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Multitouch Portal Information System

Illustrated Portfolio

Spring 2010

Research & Development by
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Accepted Gesture Language Library

Natural User Interface, or NUI, is the common parlance used by designers and developers of computer interfaces to refer to a user interface that is effectively invisible, or becomes invisible with successive learned interactions, to its users. The word natural is used because most computer interfaces use artificial control devices whose operation has to be learned. A NUI relies on a user being able to carry out relatively natural motions, movements or gestures that they quickly discover control the computer application or manipulate the on-screen content. The most descriptive identifier of a NUI is the lack of a physical keyboard and/or mouse.

This project is aimed at creating a language / framework independent Gesture Recognition toolkit that takes OSC messages formatted with TUIO specification as input and outputs recognized gestures via OSC protocol. The problem with gestures such as the pinch-to-zoom, rotate are hard-coded and require more coding to add new gestures into the system. Apart from this, there are toolkits that go one step ahead to learn and recognize single point stroke gestures based on their shape, like the nui wave to bring up a menu. Although this is very useful for application developers to use, it is still limited by not using multiple points of input that a multitouch surface allows.

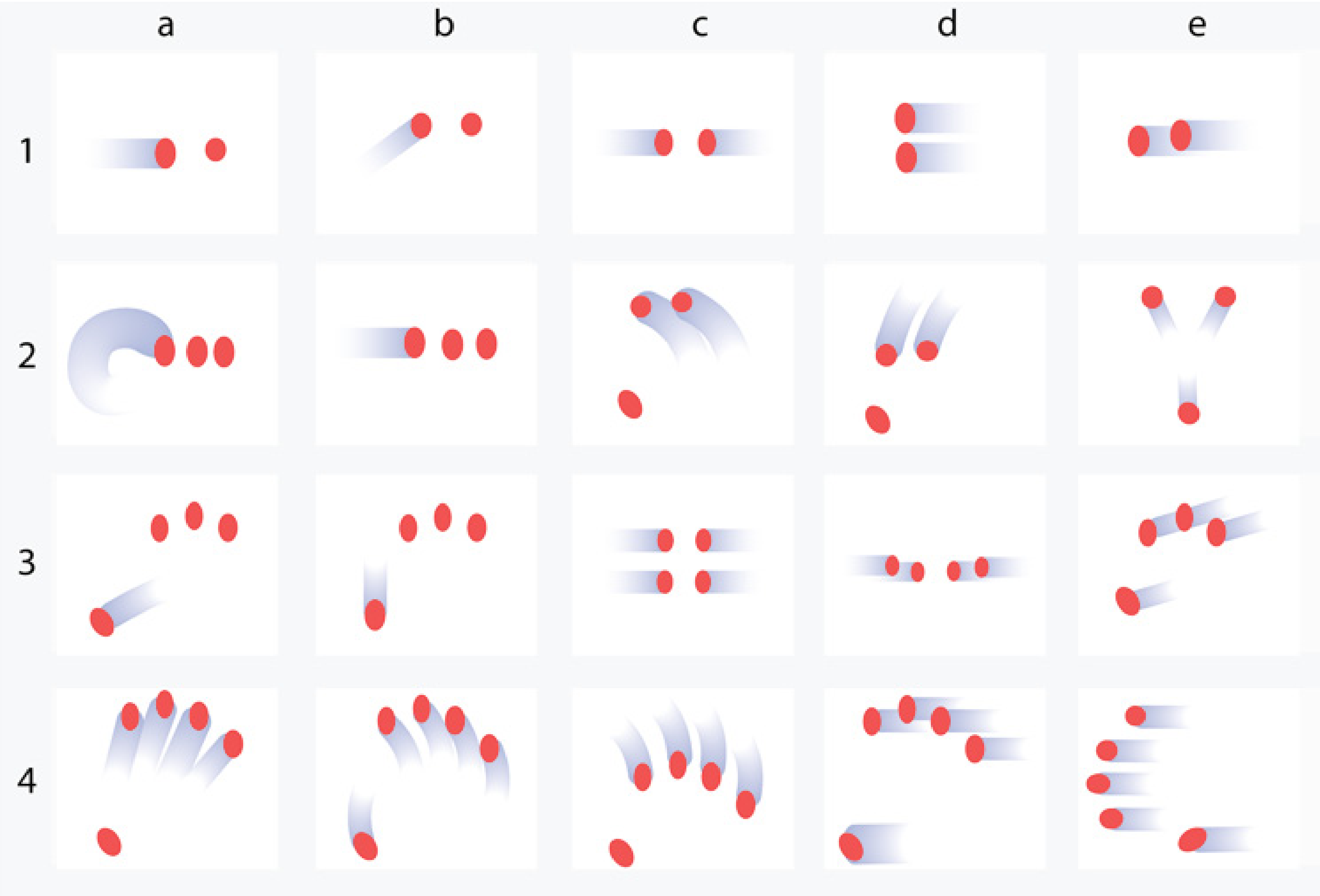

fig. 1: Google Summer of Code Project Proposal Sashikanth Damaraju

Gesture Systems Investigation

