Touch Screen Technology

Mohd Tariq Khan

Assistant Professor, Dept. of Physics, G. F. College, Shahajahanpur, India

Abstract

A touch screen includes a transparent, flexible substrate; a first conductive layer located on the flexible substrate; a flexible transparent cover sheet having integral compressible spacer dots; and a second conductive layer located on the flexible transparent cover sheet, when a force is applied to the touch screen at the location of one of the compressible spacer dots, the compressible spacer dot is compressed to allow electrical contact between the first and second conductive layers.

A touch screen which uses light sources at one or more edges of the screen which directs light across the surface of the screen and at least two cameras having electronic outputs located at the periphery of the screen to receive light from said light sources. A processor receives the outputs of said cameras and employs triangulation techniques to determine the location of an object proximate to said screen. Detecting the presence of an object includes detecting at the cameras the presence or absence of direct light due to the object, using a screen surface as a mirror and detecting at the cameras the presence or absence of reflected light due to an object. The light sources may be modulated to provide a frequency band in the output of the cameras.

KEYWORDS: Technology, Computers, Phones, Surface acoustic wave

Introduction:

Touch screen technology is the direct manipulation type gesture based technology. A Touch screen is an electronic visual display capable of detecting and locating a touch over its display area. This is generally refers to touching the display of the device with a finger or hand. This technology most widely used in computers, user interactive machines, smart phones, tablets etc to replace most functions of the mouse and keyboard. Touch screen technology has been around for a number of years but advanced touch screen technology has come on in leaps and bounds recently. Companies are including this technology into more of their products. The three most common touch screen technologies include resistive, capacitive and SAW (surface acoustic wave). Most of low end touch screen devices contain on a standard printed circuit plug-in board and are used on SPI protocol. The system has two parts, namely; hardware and software. The hardware architecture consists of a stand-alone embedded system using an 8-bit microcontroller, several types of interface and driver circuits. The system software driver is developed using an interactive C programming language [1][2].

Why we use this Technology:

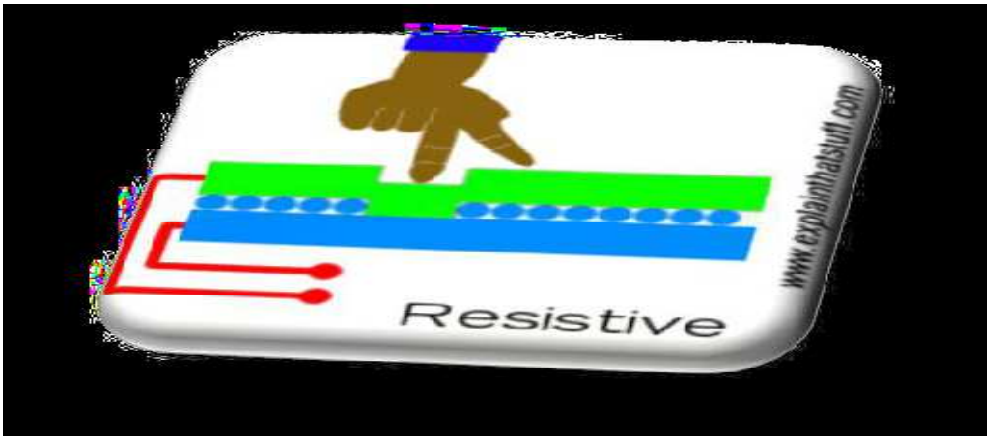
- It is very easy to use
- It increases the speed of tasks.
- It is valuable in accommodating users with physical issues that mightmake a traditional mouse and keyboard setup difficult to use.
- It reduces the size of components.

Types of Touch Screen Technology:

The Touch screen is a 2-dimensional sensing device made of 2 sheets of material separated by spacers. There are four main touch screen technologies: Resistive, Capacitive, Surface Acoustical wave (SAW) and infrared (IR)[2].

