INTERACTIVE MESSAGE WALL

A public display for collective sharing in real and virtual place

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Abstract. In this paper, we propose a design of an interactive message wall as a public display for large group setting such as a university community to encourage user participation, social interaction and creation of user content. It is a public display for collective sharing of thoughts. It is also a portal for online users to make their presence felt in the physical place. Both users at the physical place and in an online virtual world can post messages to the interactive message wall. The paper will present user studies carried out with a mock-up message wall to establish how onsite users use it, their preferred ways to leave messages, what medium of content (voice, photo, text, video) they are willing to share, and user participation. The results of the user studies will inform the design of the interactive message wall and provide learning points on how to promote user participation.

Keywords. Interactive message wall; public display; ubiquitous computing; virtual worlds; second life.

1. Introduction

Advancement in display technology has resulted in display screens such as plasma, LCD and LED screens being more affordable. There has been a proliferation of digital display screens placed in public places such as shopping centres, office lobbies, university campuses and public buildings. However, they are merely billboards for advertisements, and one-way dissemination of information such as news flash and announcement of events. The viewer is receiving information in a passive manner. With recent developments of technologies for interactive environment, such as sensing and wireless technolo-
gies, new communication services become possible and there is great potential for such public displays to become a medium for social communication among people in the public place and be more engaging for the people.

Use of 3D virtual worlds such as Second Life is increasingly popular but in-world activities exist only in the virtual realm. Users of virtual worlds are disconnected from activities happening in the real-world physical space and people in the real-world space are not aware of the presence of users in the virtual space without turning on their computer. How can we connect these two groups of people using public display medium?

There are many projects that experimented with public displays of digital messages, images or videos. In Joe Blogg (Martin et al, 2006), users send messages and images using mobile phones onto a public display. In TexTales (Ananny, 2004), users send SMS text message captions to a large scale photographic installation. In CityWall (Peltonen, 2007) users send media content using mobile devices to a large public display. Blog wall (Cheok, 2008) displays poems on a screen based on users’ SMS. However, none of these projects deals with connection between the virtual and the real space.

We propose an interactive message wall to connect users between the real and virtual worlds. The wall will exist in both the physical world and virtual world. It allows user content to be publicly displayed and serves to promote communication and awareness of presence between users in both worlds. It is a “space” to share collective thoughts of a community whether you are in the real or virtual worlds. People at the physical place and in an online virtual world such as Second Life can post messages to their respective interactive message wall. The message will appear simultaneously in the walls in both worlds.

Before arriving at the design of the interactive wall, we had people use a mock-up message wall to test our ideas and identify problems. The method of study was through surveys, interviews and user observations. A total of 47 persons took part in the survey. The mock-up message wall was placed in a busy area in the university campus. Anyone could walk up to it to leave a message in a few ways, in response to a topic of the day.

2. User study

To develop the interactive public display, previous studies on design methods are reviewed. In Rogers’ (2004) survey, most researchers or designers who are working in the human–computer interaction (HCI) field use design methods such as scenarios, storyboards, sketching, low-tech and software prototyping, interviews, field studies and questionnaires. These design methods are important in the early design stage to find out the problem before decision on
the design. In Buxton’s (2007) study, many interaction design cases use a low-tech prototyping such as a mock-up that users can experience.

“Low-tech prototypes are especially important as tools to test ideas during early design. This is because they are easy to make, allowing designers to quickly expose the problems before committing to decisions” (Johnson et al., 2008).

Using these initial design methods, user observation data, and user feedback are used to apply to the development of the design. We did a low-tech prototyping model to carry out a user study to find out the following:

1. To understand and analyse user preference of three different methods to input messages. The methods are handwriting, text by mobile phone and voice.
2. To understand how people use the medium of input and their privacy level of sharing information.
3. To observe user behaviour and discover anything we did not expect.