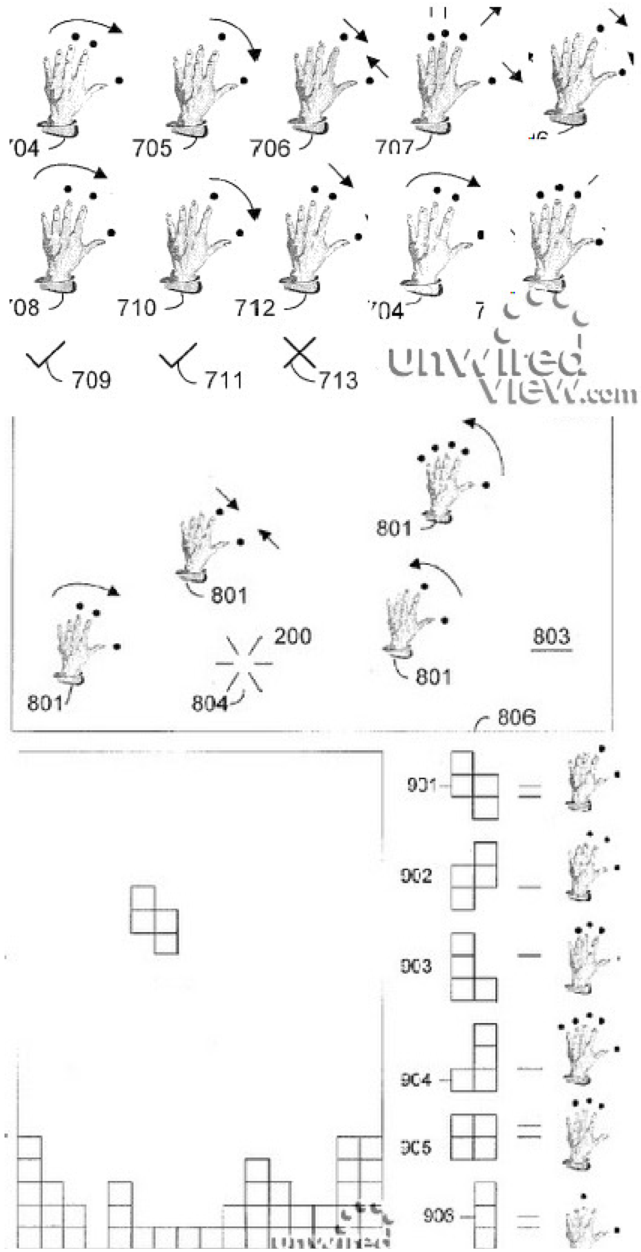

fig. 2.1: Apple Multitouch patent

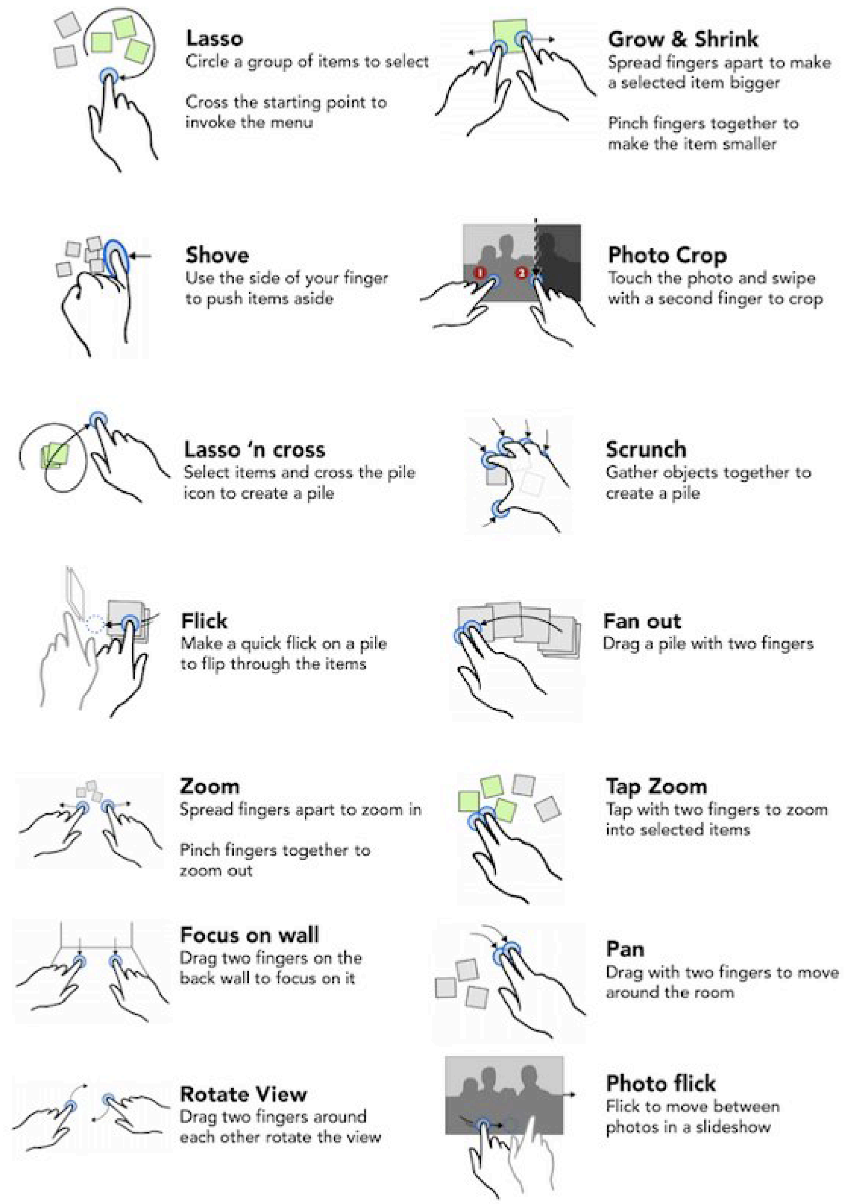

fig. 2.2: Bumptop Usages

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Different Types of Common Commercial Touch Technology

Capacitive touch screens work by sensing small changes in the electrical pattern over the touch screen surface. Your skin creates small electrical connections, and the touch screen software can interpret these to know exactly where your finger is located. Skin, or another conductive material is needed to make capacitive screens work properly. Using a stylus or other pointing device will not work. For instance, the iPhone touch screen is a capacitive screen.

Surface acoustic wave (SAW) technology uses ultrasonic waves that pass over the touchscreen panel. When the panel is touched, a portion of the wave is absorbed. This change in the ultrasonic waves registers the position of the touch event and sends this information to the controller for processing. Surface wave touch screen panels can be damaged by outside elements. Contaminants on the surface can also interfere with the functionality of the touchscreen.

A **resistive** touchscreen panel is composed of several layers, the most important of which are two thin, metallic, electrically conductive layers separated by a narrow gap. When an object, such as a finger, presses down on a point on the panel's outer surface the two metallic layers become connected at that point: the panel then behaves as a pair of voltage dividers with connected outputs. This causes a change in the electrical current which is registered as a touch event and sent to the controller for processing.