Resistive:

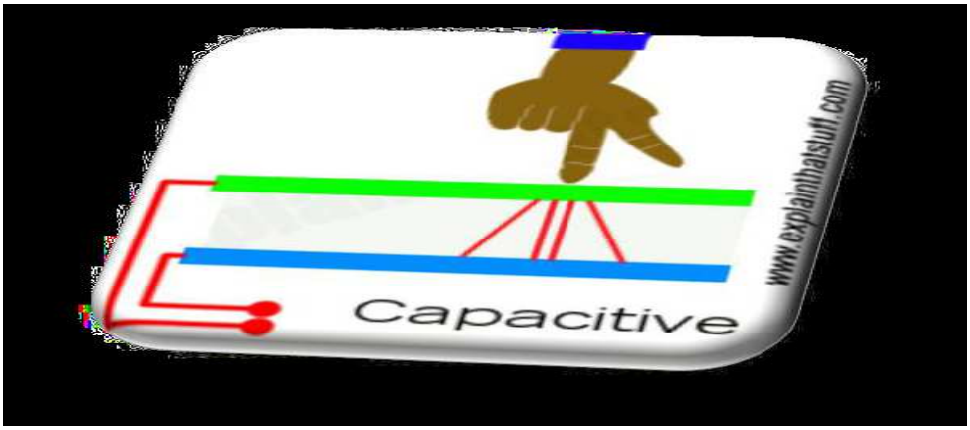
A resistive touch screen panel comprises several layers. It is composed of a flexible top layer made of polythene and a rigid bottom layer made of glass separated by insulating dots, attached to a touch screen controller. When an object, such as a fingertip, presses down onto the outer surface, the two layers touch to become connected at that point: The panel then behaves as a pair of voltage divider, one axis at a time. By rapidly switching between each layer, the position of a pressure on the screen can be read.



Resistive touch is used in restaurants, factories and hospitals due to its high resistance to liquids and contaminants. A major benefit of resistive touch technology is its low cost. Additionally, as only sufficient pressure is necessary for the touch to be sensed, they may be used with gloves on, or by using anything rigid as a finger substitute. Resistive touch screens suffer from poorer contrast; it can be damaged by sharp objects.

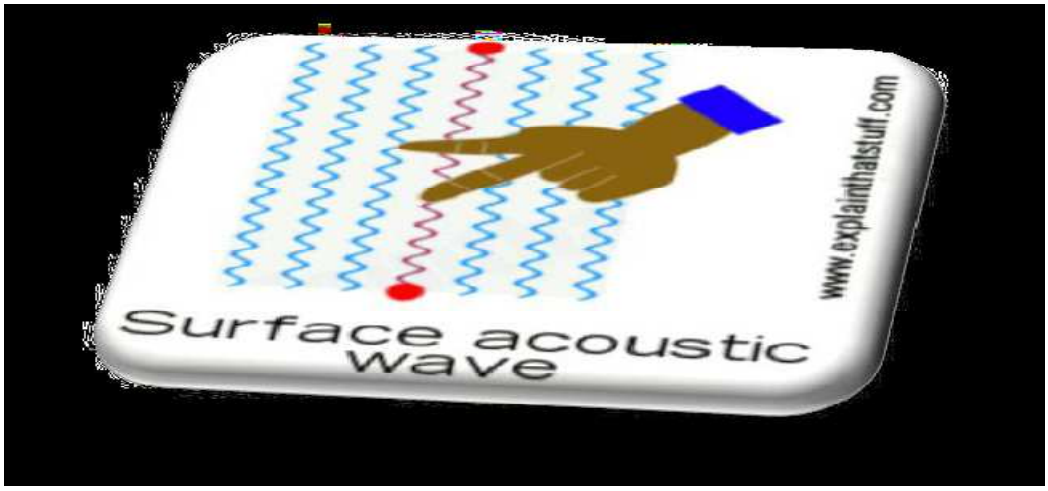
Capacitive:

These screens are made from multiple layers of glass. The inner layer conducts electricity and so does the outer layer, so effectively the screen behaves like two electrical conductors separated by an insulator- in other words, a capacitor. When you bring your finger up to the screen, you alter the electrical field by a certain amount that varies according to where your hand is. Capacitive screens can be touched in more than one place at once. Unlike most other types of touch screen, they don't work if you touch them with a plastic stylus (because the plastic is an insulator and stops your hand from affecting the electric field).



