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Touch Screen Technology – A Review

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Abstract: Touch screen technology which allows user to interact directly with what is being displayed, rather indirectly using mouse or keyboard. It can be used without any intermediate devices. Touch screen is usually found in smart phones, video games, kiosks, navigation system etc.

Keyword: *Touch Screen, Sensors, Screen, Layers, Fingers and Stylus.*

I. INTRODUCTION

A touch screen is an electronic visual display that can detect the presence and location of a touch within the display area. Touch screens can sense finger and other passive objects, such as a stylus. However if the object sensed is active, as with a light pen.

A. History

In 1971DR.Sam Hurst, founder of ELOGRAPHICS developed the first touch opaque sensor ELAGRAPH at the University of Kentucky. In 1974 he developed the first real touch screen. In 1977, ELOGRAPHICS developed the five-wire resistive technology then with the backing of Siemens Corporation, developed a curved glass sensor called the Touch Screen. The new transparent technology, ACCUTOUCH was later developed by the founder of ELOGRAPHICS, Dr. Hurst and Bill Colwell. This technology was invented by E.A. Johnson around 1965 for air traffic control. In 1983, HP-150 home computer uses infrared technology. In 1993, Apple's Newton and IBM's Simon came. In 2002 Microsoft's Windows XP tablet. In 2007 Apple's IPHONE (multi-touch) was launched.

B. What is touch screen?

An input/output device that accept input directly from the monitor, the user touches words, graphical icons or symbols displayed on screen to activate commands. A touch screen is a computer display screen that is sensitive to human touch, allowing a user to interact with the computer by touching pictures or words on the screen.

C. First Touch Telephone

Apple was the first with a touch screen Tele-phone in the year of 1983. Jason ford of ELO touch systems, (the company whose founder invented touch screen technology) for providing the touch technology. In 1971, the first Touch Sensor was developed by Doctor Sam Hurst.

D. First Touch Mobile:

The NOKIA 7710 is the first touch screen mobile phone model produced by Nokia. The 7710 is based on the Nokia 7700 which was never released. It was the Nokia's first and so far only smart phone to run the series 90 GUI a top the SYMBIAN OS.

II. HOW DOES A TOUCH SCREEN WORKS?

A basic Touch Screen has three main components:

1. A touch sensor
2. A controller
3. A software driver.

A. Touch Sensor

A touch screen sensor is a clear glass panel with a touch responsive surface. The touch sensor/panel is placed over a display screen so that the responsive area of the panel covers the viewable area of the videos screen. There is several type of touch sensor technology available in market today, each using different method to detect touch input. The sensor generally has an electrical current or signal going through it and touching the screen causes a voltage or signal changes. This voltage change is used to determine the location of the touch to the screen.

B. A Controller

A controller is a small PC card that connects between the touch sensor and PC. It takes information's from the touch sensor and translates it into information the PC can understand. The controller is usually installed

inside the monitor for integrated monitors or it is housed in the plastic case for external touch add-ons/overlays. The controller determines what type of interface/connection you will need on the PC. Specialized controllers are also available that works with DVD players and other devices.

C. A Software Driver

The diver is a software update for the PC system that allows the touch screen and computers to work together. It tells the computers operating system how to interpret the touch event information that is sent from the controller. Most touch screen drivers today are mouse-eliminated type driver. This makes touching the screen the same as clicking your mouse at the same location on the screen.

III. TOUCH SCREEN TECHNOLOGY

Four main technology are used to make touch screen.

1. Resistive
2. Capacitive
3. Surface Acoustic Wave(SAW)
4. Infrared LED or Optical

A. Resistive Touch Screens

It contains two layers of conductive material, which is separated by thin spaces. Touch creates contact between resistive layers completing circuit. It consists of Indium Tin Oxide (ITO) layers. The Touch Screen is also of different types as 4-wire design and 5-wire design and 8-wire.

Working:

Step1: Initially user presses down.

