Finding Vital Information on Houses Using Immersive Multi-Touch Interface

KAI-TZU LU, HSIN-HOU LIN, TING-HAN CHEN AND CHI-FA FAN
Xxtralab Design Co., Taiwan
kt@xxtralab.tw

Abstract. This paper discusses the creation of natural behaviours for multi-touch house information (MTHI) system using Frustrated Total Internal Reflection (FTIR) technology. After analysing how APPLE and Microsoft defined their touch behaviours we discovered that not enough were responding of commercial application. Therefore using basic touching functions as reference we developed some new gestures and GUI for the real estate market. This system was launched to assist real estate salesmen in Taiwan.

Keywords. House information; navigation; multi-touch; user interface.

1. Introduction
When iPhone and Windows 7 systems were launched between 2007 and 2009, multi-touch and seamless interfaces started to emerge on the market to be tested by common users, changing their perception of the information and how they could manipulate interfaces to access it. Because the project was no longer a laboratory project and started to have a huge influence on people’s daily life, the experience acquired in real world design and its immediate impacts are an interesting topic develop, especially when consider a large-scale visualisation with embodied interactions. On the other hand, with the last economic boom, the real estate accumulated huge of information hard to search when using traditional WIMP interface. How to develop the natural exploration of multi-touch system into the real world design practice is the key of this paper. We were contracted by one of the largest real estate companies in Taiwan to answer their real needs by building a new system.
We started reviewing the existing house information systems that were not suiting the new multi-touch screen trend and couldn’t provide enough immersive user experience. Therefore we started by analysing the information and its classification to redefine the searching gestures on the touch system matching the need for the information visualisation. We created a Multi-Touch House Information (MTHI) system, allowing the users to easily find easily their target houses.

2. Related works

Most of the information on commercial promotion of house is based on DMs, videos, websites, etc. It shows that people are used to “windows, icons, menus and pointers” (WIMP) as you can find on graphic user interface (GUI). But when the environment navigation GUI evolved first from a 2D floor plan to a 360 degree Quick time VR and then immersive seamless environments (Ishida 2002). The input device itself improved first from a keyboard/mouse to a new device with 6 degree of freedom manipulation (Lu 2004) and then to a multi-touch screen (Han 2005). Thus single user navigation status moved to collaboration design status and then to the multi-users status by touching signals input (Naef and Ferranti 2011). The natural user interface (NUI) interaction became the more important topic in the design process and the house information navigation system (Chen and Schnabel 2011).

Therefore we reviewed new touching technologies such as the IR LEDs Metris detection, the 3M company’s capacitive method, the optical multi-touch sensing by Han’s work (Han 2006), etc. We intended to develop a multi-touch system permitting more than one user searching at the same time by using customised operation gestures for houses navigation. For this reason we chose the FTIR technology for our MTHI system.

An NUI interaction we based on users’ behaviours was a kind of experimental transformation of real world activities into virtual simulation. (Lu and Chang 2005). The virtual environments had to be designed to handle a dynamic display of design data using the transparency of the virtual layers creating a clear visual effect easy to follow, for the users (Hirschberg 2003). The navigator widgets are displaying the various options to switch the different operation status (Lepinski et al. 2010).

3. Hardware setup

The hardware structure of the MTHI system is illustrated in Figure 1. For the technology based on the FTIR method, we combine two systems to enlarge the size of a 4 m × 2.5m (190”) touch screen (Figure 1). For the display we use
two SXGA+ projectors and the “TV one” video conversion system to merge the graphic interface. The final image resolution is $2050 \times 1050$ pixels, and we use mirrors to cut by 1/2 the projection distance originally needed. For the touching function, the glasses surfaces are illuminated by 8 IR lasers, using a IR camera and Touchlib to capture the finger points signal (Figure 2).

![Figure 1. The 190” multi-touch prototype-MTHI.](image)

![Figure 2. Touchlib detected finger point of X, Y, area, and weight signals.](image)

4. A houses information system

A Multi-touch houses information (MTHI) system is described in a map presentation mode creating an intelligent space designed to carry the real estate company’s exclusive luxurious services to its customers. The real estate company data structure is shown in the Figure 3. The customers look for future investment target Houses in front of a $4 \times 2.5$ m screen using three
different functions: 1. i-Navigator, 2. The thematic multi-layer, 3. The media info window on the MTHI system.

4.1. I-NAVIGATOR

A navigation wheel flies to wherever the user double-clicks on the sides of the screen. This navigator wheel is like a marking menu that contains switching functions for regions and the thematic multi-layer. “The region switch” can change different area maps from region 1 ~ region n to present a location introduction. “The thematic multi-layer switch” can link different topic layers to show an urban plan in details, from surrounding environments to transportation, etc. (Figure 4). Otherwise, when the user wants to close the text index of the navigation wheel, he only needs to apply two fingers (thumb and index) on it and close the distance between them, to open the text index he just has to reverse the gesture.
4.2. THE THEMATIC MULTI-LAYER

The thematic multi-layer drags different theme layers (e.g. urban plan, transportation, landmark buildings, target buildings and parks) going from top to bottom, to explain the value of luxury residential properties. By touching the main map of the thematic multi-layer the users can pull out a map on the topic they chose. Then the different topic layers will separate with different topic info (Figure 5).

Figure 5. There are different topic layers to describe value of the land.

4.3. THE MEDIA INFO WINDOWS

Users can use a circle gesture to post an orange house icon tag and click the tag to show the media info window. Figure 6 shows four highlighted regions and the user can click the tag icon. Then the media info window will pop out on the screen. The information includes house content, house photo/video, and house location on Google Maps (Figure 7). All information is directly connected to a database and an on line map. The media info window uses multi-touch advantages to show details and to compare different cases.

Figure 6. City map shows 4 regions and tag icon.
5. Result

After the implementation for the MTHI system we provide five gestures: Drag, Zoom, Mark, Delete, Pull (Table 1). Based on regular multi-touch functions we redefined three gestures: “Mark”: the user draws a circle on the target building; the orange house tag icon shows the link on it. “Delete”: user draws a cross on the orange house tag icon for the icon to disappear. “Pull”: user pulls the different topic layers from the main region layer, by sticking a finger on the chosen layer and position it vertically on the screen where ever the user wants as long as the finger stays in contact with the screen.

<table>
<thead>
<tr>
<th>Item</th>
<th>Drag</th>
<th>Zoom</th>
<th>Mark</th>
<th>Delete</th>
<th>Pull</th>
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<tbody>
<tr>
<td>Gesture</td>
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6. Conclusion and future work

In this paper we present the MTHI-a multi-touch wall. The key contribution is the redefinition of the gestures used for real estate filed. And this system has been running from 2009 until now. It shows that the MTHI system really answered the needs of house sale’s procedures. But today the MTHI system is an expensive installation. For the future we try to decrease the total cost and the projection distance. That will achieve the market request.
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References


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