

An Insight to Multi-touch Technology - The Synergic approach

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Abstract

Multi-touch technology with computationally enhanced surfaces has attracted considerable attention in recent years, not least because of its potential to improve human/computer interaction. Nowadays the most conceivable area of research is Multi-touch technology. The paper brings up a platform for the understanding of the technological aspects and the gestures for the recognition, and the capacitive sensors.

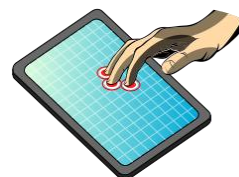
Keywords- Multi-touch, Capacitive Sensors, Gesture recognition, Pen Computing.

I. INTRODUCTION

Multi-touch is a method of input on a touchscreen that allows two or more fingers to be used on the screen at one time. Apple's iPhone is famous for introducing multi-touch to the cell phone world by using it to allow pinching and stretching gestures on the screen to control zooming. Multi-touch is something typically associated with capacitive touchscreen displays rather than with more common resistive touchscreen displays.

In computing, multi-touch refers to the ability of a surface (a track pad or touchscreen) to recognize the presence of more than one or more than two points of contact with the surface. This plural-point awareness is often used to implement advanced functionality such as pinch to zoom or to activate certain subroutines attached to predefined gestures.

Recent developments of multi-touch interfaces, which are touch devices able to recognize at least three touches simultaneously, have hit the commercial market with considerable success, as Apple's iPhone and iPad creations show. The technology is not new, however, but has a long way of more than 30 years of research and development behind it.



II. CAPACITANCE-BASED SENSORS

A capacitive touchscreen panel (as in Pro-Cap multi touch) consists of an insulator such as glass, which is coated with a transparent conductor, like ITO (indium tin oxide). The user's finger conducts electricity, so touching the surface of the screen results in a distortion of the screen's electrostatic field; that distortion is measurable as a change in capacitance. In other words, a capacitance-based sensor is a circuit designed to sense touch by coupling with the electrical fields; touch causes the capacitance of the circuit to change (Figure).

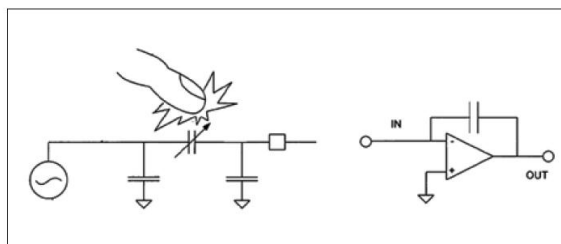


Figure 3. Input power, capacitive sensing and signal amplification¹

Different technologies may be used to determine the location of the touch; the location is then sent to the controller for processing. The way Apple describes it, the process is fairly straightforward:

- Read output from sensing points, producing and analyzing the touch data
- Then compare the current data to past data and perform actions based on the comparison
- Additionally, receive and filter the raw data, generate gradient data, calculate boundaries and coordinates for each touch region, performing multipoint tracking.

III. TOUCHSCREEN CONSTRUCTION

A capacitive touchscreen sensor consists of a large array of indium tin oxide (ITO) conductors on one or more layers of glass or polyethylene terephthalate

(PET) plastic. The good optical clarity and low resistivity of ITO make it the overwhelming choice for this very sensitive circuit (see Figure).

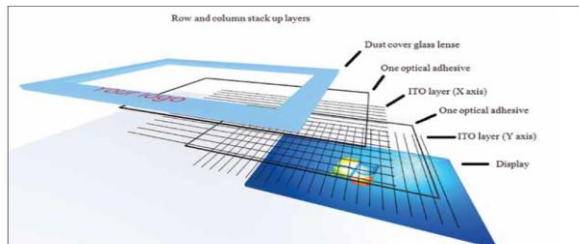


Figure 4. Dust cover glass lenses. Options: 6mm with vandal proof glass.

IV. OVERVIEW OF TOUCH-INPUT SOFTWARE WINDOWS MULTI TOUCH

A. Windows 7

Windows 7, released in October 2009, included many features, such as new ways to work with windows—Snap, Peek, and Shake. It also introduced Windows Multi Touch, a built-in driver enabling users to browse the web, flip through photos, stream multimedia files from a PC to a stereo or TV, and open files/folders, all with their fingers.

B. Windows Embedded

According to Microsoft, “The WS70 SKU can satisfy complex scenarios involving multi-touch gestures - ideal for many device categories including digital signage, kiosks and advanced set top boxes.”

