web app.

Conclusion

Proactive displays are increasingly becoming pervasive. In this work we presented a community driven proactive display system called StoneSoup that aggregates content from its users. By leveraging existing literature, we believe that StoneSoup would allow its users to easily create and share content for increased interaction and awareness within the community. More importantly, our designs related to the appropriation of content are an important contribution towards collaborative systems in general.

Note

The title of the paper- "StoneSoup" is taken from the folk tale inspiring contribution by the community for the greater good [9].

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