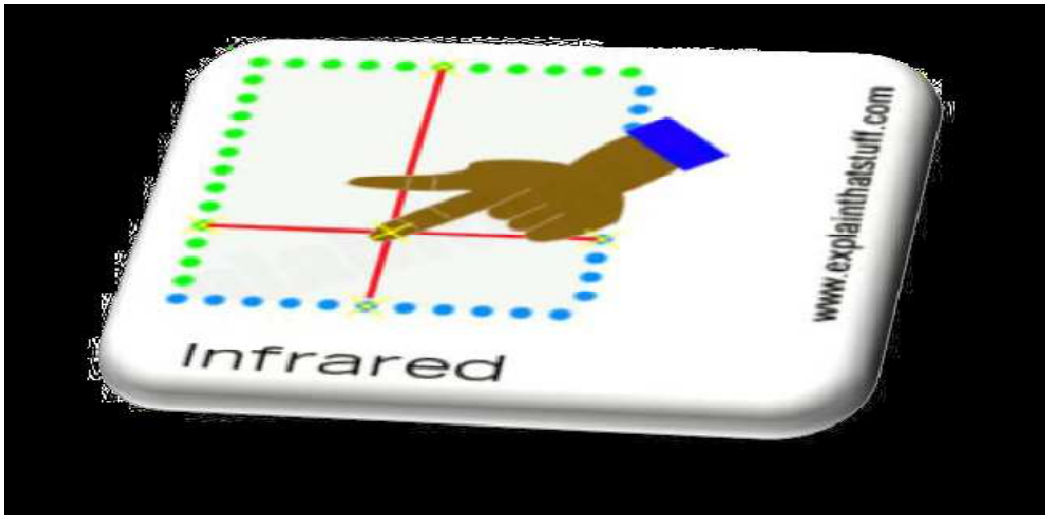
Surface acoustic wave:

The surface acoustic wave technology contains two transducers placed along X-axis and Y-axis of the monitor's glass plate along with some reflectors. When the screen is touched, the waves are absorbed and a touch is detected at that point. These reflectors reflect all electrical signals sent from one transducer to another. This technology provides excellent through put and quality.



Infrared grid:

In infrared touch screen technology, an array of X and Y axis is fitted with pairs of IR Leds and photo detectors. Photo detectors will detect any image in the pattern of light emitted by the Leds whenever the user touches the screen.

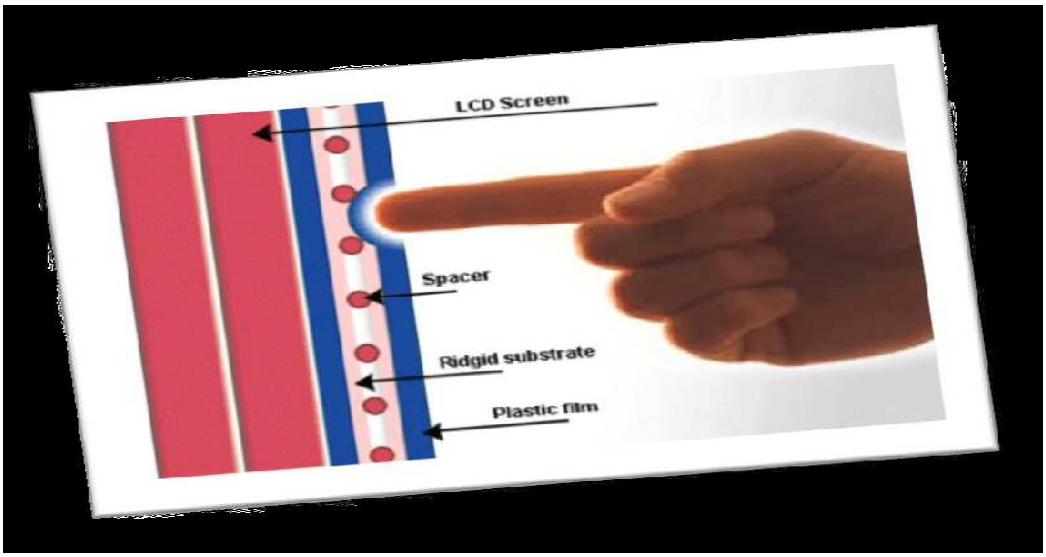


Construction:

There are several principal ways to build a touch screen. The key goals are to recognize one or more fingers touching a display, to interpret the command that this represents, and to communicate the command to the appropriate application.