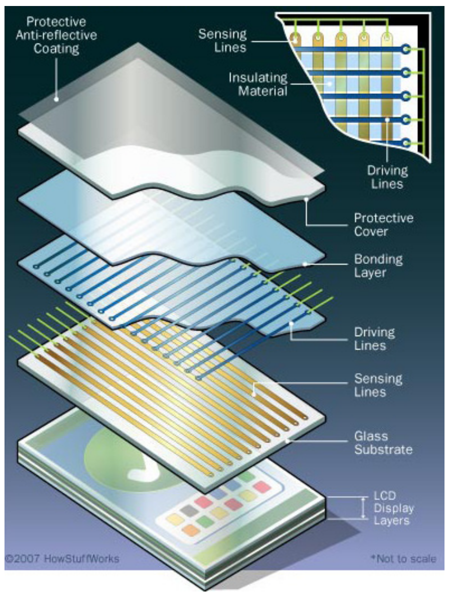

fig. 3.1: Capacitive Screen layers

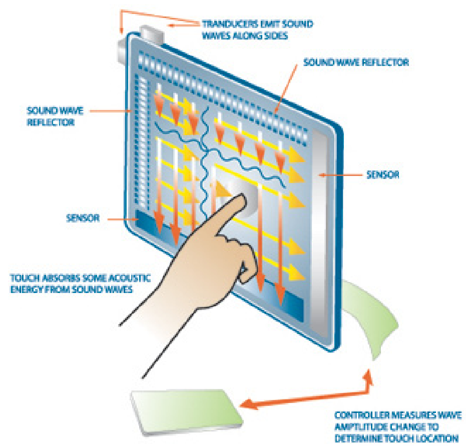

fig. 3.2: Surface Acoustic Wave construction

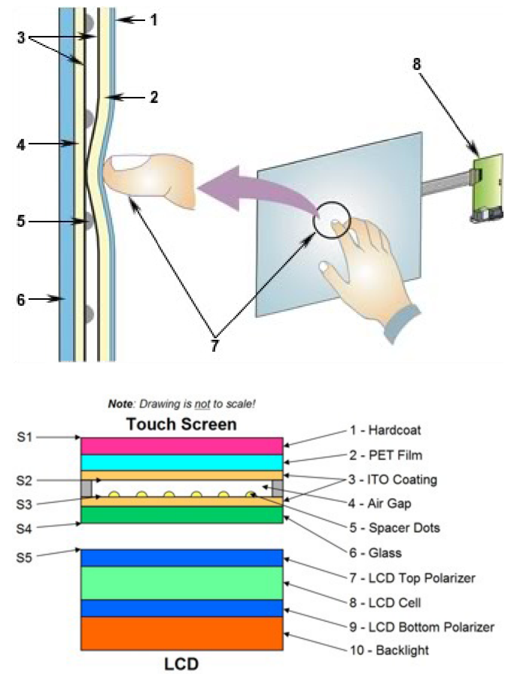

fig. 3.3: resistive screen layers

Current Setup at Portal 1 in Terra Lobby

The technology we are using is called Diffused Infrared. This is the method first used to develop multitouch systems. We choose this for a couple reasons. It lends itself to the space we were provided, as well as rear projection. It is quick to prototype, and most importantly, it's cheap.

The process of how it works is quite simple. IR arrays flood a screen, and as your fingers touch the screen, the IR camera picks up the light as hot points. The points, or "blobs" are translated by an open source touch recognition software that tags the blobs and feeds those tags to a server which interprets them as mouse points.

