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What's New In Multi Touch Technology?

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Abstract:

Technology is touching more people's lives every day. Multi touch-enabled devices and equipment can sense touch inputs in more than one location simultaneously, and they are having a profound impact in industrial settings. Nearly everyone is beginning to interact frequently with multi-touch technology, including end-users, panel operators, engineers, managers, purchasers, executives and other decision-makers.

Multi touch technology can make workers more productive and facilities more profitable, because users can simply do so many things with just their fingers than was previously possible.

Executive Summary:

By offering a more complete picture of how modern multi-touch technology is impacting business, we can better understand the environmental, ergonomic, economic and workflow enhancements that are resulting from innovations in this technology.

This paper will focus specifically on new and existing users of equipment in the fields of building automation and HVAC, medical & healthcare, interactive and self-service kiosks. We'll evaluate the most current technologies, features and benefits of multi-touch technology.

In conclusion, readers should have gained a firm grasp on if and how to integrate touch technologies into their businesses.

1.

What Is Multi Touch?

Unlike single touch input – where users can select a single point, drag and drop, push and slide with only a single finger or stylus – multi touch technologies enable devices to recognize and respond to touch inputs at multiple locations simultaneously.

Figure 1 shows what happens in a multi touch monitor: the screen utilizes a grid for locating the inputs at multiple locations, and the device senses whole group-ings rather than just one point of intersection, which yields high accuracy.
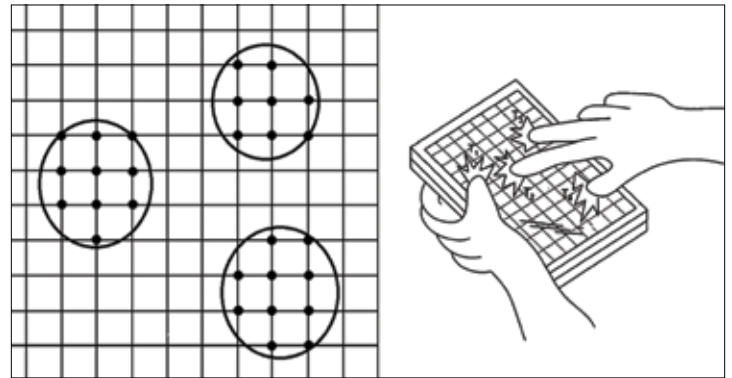

Figure 1. Multi touch

The Benefits Of Multi Touch Over Single Touch

Quite simply, multi touch input expands the range of functionality these devices can support. Two fingers (or activation points) allow users, for example, to zoom in/out or rescale the display, with the right software.

The power of this enhanced functionality becomes immediately apparent when we look at industrial applications. Consider Figure 2.

In an industrial environment, requiring two activation points – that is, both of the user's hands on the screen – can be used before beginning a process to enhance safety. Three and more activation points are also possible by including "gestures," and here custom software affords the ability to be creative while minimizing or eliminating any learning curve.

For example, secure keyless entry to a room can be implemented with a "secret handshake" via touch display. Different security paradigms can be combined to implement a high level of security, e.g., unique gestures on the touch screen display serve as the new password while the meeting schedule further secures the entry.

Another great example is building automation: imagine your building is big enough that when the floor plan fills a display, details are rendered too small to see. At this level, all you can do is get an overview, which is enough for new visitors trying to find their way around but proves insufficient for others needs.

Figure 2. Industrial 2-Hand Lock Out/Activation

Consider a user who wants to find an electrical outlet for his or her iPhone: the user must zoom in and out repeatedly in order to examine each likely location. Multi touch gestures greatly simplify an otherwise manual zooming process.

That's not the only reason to zoom: in key locations, the display may contain important indicator information, like temperature, moisture, safety indicators, pressure volume, etc. Multi touch literally puts all this information at the user's fingertips.

Similarly, if a user needed to read a manual, multi touch makes two-finger scrolling, pinching, spreading and rotating all available and with no learning curve.

2.

What Is Capacitive Touch Technology?

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. [i]

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 3).

Figure 3. Input power, capacitive sensing and signal amplification[ii]

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:

1   Read output from sensing points, producing and analyzing the touch data

2   Then compare the current data to past data and perform actions based on the comparison

3   Additionally, receive and filter the raw data, generate gradient data, calculate boundaries and coordinates for each touch region, performing multipoint tracking.[iii]

Unlike a resistive touchscreen, capacitive touch displays require the direct contact of the finger, capacitive stylus, or special-application glove. However, despite this limitation, the benefits of capacitance-based sensors are numerous, including a long lifetime due to the lack of physical contact with the actual sensors.