In the most popular techniques, the capacitive or resistive approach, there are typically four layers:

1. Top polyester coated with a transparent metallic conductive coating on the bottom.
2. Adhesive spacer
3. Glass layer coated with a transparent metallic conductive coating on the top
4. Adhesive layer on the backside of the glass for mounting.



When a user touches the surface, the system records the change in the electric current that flows through the display.

Dispersive-signal technology which 3M created in 2002, measures the piezoelectric effect the voltage generated when mechanical force is applied to a material—that occurs chemically when a strengthened glass substrate is touched.

There are two infrared-based approaches. In one, an array of sensors detects a finger touching or almost touching the display, thereby interrupting light beams projected over the screen. In the other, bottom-mounted infrared cameras record screen touches.

In each case, the system determines the intended command based on the controls showing on the screen at the time and the location of the touch.

Development:

The development of multipoint touch screens facilitated the tracking of more than one finger on the screen; thus, operations that require more than one finger are possible. These devices also allow multiple users to interact with the touch screen simultaneously. With the growing use of touch screens, the marginal cost of touch screen technology is routinely absorbed into the products that incorporate it and is nearly eliminated. Touch screens now have proven reliability. Thus, touch screen displays are found today in airplanes, automobiles, gaming consoles, machine control systems, appliances, and handheld display devices including the Nintendo DS and multi-touch enabled cell phones; the touch screen market for mobile devices was projected to produce US$5 billion by 2009. The ability to accurately point on the screen itself is also advancing with the emerging graphics tablet/screen hybrids. PVDF plays a major role in this innovation due its high piezoelectric properties .Tap Sense, announced in October 2011, allows touch screens to distinguish what part of the hand was used for input, such as the fingertip, knuckle and fingernail. This could be used in a variety of ways, for example, to copy and paste, to capitalize letters, to activate different drawing modes, and similar.

A real time Application: Controlling home appliances using Touch Screen Technology:

It is possible to control the electrical appliances at home using touch screen technology. The whole system works by sending input commands from the touch screen panel through the RF communication which are received at the receiver end and control the switching of loads. At the transmitter end, a touch screen panel is interfaced to the Microcontroller through a touch screen connector. When an area on the panel is touched, the x and y coordinates of that area are sent to the Microcontroller which generates a binary code from the input. This 4 bit binary data is given to the data pins of the H12E encoder which develops a serial output. This serial output is now sent using a RF module and an antenna. At the receiver end, the RF module receives the coded serial data, demodulates it and this serial data is given to the H12D decoder [3][4]. This decoder converts this serial data into the parallel data which pertains to the original data sent by the microcontroller at transmission end. The microcontroller at the receiver end receives this data and accordingly sends a low logic signal to the corresponding opt isolator which in turn switches on the respective TRIAC to allow AC current to the load and the respective load is switched on[5].

Light Pen:

Light pens were an early form of touch screen technology, but they worked in a completely different way to modern touch screens. In old-style computer screens, the picture was drawn by an electron beam that scanned back and forth, just like in a cathode-ray tube television. The pen contained a photoelectric cell that detected the

electron beam as it passed by, sending a signal to the computer down a cable. Since the computer knew exactly where the electron beam was at any moment, it could figure out where the pen was pointing. Light pens could be used either to select menu items or text from the screen (similar to a mouse) or, as shown in the picture here, to draw computer graphics.

Conclusion:

Touch systems represent a rapidly growing subset of the display market. Though the Touch screen technology contains some limitations it is user friendly, fast, accurate and easy to operate. It has been widely accepted and a little modification can replace the mouse and key board completely in near future.

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