Industry Focus: Touchscreens Press Deep Into Consumer Electronics

Christopher Keuling, Associate Editor

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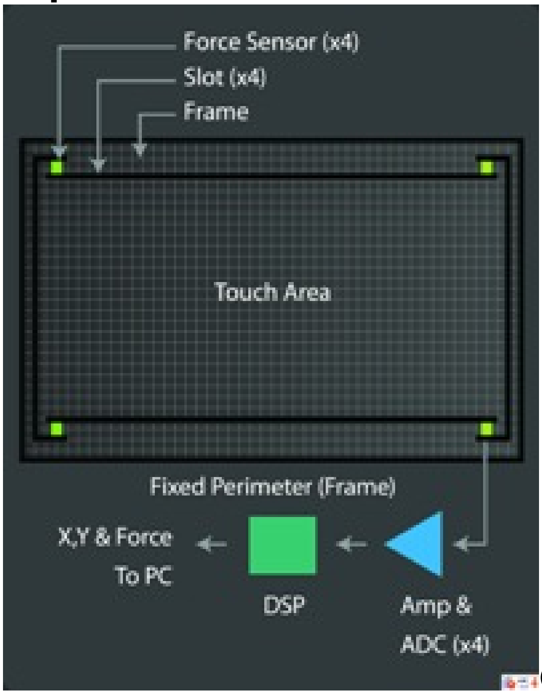
Touchscreen technology has become more prominent in recent years, especially in the consumer and kiosk markets. PDAs, ATM machines, supermarket check-outs, and Apple's iPhone are among the most well-known uses of touchscreen technology. Some touchscreen technologies have found a place in applications where the more commercially known technologies (resistive and capacitive) are inadequate. This month, we review the different types of touchscreen technologies available for the consumer electronics industry, along with their pros and cons, their applications, and a look into the future.

Resistive
Resistive touchscreen technology has two layers of indium tin oxide (ITO) film that the user presses with a stylus (any object, be it a pen or a glove). Resistive screens exhibit single touch recognition and tactile feedback. Resistive screens get worn out after many touches in the same place or from excessive force; they don't let as much light in the display, so more backlighting is needed. Cleaning isn't possible with standard cleaners because the film is upfront on the screen. The film's flexibility can cause the ITO to break down and degrade over time. In addition, resistive technology needs a raised bezel around the screen in order to fit the elements of the technology into a physical space. This form of touchscreen operates in PDAs, retail registers, credit card readers, ATMs, and portable navigation in the car. Resistive technology will still be seen in consumer products, including EMR on tablets for PC monitors, due to its price and name value. However, Eric Itakura, director of business development for touch technology at Leadis, says that, "capacitive touch will become the primary consumer electronic touch technology

within the next few years."

Capacitive

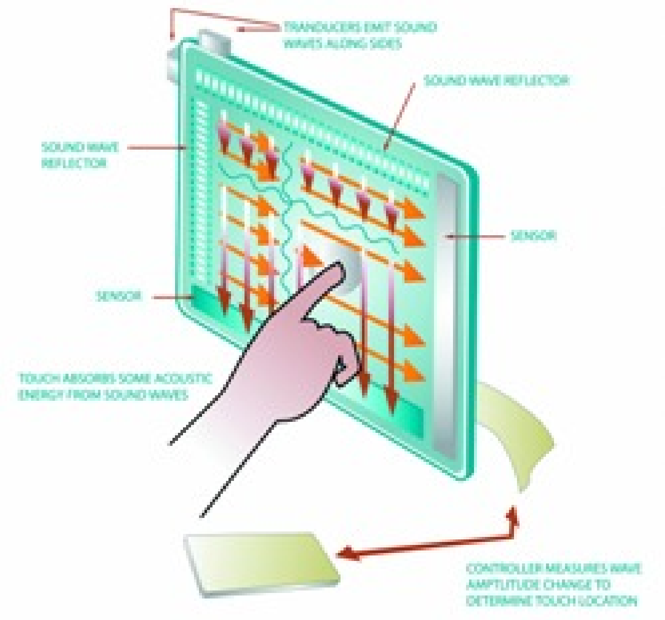


Capacitive touch spiked in popularity after its application in Apple's iPhone. It's also used in portable insulin pumps, lighting controllers, white and brown goods, and kitchen appliances. The technology works by having a finger touch or be in a current range of capacitive touch panels, and the current from the finger creates movement through the conductive layer in the panel. The touch sensor lies behind a flat rigid surface, making it harder to wear out. According to Scott Gray, senior project manager of Sharp's LCD Group, capacitive technology offers surface touch, which allows one-touch input, or mutual touch, which enables multi-touch via an array on the top and bottom of the substrate. Unlike resistive technology, capacitive shows self-calibration and multiple points of touch recognition. Pressure won't activate the buttoning, but an object with current will affect the panel so gloved hands and styli won't work. Capacitive touch is prohibited for use on a large scale or when moisture is present, and there is no tactile feedback. However, Itakura states that haptics can be added for visual, sound, and tactile feedback. Within two to three years, capacitive will be cost-competitive with resistive, making the former the dominant touch type.

