

## A Study on Various Touch Screen Technologies

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### Abstract:

The investigation about the touchscreen display is introduced here. What are the different types of touchscreen display and the combination of technology is introduced here. The touchscreen display is mostly used in today's world. The demand of touchscreen is improving day by day. This technology is a unique type of visual display device that allows the user to physically interact with the computer or daily electronic appliances where the touchscreen technology is used. In this paper we have provided information on each touch screen technology and their basic operation. Also it includes common applications and current issues or future scope for a technology.

**Keywords** — Touchscreen technology, capacitive, resistive, surface wave acoustic and infrared touch type.

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### I. INTRODUCTION

Touchscreen technology is a gesture based technology with direct manipulation type. A touchscreen is an electronic visual display, which is capable of detecting and locating a touch over its display area.[1] The idea of a touch screen was first invented by E.A. Johnson in 1965. In the early 1970s, the first touch screen was developed by CERN (European Organization for Nuclear Research). The two engineers' Frank Beck and Bent Stumped, developed transparent touch screen. The first physical product of touch screen device was created and utilized in 1973. After this George Samuel Hurst American inventors developed first resistive touch screen, but didn't produce and used until 1982.[2]

This technology generally referred to as touching the display of the device with a hand or finger this

technology is most widely used in user interactive machines, computer, smartphone tablets, laptop display, gaming consoles, printers, industries, ATMs, shopping malls, ticket vending machine with increasing in demand for intuitive and easy GUI (Graphical user interface). There are different types of touch screen technologies available; some of the touch screens use a grid of infrared beam to sense the presence of finger instead of utilizing touch-sensitive input.[3]

This technology is replacing the most function of mouse and keyboard. The technology came around a number of years ago but advanced touchscreen technology came recently. There are many companies now which use this technology in their products. The most common touch screen technologies include resistive, capacitive, surface acoustic wave (SAW), infrared optical touch type.[2]

## II. METHODOLOGY

### A. Types of Touch Screen Technology

#### 1. Resistive Touch Type

In this technology the touch panel covers layers of two flexible sheets which are coated by resistive material. Also flexible sheets are separated by air gaps. There are two types of layers, digital type and analogue type. Whenever the touch panel will be pressed, it pushes next layer as a result it senses pressure and works accordingly.[4] There are different resistive touches like 4-wired

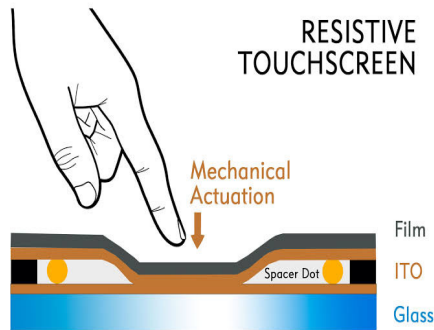


Fig.1 Resistive Touch Type

resistive touch, 5-wired resistive touch, 8-wired resistive touch screen.

#### 2. Capacitive Touch Type

This technology works on the principle of capacitance. As the human finger when touched the capacitor of the circuit, it acts as another capacitor added to the circuit. Here human body acts as a Dielectric .So this increases the overall capacitance of the circuit and interferes with the charging and discharging times of the circuit.[5] As a result the difference in the charge-discharge time across the circuit will signify the presence of the touch by human.

The only disadvantage of this technology is it works only when naked finger is applied as an input.

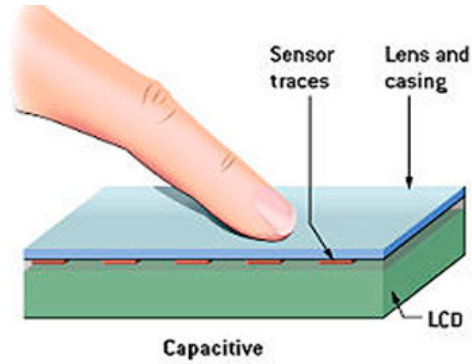


Fig.2 Capacitive Touch Type

#### 3. Surface Acoustic Wave (SAW)

SAW touchscreens works on the principle of sound waves. Two transducers are being placed in two of the corners, and two receivers are being mounted in the opposite corners.