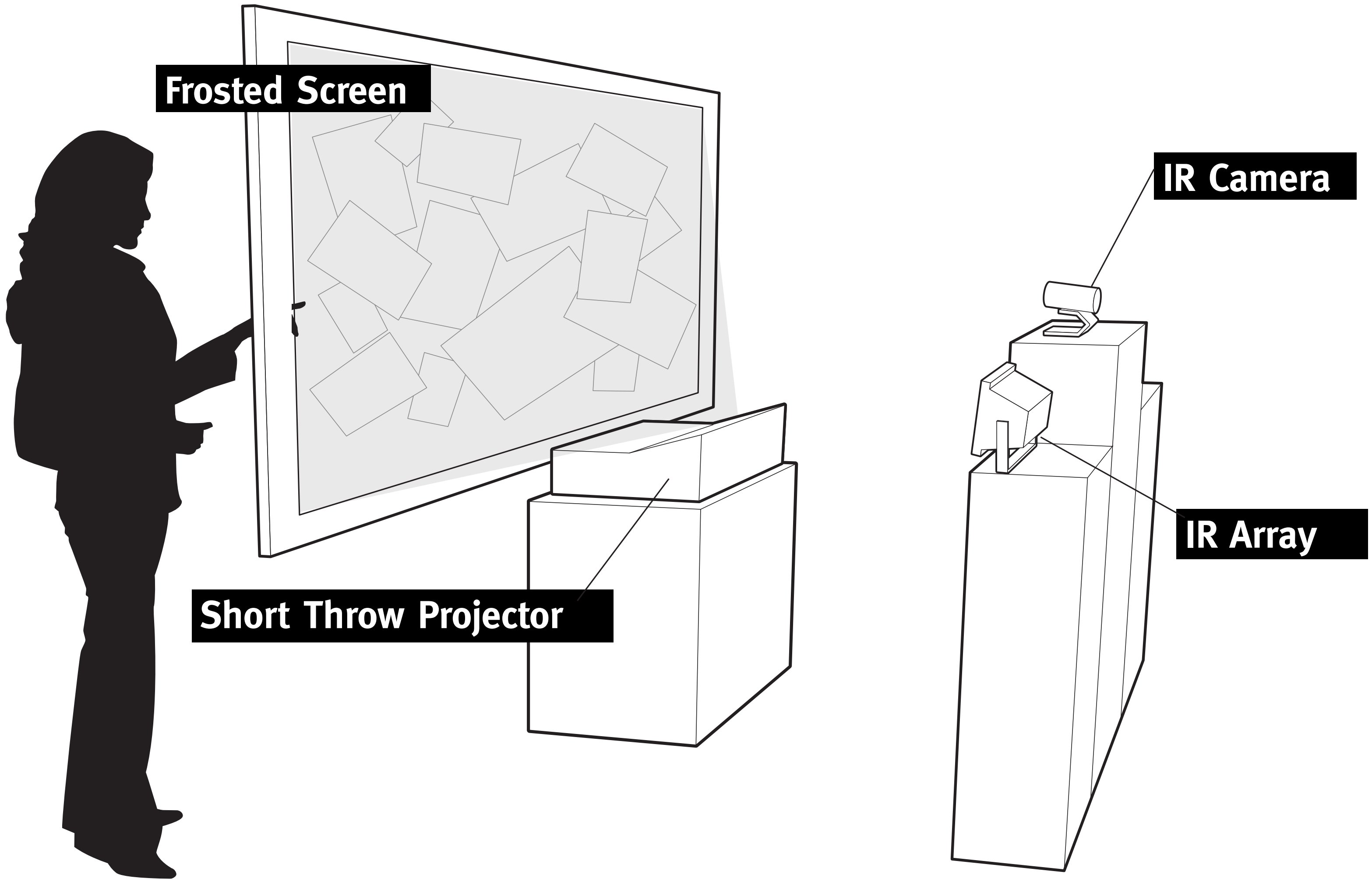

fig. 4.1: current layout of DI multitouch screen in the Terra lobby

How the Surface Works

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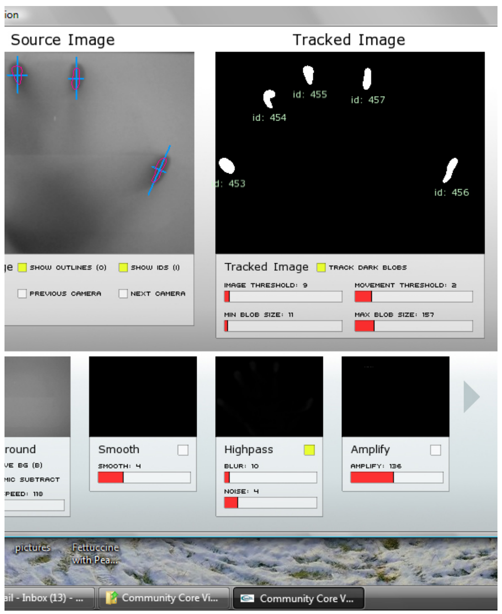


fig. 5.1: CCV open source software

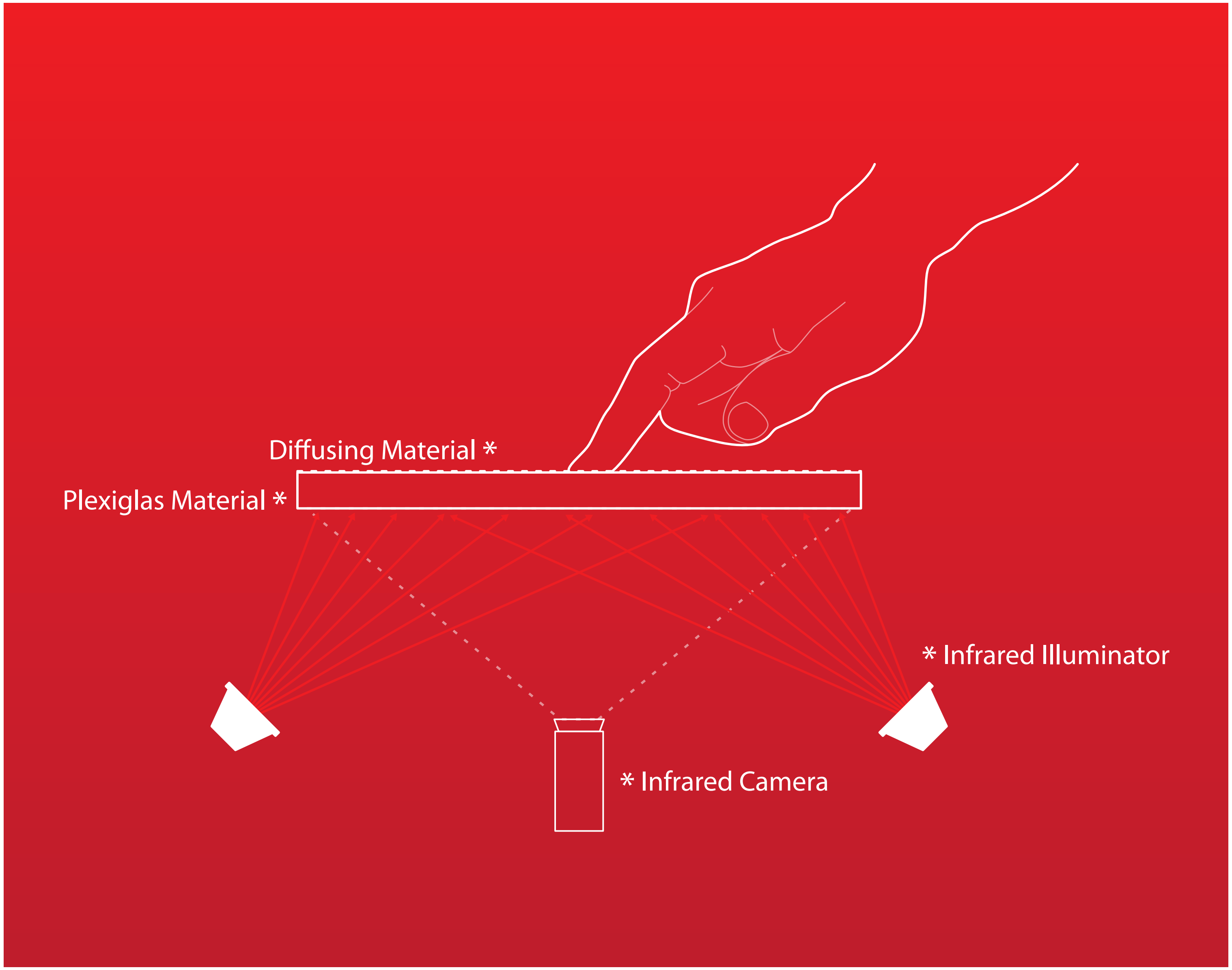


fig. 5.2: diagram depicting how the CCV software determines "hot points" by using infrared arrays