Infrared

Infrared is the oldest form of touchscreen technology on the market. It works by creating a matrix that intercepts infrared light across the touchscreen surface, and vertical and horizontal light sensors on all four sides of the screen detect interruptions in the light matrix. This all occurs within a hard glass substrate in outdoor environments such as military and marine applications. According to Steve Kroll, president of E-Z Screen, infrared touchscreen technology offers no loss of linearity up to sizes of 132", ADA compliance for full accessibility, and smart rejection, which means that objects get rejected after 30 seconds of being fixed on the touch surface. However, these objects will interrupt the flow of light waves, and the light sensors in the touchscreen only function if the infrared window or side window is exposed to let light in. There can only be as many transmitters as there are touch sensors. Kroll states that new trends emerging in infrared touch technology include a move to large-scale front and rear projection surfaces, such as laser projectors, and the potential to create a 3-D touch surface.

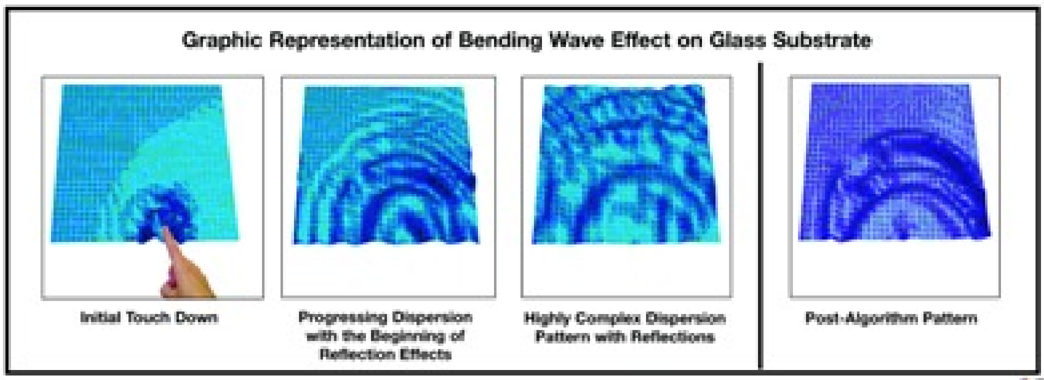
Surface Acoustic Wave (SAW)



S AW touchscreen technology operates by sending acoustic waves across the touch surface. Matt Walsh, sales director for touchscreens at Planar Systems, says that when a touch occurs, an electrical signal gets sent to transmitting transducers, and they convert the signal to ultrasonic waves. Then, reflectors within the touch sensors gather the information, convert the waves back into electrical signals, take heat from the touch, and send the wave out to the controller. This all occurs within a hard glass substrate which can be activated via a glove or a thicker stylus, making it suitable for hospital environments, such as cart-based applications and medical dispensing kiosks. Non-medical applications include multimedia marketing, ticket and vending sales, and kiosks. However, condensation causes false touches and solid obstructions on the screen, causing that area to stop functioning, thus making it inappropriate for use outdoors. Walsh says there will be broader access of SAW technology in the next few years. Until recently, only one supplier owned the rights to the technology.

Bending Wave

The two main bending wave touchscreen technologies are dispersive signal technology (DST) and acoustic pulse recognition (APR). They use piezo-electrical sensors at the edges to detect bending waves, and a DSP to determine touch location. Tim Holt, communications manager of 3M, explains that DST decodes touch location in the controller and processes it in a USB device. APR, however, puts more waves out to the host PC. Bending wave technologies lend themselves to being stretched, making them appropriate in the digital signal space at car dealerships and retail tire chains. However, there is an anti-glare finish on the front of the touch surfa



ce, washing out the screen if used outdoors. In the near future, lamination will allow for more outdoor applications. Holt adds that bending wave will be suitable for transportation (i.e., bus stops and subways), commercial, and industrial applications.

Force Panel
Force-based touch panels measure the force from a touch with four sensors, one on each corner of the screen, and can measure how hard the user is pressing against the panel. David Soss, senior electrical engineer of the InfiniTouch division of QSI, says, “the harder a user pushes on a touch surface, the more accurate the reading will be, with accurate readings being in the 2 N range.” Force panel technology has been around since 1972.
The technology is sensitive to vibration, giving wrong touch readings and inaccuracies. Soss adds that the vandal-and weather-resistant technology can be made from any material. Force panel works in outdoor applications including toll booth collection systems entry/call systems, and outdoor kiosks. The technology will expand in application in the next two to three years, but will not become as prevalent as resistive or capacitive touch technologies.

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