Investigating Attraction and Engagement of Animation on Large Interactive Walls in Public Settings

Abstract

Large interactive walls capable of delivering dynamic content to broad audiences are becoming increasingly common in public areas for information dissemination, advertising, and entertainment purposes. A major design challenge for these systems is to entice and engage passersby to interact with the system, and in a manner intended by the designers. To address this issue, we are examining the use of different types of animation at various stages of the interaction as someone approaches and begins interacting with the system. Using usage measures from museum studies, namely, attraction and engagement of an exhibit, we plan to assess the effectiveness of different types of animation in the context of an interactive notice board application in a university campus. We describe our design approach and plans for studying the animation design in a real-world public setting.

Author Keywords
Large interactive walls; interface design; animation

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): user interfaces.
Introduction

Large, interactive surfaces that support simultaneous multi-touch interaction have become a popular choice for content presentation due to their dynamic presence, and support for multiple users. When set up as a wall in a public setting they act as a point of interest for passersby and a means for the content provider to communicate with its target audience. However, interactions tend to be very short, and unlike a dedicated system in a work environment, users may not be familiar with the interface. Thus, the interface must to be self-explanatory, even upon first use [6].

For example, imagine a large interactive wall used as an electronic notice board displaying upcoming events. A typical use-case scenario would be a passerby noticing something interesting on the board, and begin to interact with the content. After a brief period of interaction, they would obtain the desired information and then continue on their way. This scenario presents two particular interface design requirements: 1) the ability to attract potential users, and 2) to enable quick information access with easily learnable interaction techniques. These requirements are similar to those for museum exhibitions in which learning is promoted through attraction and visitor engagement [3][5].

Animation of content and controls (e.g. floating images, popping-up menu hints) has been shown to help draw visitors’ attention and guide their interaction on an interactive exhibit [8]. It also helps contributes to a lively and engaging experience.

In this work-in-progress paper, we use an existing interaction model describing the discoverability process of public interactive surfaces as a basis for studying the use of animation to facilitate attraction and engagement in these systems. First, we describe our research approach. Next, we outline our plans to examine the effectiveness of different animation types for facilitating key state transitions during user interaction with public surfaces in a case study of a public notice board application setting.

Public Interaction Facilitated by Animation

From our previous experiences studying discoverability of tabletop interface features in a public museum setting [7], we have developed an interaction model that describes the sequence of user states involved in the discovery and system engagement process. Figure 1 illustrates this interaction model applied to the interactive notice board context previously discussed. The model identifies favorable transitions between the user states. Our research focuses on discovering how different interface design techniques, such as various forms of animation, can facilitate the transitions from one state to another. This project specifically targets the initial stages where passersby are attracted to and then begin interacting with the content displayed. This design space is similar to the “activity spaces” described by Brignull and Rogers [4] except that the display itself is interactive, and the aim of the application is information dissemination rather than gathering opinions and encouraging conversations.

![Figure 1. Sequence of interaction stages for an interactive wall driving our study, adapted from [1] with a focus on a wall setup and the initial stages of the discovery process.](image-url)
Each transition in the interaction model shown in Figure 1 provides a unique design goal that must be met by the system interface at that stage of the interaction process. To achieve the first transition, the interface must *Capture Attention*. To achieve the second transition, the interface must *Guide Interaction*. To discuss how animation may be used to achieve these design goals, we first distinguish between two types of animation, *proactive* and *reactive*, in which the latter is triggered by a user while the former is not. These animation types together with the above design goals allow a 2-dimensional grouping of animation types described below (and summarized in Table 1).

**Dimension 1: Design goals to foster state transitions**

*Capturing Attention* in order to facilitate the first state transition, animation must attract passersby to notice and approach the interactive wall. Prior research has shown that animation, as a form of visual stimuli, can easily capture a person’s attention [2].

*Guiding Interaction* in order to facilitate the second transition, animation must guide users (attracted passersby) to interact with the interface the way it is designed. Animation can be used to communicate structure, process, and function of an interface [1], thereby both guiding and engaging users [5].

**Dimension 2: Triggering mechanism**

*Proactive* animation is automatically triggered by the system, and helps to convey the impression that the system is functioning, and helps suggest interactivity to both invite passersby and guide users [7].

*Reactive* animation is triggered by the user, and helps to establish an action-response causal relationship: a follow-through for a passerby who approaches an interactive wall, or guidance for a user to interact with the interface correctly. For example, indicating which interface components are interactive and the correct activating/interacting gestures.

All of the animation types can be achieved by a typical multi-touch surface except the Reactive-Capturing Attention animation, which requires proximity sensing typically realized by external optical sensors.

**Case Study: Interactive Notice Board**

To further examine the utility of animations, and to identify specific animation properties, that satisfy our design goals, we will conduct a case study of the interactive notice board application context described above. The system will be located in a busy university building foyer and will provide information related to ongoing campus events, such as maps and event details displayed in interactive windows (Figure 2a).

Different view modes (e.g. time-based, map-based) will be provided to allow for flexible information access (Figure 2b-d). Different types of animations (Figure 3a-c) will be developed and applied to the notice board application, representing each of the four animation categories described in Table 1. The effectiveness of these animations will then be evaluated through a series of observational studies.

|              | Proactive | Reactive                           |
|--------------|-----------|------------------------------------|
| **Capturing Attention** | Floating content windows | Content windows slowing down in response to passerby's approach |
| **Guiding Interaction**   | Glowing buttons     | Growing touch-and-held icons, trembling components in response to invalid action |

Table 1. Summary of the 4 animation types based on the interaction stages and triggering mechanisms, with examples.
Measuring Attraction Power and Engagement Levels
Research in museum studies has established a positive correlation between learning and attraction, holding power, and visitor engagement in exhibits [3]. As discussed above, we aim to achieve similar goals in our system so that passersby are attracted and invited to interact with the system. Based on our interaction model, we adapt attraction (measured as the percentage of visitors who stop and observe an exhibit for five seconds or more [3]) as the percentage of passersby walking towards the wall; and engagement (measured as various types (levels) of attention paid to an exhibit, ranging from looking at it to touching or manipulating it [3]) as types of increasing interactivity from just looking to actively interacting with the wall.

In addition, we will measure how well animation guides a user by the rate of correct interaction with the content (e.g. tapping a valid button, not using a non-interactive component).

Technical Setup and Future Work
We plan to implement the notice board application on a 162”x46” (4.1mx1.2m) interactive wall, created by tiling two rows of four 1920x1080 pixels monitors, and 32” (0.8m) above the floor. Multi-touch interaction is enabled by a custom-made IR-frame from PQ-Lab¹.

We intend to conduct an in-situ observational study investigating the helpfulness of animation in terms of attraction, engagement, and rate of correct interaction as described above. The long-term goal is to expand the interaction states to more complex interactions and determine the types of animation that are most helpful for each state (and for each transition between states), thus providing interaction designers insights on designing for public interactive displays.

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¹ http://multitouch.com/

Figure 3. Various types of animations applied to the application:
(a) windows slowing down reactively to capture attention in response to visitor approaching;
(b) buttons glowing to proactively suggest interaction;
(c) icon growing to reactively guide a timed interaction