C. Windows CE

For mobile devices, Microsoft included multi-touch and custom gesture support in WinCE 7. The touch display can operate in a range of different modes with the WinCE7 driver ported on the hardware, easing interaction with the device.

V. TECHNOLOGICAL ASPECTS

The following shall provide understanding of some basic technologies aspects related to multi-touch interfaces.

A. Touch Technologies

There are three major basic technologies for recognizing touches, the first being a resistive surface which recognizes input by electric currents built between two layers on touch. Second, capacitive surfaces using electric fields created from the surface's corners. And lastly, there are optical approaches which consist of capturing camera images of a surface and reacting to distinctions created by touches.

B. Discrete & Continuous Processing

As Bill Buxton points out, there are two types of actions on touch interfaces. There are discrete input

scenarios where users are basically just pushing on specific spots and there are continuous actions where users are performing an ongoing movement that has to be followed. Naturally, the latter requires a more precise touch recognition for reasonable results.

C. Information Content of a Touch

Buxton also describes how diverse the information delivered on a single touch can be. Although many systems only reacts on the position of a touch input, you could also access much further data characterizing the type of the performed touch, including the pressure sensitivity which basically enables a third axis for touch interaction apart from the horizontal and vertical position. Furthermore, the angle in which a finger or device approaches the surface could be recognized, e.g. by the touch contour or by checking where the palm or other fingers are hovering above the surface. Force vectors enable the user to add additional touch data by making use of friction between finger and screen.

VI. GESTURE RECOGNITION



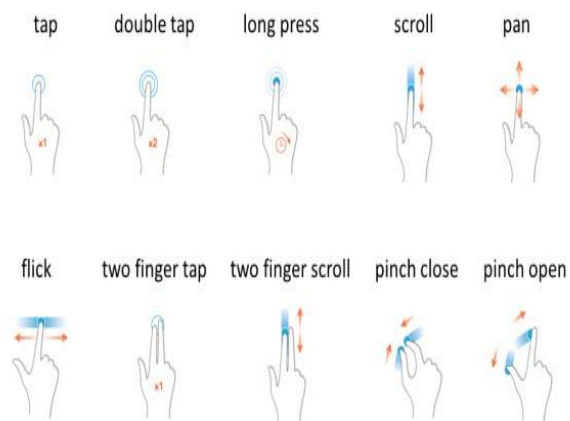
A child being sensed by a simple gesture recognition algorithm detecting hand location and movement.

Gestures can originate from any bodily motion or state but commonly originate from the face or hand. Gesture recognition enables humans to communicate with the machine (HMI) and interact naturally without any mechanical devices. Using the concept of gesture recognition, it is possible to point a finger at the computer screen so that the cursor will move accordingly.

A. Gesture Recognition and Pen Computing

This computing not only going to reduce the hardware impact of the system but also it increases the range of usage of physical world object instead of digital object like keyboard, mouse. This idea may lead us to the creation of holographic display. The term gesture recognition has been used to refer more narrowly to non-text-input, handwriting symbols, such as inking on a graphics tablet, multi-touch gestures, and mouse gesture recognition. This is computer

interaction through the drawing of symbols with a pointing device cursor.



VII. MULTI-TOUCH AMONG US

An important hurdle multi-touch technology helped overcome was with an autistic student. After being unable for 14 years, TouchSmart computing helped the student to speak and communicate for the first time (Laudon 179).

Another advantage is the easy-to-use aspect to children. TouchSmart technology is a simple computer that elementary level students can use (Laudon 179), not to mention kids love the touch interfaces.

The key advantage of the multi-touch interface is that you can peruse the Internet, swipe through photos, shuffle applications around, zoom in & out, and save files and all with just your fingers (Laudon 178).

A beneficial multi-touch application would be electronic signature software, like the Square app. Businesses can easily sign the multi-touch devices with their finger [or a stylus] - something important for businesses that are mobile or completely immersed in the digital world and heavily rely on touch devices for the success of their business.

VIII. CONCLUSION

Touch technology has multiple advantages but few disadvantages. The main issue is that some devices are more touch sensitive than others. The multi-touch has created a major impact on the current innovations. As can be seen, a lot of diverse research has been done on the subject for quite a long time, and is continuing to take place. The revolutionary research in multi-touch was done by Apple and Microsoft. The paper has made an attempt to bring a platform for the understanding of the multi-touch and its technological aspects. The future challenges could be the perfection in Gesture recognition, more touch sensitive screen with multiple touches.

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