A low-tech prototype model of the initial message wall designed with the basic concept for people to share their thoughts in the public space was set up in a busy area on campus with high pedestrian traffic. A white board simulated an interactive public display (figure 1). Topics were placed at the top of the board to be seen from afar and the tasks are explained below the topics. The participants are requested to leave messages for the following topics: “What is the first thing you will do after the exams?” and “What is your favourite landmark on campus? Why?” Three different ways of leaving a message were available to participants – handwriting using post-it, voice recording using microphone (simulated by a windmill that would have a hidden microphone) and sending SMS using mobile phone. Participants stick their handwritten messages on the board after writing on post-its. But SMS message and voice message cannot be displayed on the board since we are using a prototype

Figure 1. Low-tech prototype model for initial user study.
model. It was explained to the participants that voice and SMS messages would be displayed on the wall in a working message wall.

2.1. DATA COLLECTION

We collected data through questionnaires, interviews and user observations.

**Questionnaire.** After the participants experienced what they are tasked to do, they were given a questionnaire to fill in order to collect quantitative data on: 1) which ways users prefer to post messages on the public display, and 2) how willing they are to share their contents with the public.

**Interview.** An interview is used to collect the qualitative data after their participation. The concept and purpose of the message wall were explained to the participants. They were then asked how they felt, how much they understood and their feedback after experiencing the prototype.

**Video observation.** With the permission of participants, their actions were video recorded. We analysed what they said, how long they took to post their message and what was happening when they were posting or looking at the public display.

**Post-analysis of user messages.** The messages from handwritten message, voice message and SMS message were analysed to compare the three different ways of leaving messages.

2.2. FINDINGS / DATA ANALYSIS

A total of 47 students of the National University of Singapore took part in the survey over two days. The results of the questionnaire are discussed below.

2.2.1. User preference to post message

Figure 2 shows the user preference of the three different ways. The result of the survey of question 1 shows that most (70%) of them selected handwriting as first choice, followed by SMS and voice recording as second and third choices respectively.

**Handwriting.** Handwriting is the most preferred method in the survey. Participants said that it is the easiest way to leave messages. It is also found that users can express their emotion easily compared with other different ways. Figure 3 shows the post-its with handwriting and users express their emotion or identity using short word and drawings. Users can identify their message by writing their initials, or it can also be left anonymous. It is observed most users wrote messages without any difficulty and they place their messages where they want on the board.
However, since the interactive public display will need to have the message in digital format to provide interaction functions to users, there is a need to recognise the handwriting message into the computer using tablet, electric board, smart pen and touch screen to input user handwriting message to the computer are options, but these pen-based man–machine interfaces (MMI) are still not very user-friendly (Cheriet et al., 2009) for the interactive public display in this study.

**SMS.** Short message service (SMS) is a widely used communication service nowadays. It is observed that most participants use mobile to leave their SMS message with ease. It is also easy to input the message to the computer using GSM modem. User can participate in the interactive public display without other extra input device.

However, the result of the duration of creating a message (figure 4) shows that the mean duration of typing a SMS is 70 seconds, while it took 9 seconds to leave a voice message and 37 seconds to leave a handwritten message. There were some negative user comments that using SMS could pose a privacy issue in that using SMS reveals their mobile number to the server or system administrator.

**Voice recording.** Voice recording is the quickest way to leave a message. Some participants were interested to leave their voice message, but most users
said it is weird to speak to a display board. One participant said he usually speaks to someone present and it is weird when there is nobody to speak to.

2.2.2. Willingness to share with the public

The concept of the interactive public display is to share user-posted contents to a large group. The survey result shows that all participants agree to share their written messages. However, they are against sharing their voice message, photo and movie clip with the public.

2.2.3. User participation

From the video observation, participants’ habits, patterns and conversations were observed. Many students who were not participants crowd around the

![Figure 4. Time taken to create message.](image)

![Figure 5. Willingness to share the different media with public.](image)
message wall to read what other students posted. They were interested in what other people want to do after the exam. They were curious enough to stay and read the messages on the board without any prompting from the researcher. We observed that the messages trigger conversations among people as they discussed the messages on the board and it leads them to participate and post messages (see figure 6). As Peltonen (2008) argued, users could be part of creators of public display with their active participation.