fig. 6.1: testing of Donovan's Prototype FTIR touch screen

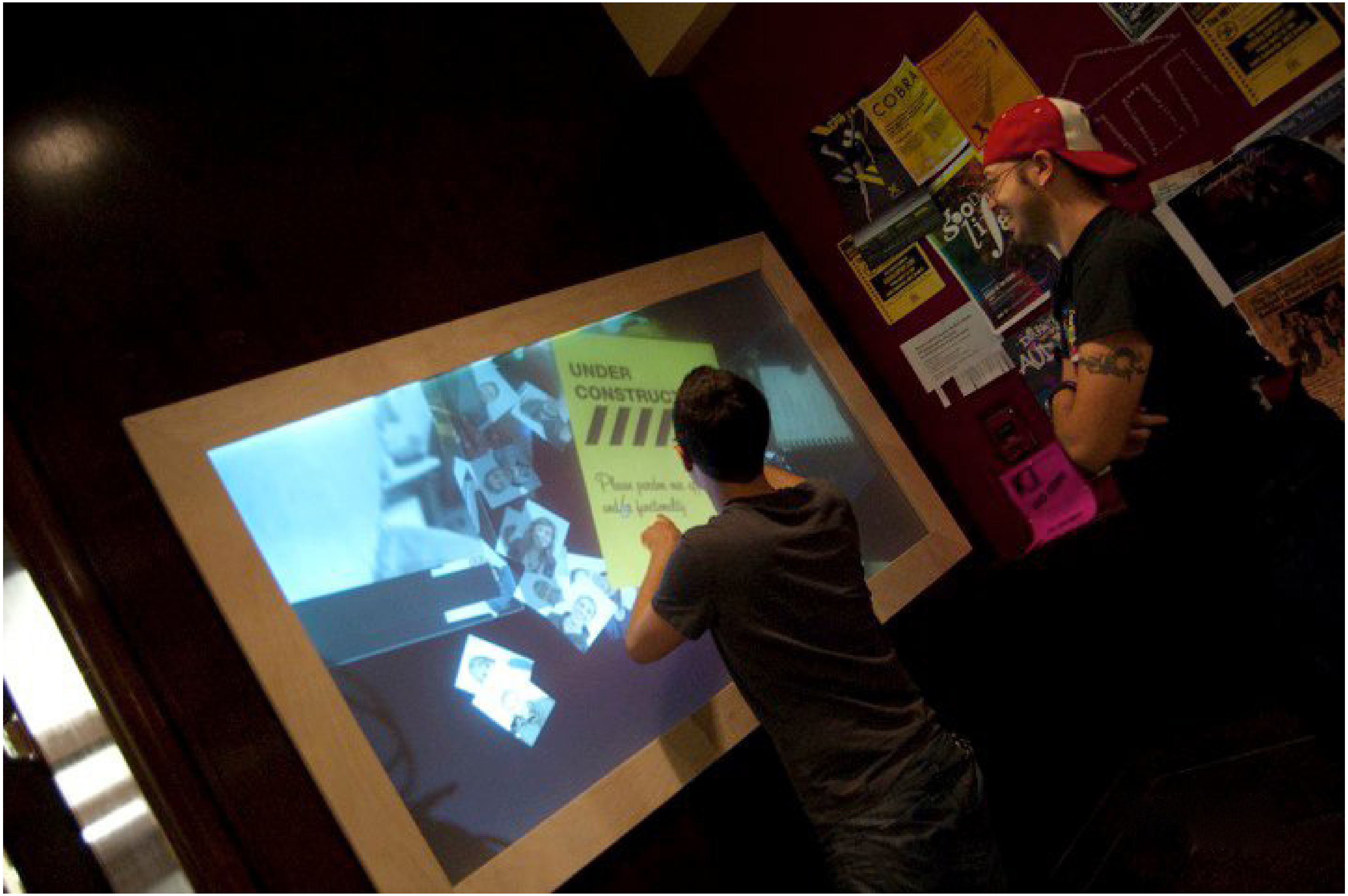


fig. 6.2: testing of Prototype DIR Terra touch screen

fig. 6.3: as the screen lay dormant for two months, posters again began to migrate onto the screen, in some cases covering it up

fig. 6.3: before the touch screen went live, a period of transition was employed. This pin surface was installed in an attempt to "scaffold" the populace

fig. 6.4: in an attempt to enhance image quality as mirror was installed into the space

fig. 6.5: calibration of the screen is a constant issue due to the changing light conditions. Further development of the screen will require a more stable technology such as capacitive