A projected capacitive circuit is a specially designed sensor that's so sensitive it can sense through glass up to 6mm thick.
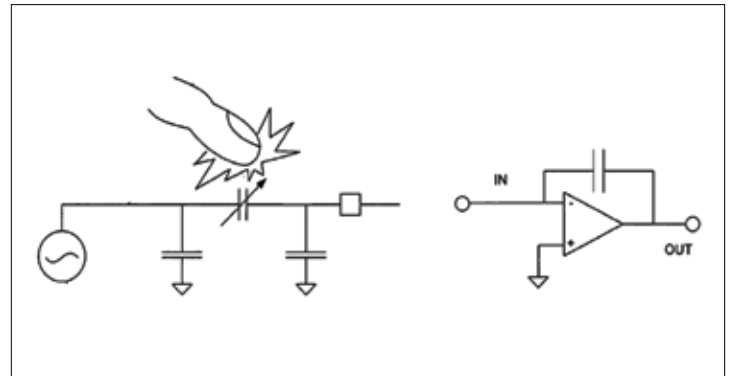
Older Touch Input Technologies

Capacitive touch input is only one technology among many. Additionally, many devices use SAW, infrared and analog resistive technologies. These forms of touch input are discussed in the Appendix and are all available from AIS.
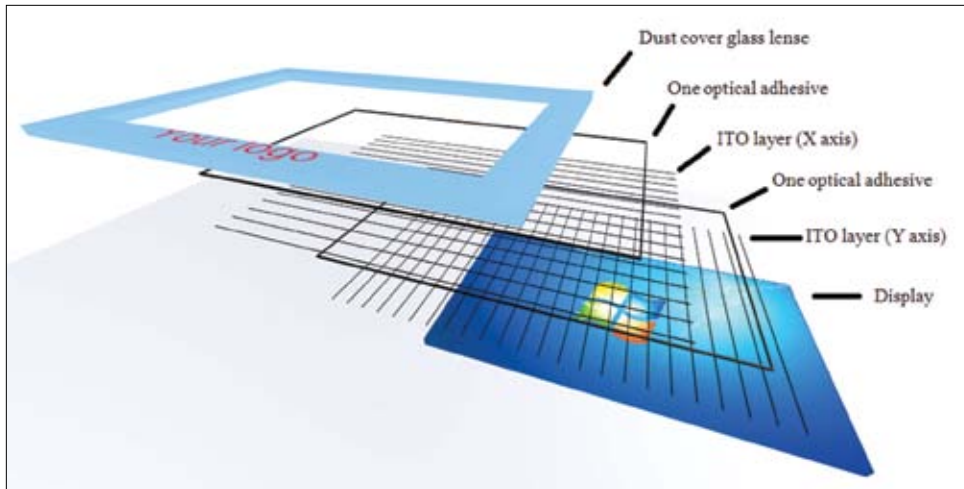
Figure 4. Dust cover glass lenses.
Options: 6mm with vandal proof glass.

3.

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 4).

Customized Touch Screens from AIS. We give you choices!

You are no longer limited to black-and-white printing on glass: here at AIS, we can take your custom orders for Projected Capacitive Multi Touch Displays, with color and logos printed right on the glass. Brand your touch screen devices with vivid, full-color print on glass.
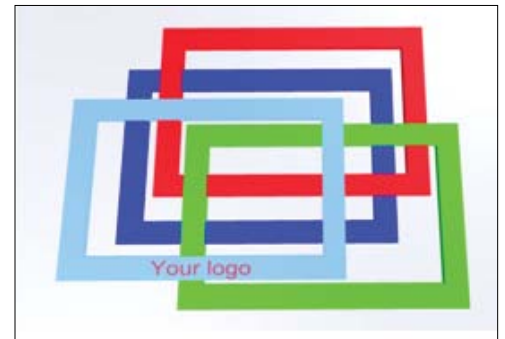
Atop the display screen, but before the touch sensor is added, falls an insulating material to avoid interference from capacitive noise. Particularly if a metal bezel is used, an additional insulator is needed for the same reason (Figure 5).
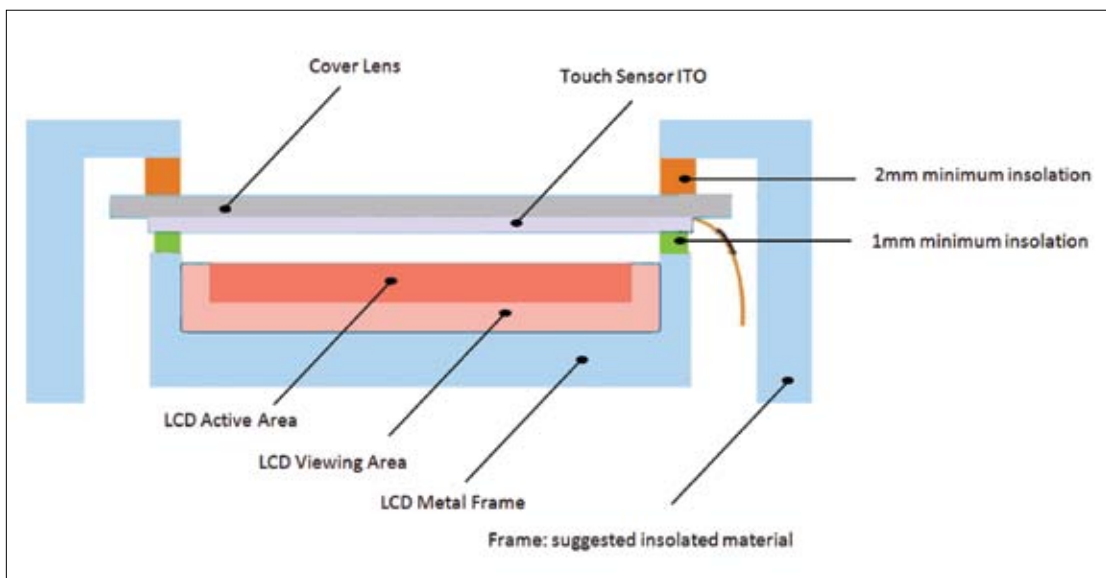
Figure 5.
Touch display layers.