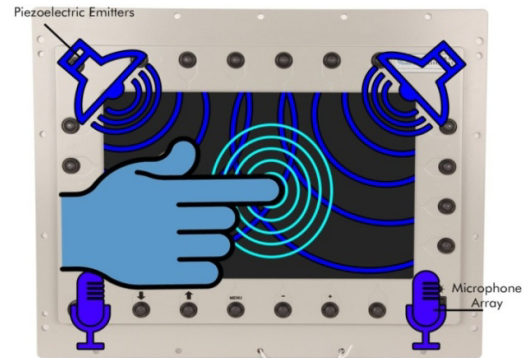


Fig.3 SAW Touch Type

A sound wave travel parallel to the edges. When sound wave encounters the reflectors, wave is transmitted from the transducers to the receivers.[4] A touch point is detected when a difference in the amplitude of the sound wave is seen. The drawback of this technology is that that the surface gets easily contaminated.

#### 4. Infrared Optical Touch Type

Infrared touch uses light emitting diodes and sensors that are embedded in a bezel around the display which will emit and detect rows and columns of infrared light across the front of the display. Infrared touch screens do not require any patterning on the glass which increases durability

and optical clarity.[6] But the cost of manufacturing this touch screen is on expensive side.[7]

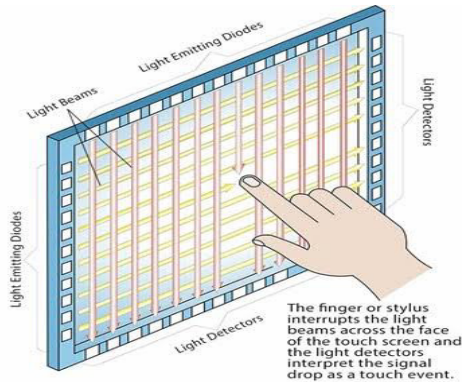


Fig.4 Infrared Touch Type

### III. RESULTS

TABLE I  
 Comparison of Various Touchscreen Technologies

Properties	Resistive Touch Type	Capacitive Touch Type	Surface Acoustic Wave	Infrared Touch Type
Transparency	Bad	Normal	Good	Good
Touch	Anything	Conductive	Finger/ Pen	Finger/ Pen
Resolution	Moderate	High	Low	Low
Sensitivity	High	Normal	Normal	Low
Weather immunity	High	Moderate	Low	High
Sensor Substrate	Polyester top sheet	Glass/ITO	Glass ITO	Any Substrate
Montior Option	LCD/ CRT	LCD/LED/ CRT	LCD/CRT	LCD/CRT

### IV.CONCLUSIONANDFUTURESCOPE

This paper gives a review on touch screen and touch screen technologies and explaining that, now days everyone is familiar with touch screens, but we don't know what the technology behind it is i.e. how the touch is being sensed, how it is constructed, what are the technologies behind it and what are the various method to construct touch screen.

The touch screen interface is easier to use than other input devices. It is useful to make information more easily accessible by allowing the user to navigate by simply touching the display screen.

The optimistic goal of the future is to enhance usage of technology with low cost and high efficiency. When compared to resistive, capacitive, SAW and infrared LED touch types the resistive and infrared touch types are better which are efficient to durability of touch panel and supports a harsh environment when compared to SAW so no matter when we work on the dust, dirt and stream of water imposed on. If we compare with capacitive we would observe they are resistant to chemicals and the screen can easily break down. For instance, if you look at these two technologies, the infrared is a better option as it provides excellent image clarity and is quite accurate than the resistive touch type.[12]

The future of touch surface is touch screen video projectors. In a restaurant, for e.g., we can place the order using the surface of the table as the touch interface, instead of using a touch screen laptop. The ability to transform any surface in a touch screen means lower costs, making the Technology more cost effective.

Touch screens can suffer from the problem of fingerprints on the display. This can be mitigated by the use of materials with optical coatings designed to reduce the visible effects of fingerprint oils, such as the oleo phobic coating used in the i-Phone 3G, or by reducing skin contact by using a fingernail.

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