fig. 6.6: shows calibration in getting 5 points is possible

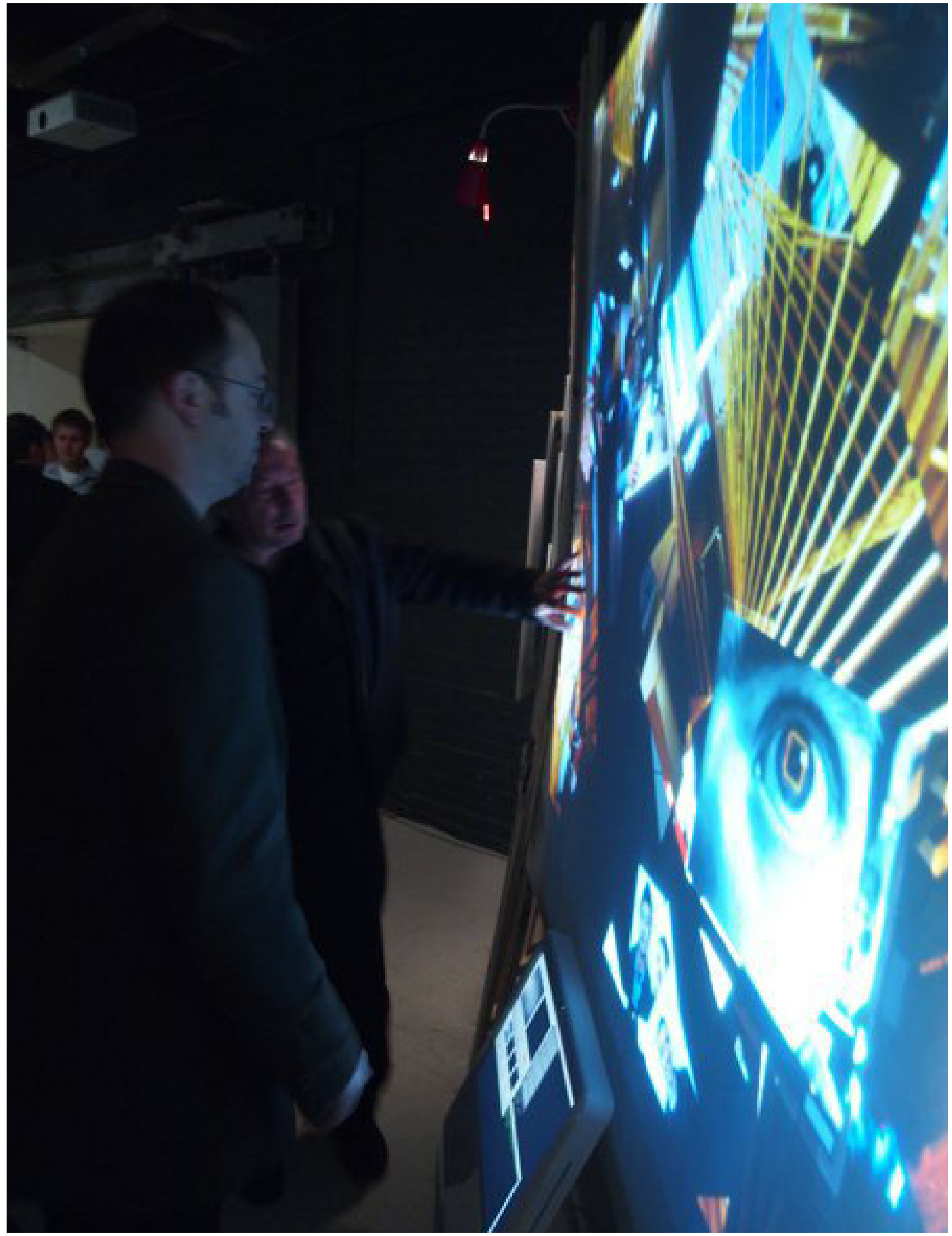


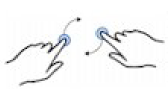
fig. 6.7: such a large scale touch wall, however, doesn't warrant such accuracy in some instances

fig. 6.7: truer words were never spoken

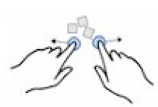
The Interface

In its dormant state, the portal looks like the same jumbled message board. Digital flyers strewn every which way. Once the User walks up to the board, or if the board is seeking attention, it sorts. Further more, events are now tied to both departments and locations via “Threads.” Students can choose to “tie” themselves to an event, thus tying themselves to one another.

fig. 7.1: Dormant state of the screen until activate by the user with a touch

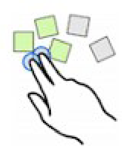


Rotate View
Drag two fingers around each other rotate the view

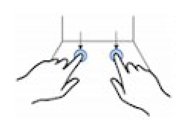


Zoom
Spread fingers apart to zoom

Pinch fingers together to zoom out



Tap Zoom
Tap with two fingers to zoom into selected items



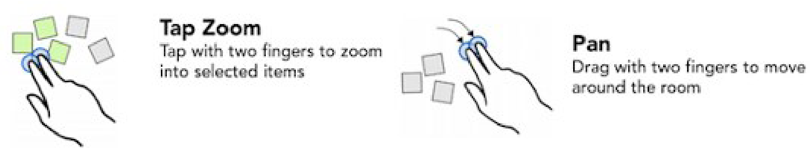
Focus on wall
Drag two fingers on the back wall to focus on it

The Interface

Once the screen is activated, a User can navigate through a visual list of events. Initial order is by date, but by holding a single finger on teh screen, the User can select by week, month or even by School.

By using 2 fingers on their second hand he User can slide the listings left to right or up and down.

fig. 7.2: Sorted events listings



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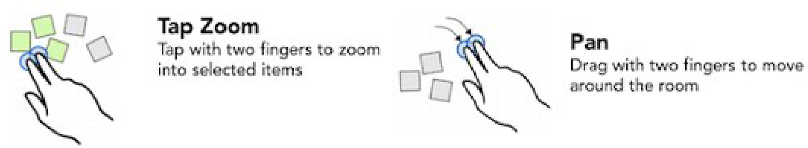
Once an event is activated, the "threading" mechanism shows the department that the event is tied to and/or located. By pulling the event with two fingers to the right, the building directory is displayed with the location highlighted.

fig. 7.3: activated event, also shows "thread" to location



The Interface

fig. 7.4: activated event pulled out to show location in the building

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The Interface

Upon activating the board, the User can choose to view the building directory instead of events.

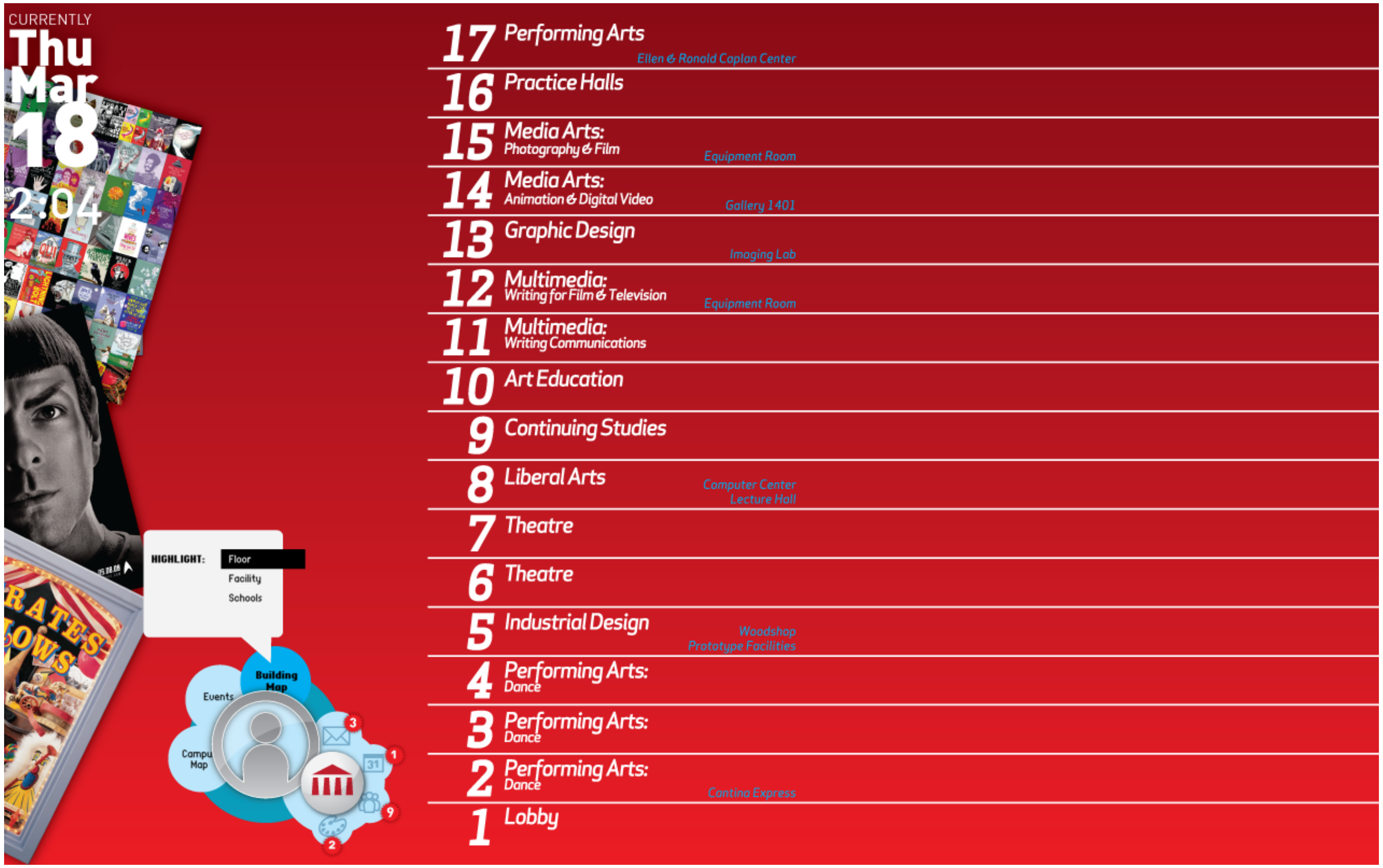
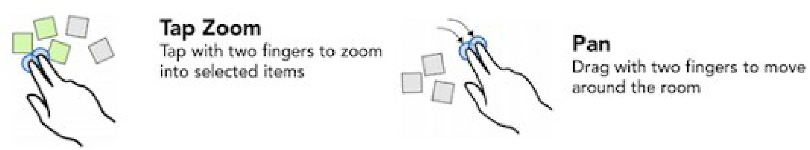