4.

Overview Of Touch-Input Software
Windows Multi Touch[iv]

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.[v]

Windows Embedded

Additionally, Microsoft made Windows Multi Touch available through WCE7 and the WS7P SKU of Windows Embedded Standard 7 Service Pack 1. 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."

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. Meanwhile, OEMs can customize the browser application to match the shell to their entire experience and change its markup with an expression blend. Altogether, the inclusion advanced rich user experiences with mobile devices.

Off The Shelf (OTS) Software

AIS is a leading purveyor of touch technology with both off the shelf (OTS) and custom made-to-order (MTO) product solutions. One goal of this paper is to bring this technology to light; in this section, we'll summarize various software solutions that complete the functionality of the multi touch technology in industrial control and automation settings.

InduSoft EmbeddedView and CEView

InduSoft Embedded View was designed to give users touch access to every feature available in InduSoft Web Studio. In addition, the software can scale applications from small capacity devices (like smartphones) to large-scale projects. Embedded View includes the full 240+ drives available from Indusoft.

InduSoft CEView is based on the InduSoft Windows-based control and monitoring system, offering virtually all of the same features: object-oriented database, report generation, interfaces for PLCs, remote I/O, TCIP/IP networking, and more. InduSoft describes CEView as "a full function supervisory control and monitoring system that fits in the palm of your hand and can be embedded in the chipset of a low cost operator interface." [vi]

Progea Movicon™11 and Movicon™ CE

The Movicon ™ 11 technologies are billed as the only kind that are completed based on XML standards and other modern technologies like SQL, XML, .NET and COM. Movicon™ CE is "a runtime engine for Windows CE that offers a powerful and open HMI solution." It's a single platform that can run XML projects on Win32, Win64 or WinCE.[vii]

The new and evolutional "next generation" has arrived — the **Scada/HMI** software technology that redefines the concepts of supervision and control

A new user experience based on unprecedented graphics combined with the new **Multi-Touch** and **Kinect** interactivity concepts

Copadata Zenon Supervisor

The Zenon Supervisor independent SCADA system enables users to visualize and control complex industrial facilities through a simplified touch interface. Zenon Operator is their embedded HMI system, allowing users to configure and control equipment. Finally, Zenon Logic is an integrated PLC system that offers an integrated, IEC 61131-3-based PLC system. It links PLCs in order to facilitate both process engineering and logical data management.viii

Wonderware Invensys Operations Management ArchestrA System Platform

This scalable software platform integrates existing SCADA, supervisory HMI, MES and EMI systems into a unified operations management hub. The InTouch Compact Edition is widely available via Windows CE devices, offering the ability to connect to multiple I/O drivers simultaneously.ix

5. Conclusion

We've now explored how multi touch technologies open up a world of possibilities: now users can simply do so many things with their fingers that were impossible before. Particularly in complex industrial environments, touch input applications can expand functionality and streamline operations with little-to-no learning curve for operators.

We also examined the underlying electronics and science, to empower readers to better understand and discuss multi touch software and devices with colleagues and vendors. Finally, we provided an overview of OTS software available that makes multi touch devices useful in industrial settings.

About AIS - Headquartered in the USA, in the IT center of Orange County in Irvine, California, AIS is an ISO 9001:2008 certified supplier and manufacturer of rugged computer and display, and had received completion of the International Traffic in Arms Regulations (ITAR) registration from the Directorate of Defense Trade Controls (DDTC). AIS is an established global manufacturer of a wide range off-the-shelf and customized industrial-grade HMI and display products in different configurations for various industrial, military, and outdoor digital signage applications.

Visit us at http://www.aispro.com or call (888) 485 – 6688 for more information.

Acronyms

EMI – Electromotive Interference

ITO – Indium – Tin - Oxide also called TCE

MARS - Multi touch Analog Resistive Screen

MES – Manufacturing Execution Systems

OTS – Off the shelf

POI – Point of Information

Pro-Cap - Projected capacitance

TCE – Transparent Conductive Electrodes

TCF – Transparent Conductive Film

TFR - Thin film resistor

Glossary

Infrared - As in, traditional infrared using absence of light (touch Screen technology)

Interdigital transducers (IDTs) - A device used to convert microwaves to surface acoustic waves

Multi touch - The technology enabling 2 or more XY points of simultaneous contact

Multi touch screen – An LCD screen with a multi touch panel attached

Projected capacitance – A touch screen technology that uses capacitance in a projected area (around the contact point of a finger or conductive pointer)

Touch – In this paper, it means to make contact by finger or pointer device

Touch technology – The enabling science and application of it to send XY coordinates to an application

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