The results of the user studies will inform the design of the interactive message wall and provide learning points on how to promote user participation.

3. Communication between real world and virtual world

To design communication between users in the real world and virtual world through the message wall, we did experiments to explore the possible controls between real and virtual. It is possible to connect real and virtual space using sensor network technology. Sensors and actuators in physical space can be used to communicate with 3D objects in virtual space. For example, a controller in the physical space can control 3D objects in the virtual space. A user can change the colour and move the virtual object using the physical controller. It means that users do not need to log on to the computer and use a keyboard or mouse to access the virtual space. It is also possible to control physical objects from the virtual space using this sensor network technology. We successfully tested communication between these two worlds using sensor network technology such as micro controller (arduino) and sensor database in the following examples. For controlling virtual object from real space:

1. Rotation sensor changes the color of a virtual wall.
2. Lighting sensor changes the transparency of the virtual wall.
3. Touch sensor turns on the light in virtual wall.
For controlling physical object from virtual space:

1. Touching a virtual wall turns on/off the LEDs in real space.
2. An avatar’s distance from the virtual wall affects number of LEDs turned on in the real space.
3. Direction of avatar movement rotates a billboard mounted on a servo motor.

(See the video clip http://www.youtube.com/watch?v=0m0XVkF23Zs.)

4. Design of interactive message wall

With the understanding through our experiments in sections 2 and 3, we propose an interactive message wall that exists in both the real and virtual worlds. It will consist of 3 components namely the physical message wall, the virtual message wall and message wall server.

![Diagram](image.png)  
*Figure 7. Concept design of interactive message wall. Message wall in physical space (left) and virtual message wall (right).*

Messages can only be posted when a person stands in front of the walls. For an initial version of message wall, the input of message will be using mobile phone as it is easier to implement technically. The next development is to use digital handwritten message. In our university’s Second Life Campus,
users can post messages by typing a message on the keyboard and posting it onto the message wall in the virtual world.

Messages will appear real-time in both walls. Displayed messages posted from the real world or virtual world will be differentiated by different colour background. The message wall server saves messages and data is sensed from the real and virtual spaces.

4.1. AWARENESS AND PRESENCE

To bring awareness of presence of real time virtual users to people looking at the physical wall, silhouettes of human cut-outs are used. When a virtual user (an avatar) is near the virtual message wall, a LED will be turned on showing a silhouette. The number of silhouettes on the physical message wall indicates crowd size in front of the virtual message wall. A camera at the physical message wall will capture image of people standing in front of it. The image is pixelated and displayed as background of the virtual message wall indicating presence of people at the real world message wall.

5. Scenario and applications

What are possible scenarios for using the interactive message wall? Weekly topics that concern a community can be posted on the wall to solicit reactions. Through public display of the different views of a community, connectedness to the community can be cultivated. For example, for a university with more than one campus, the message wall can be used to connect students in the different campuses. A message wall can be located in the student centre of each campus. Students can post messages and their thoughts will be displayed for all to see at all campuses, even if the viewers are not from the same geographical location. It will serve to connect students from different campuses and provide a shared “space” for all their collective thoughts. A second scenario is to connect current students with alumni and international exchange students who have returned to their home countries. A message wall can be placed in a student centre on campus and a virtual message wall in the 3D virtual campus for alumni and visitors. Through this setup, alumni and exchange students can keep up to date about the sentiments of current students and vice versa.

6. Conclusion

In this paper we started with an idea to use public display of people’s thoughts to connect people in the physical and virtual worlds and carried out a low-tech prototype for user studies to understand the issues and problem. From that, we proposed a design of an interactive message wall to be implemented. One
of the interesting findings is that people are very interested to read messages left by others and the messages trigger conversations among people as they discuss the messages on the wall and it leads them to participate and post messages. The next stage is to start building and programming both the real and virtual message walls, implement it and obtain further user studies. The goal is to have a final version of a message wall that can bond a community together, whether they are in the same space or geographically separated or in real and virtual worlds.

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References