fig. 7.5: building map activated



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As an addition to the building directory, by additionally activating the events listings, they sort by department and location.

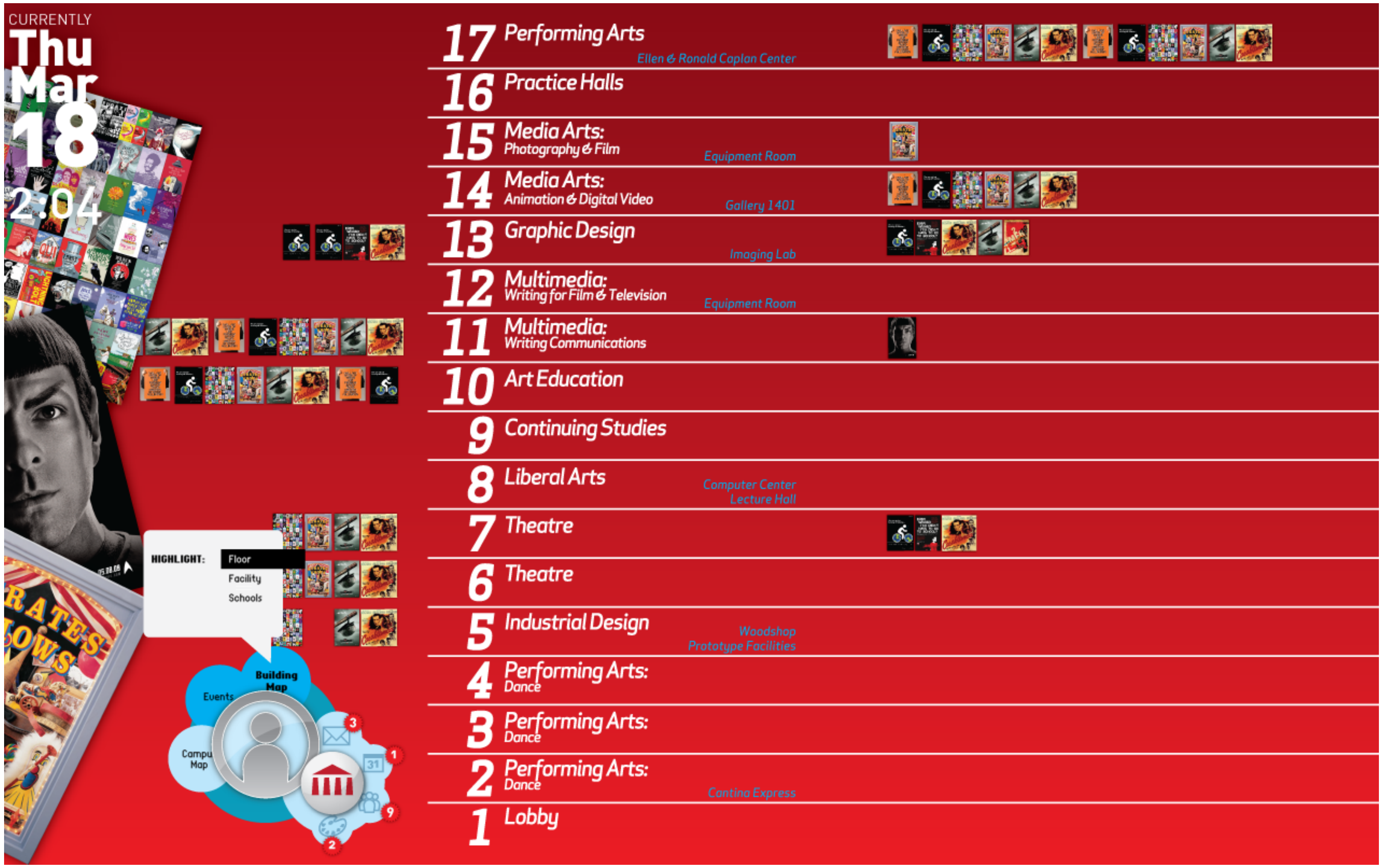
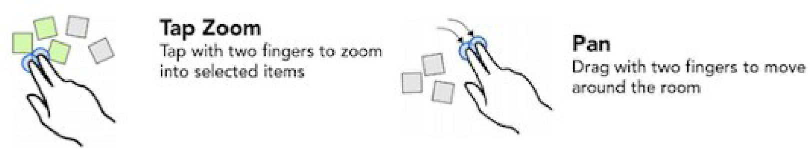


fig. 7.6: building directory with activated events listings



The Interface

If a User is logged into the school system, they will have the ability to activate all of their personal events that they are tied to whether through teacher recommendations, being in a specific class, or holding an event.

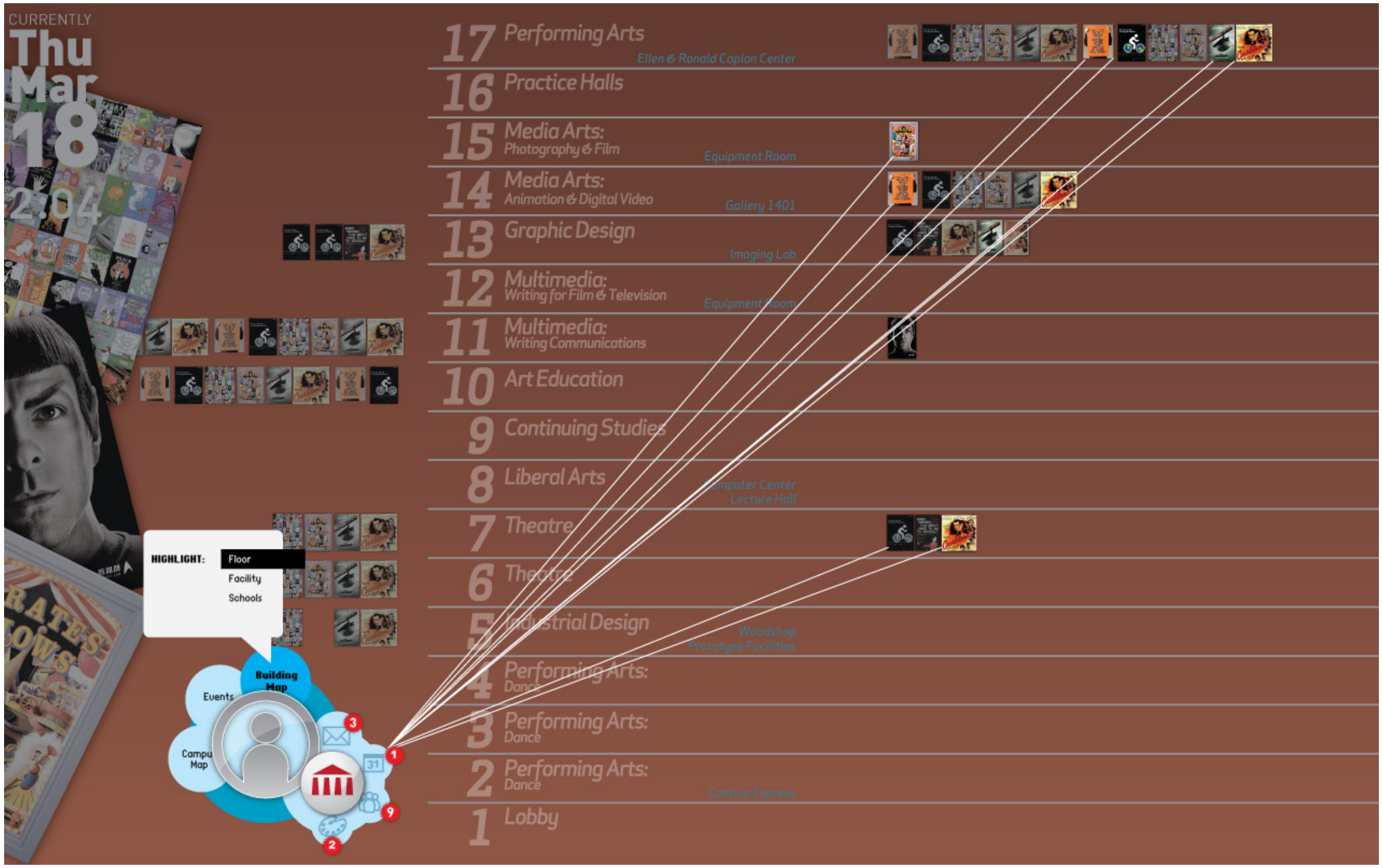
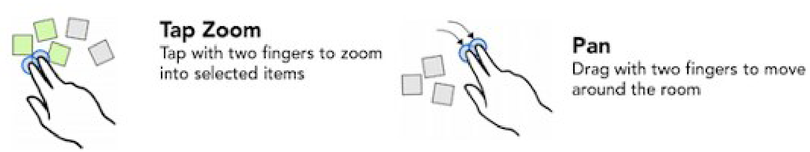


fig. 7.7: building directory with activated events listings and a student login with their personal events being "threaded" to them



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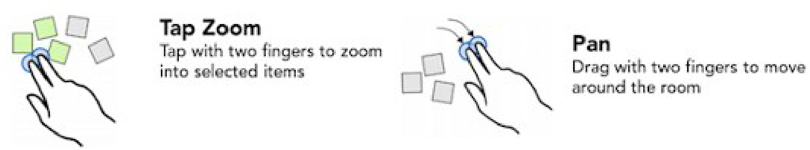
By activating a specific event in this mode, the User can see other attendees, and add some their friends as well or “cut” ties by swiping thier finger across a thread.

fig. 7.8: activated event with all attendees threaded together



Future Usage

The PORTAL System a lots for much more than just an event board. The ability to effortless aid a University User in wayfinding, information, and communication is merely it's facade. Being teachers as well as students, we experience many of the issues facing the common student populace. Printing issues, no stable, simple-to-use online classroom, or inaccessible information.

Imagine if you will this simple scenario. Students now each carry a school issued iPad as part of their tuition. As they approach the PORTAL, it can communicate with each student directly, greeting them, checking them in to class, and uploading their assignments automatically, before they even reach the elevator.

Upon entering their classroom, the Professor already has them checked in on the roster, and has their work on the wall ready to be critiqued. No need to print out the work, or wait for projection screens to log in. Class can begin immediately on arrival, thus making the experience more about the learning and less about the technology.

fig. 8.1: students critique work uploaded via the PORTAL system.