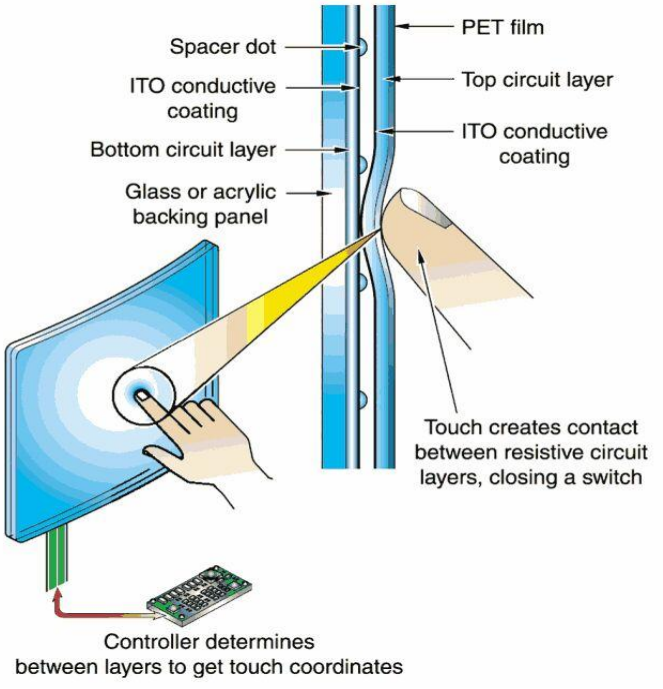
Step2: Contact is made.

Step3: uniform voltage is given to the first layer.

Step4: And same force touches on to the second layer, which is happened instantaneously.

Advantages:

- Works well with fingertip or stylus input.
- It is most affordable Touch Screen Technology.
- Most probably it is rugged and long lasting.
- It has a multi touch input capability.



	4 Wire	5 Wire	8 Wire
Linearity	Very Good	Least Linear	Very Good
Power	Low	Medium	Low
Bus Bar Size	Thin	Medium	Wide
Drift Susceptibility	Susceptible	Susceptible	Senses & Compensates
Durability	Medium	High	Medium
Cost	Low	Medium	Medium
Suppliers	Many	Many	Fewest

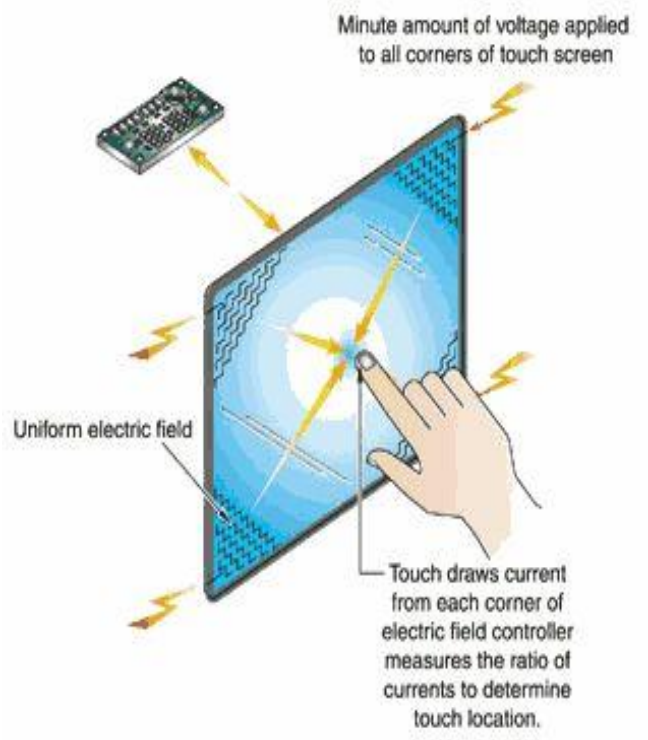
Figure 3: Comparison of Wires in Resistive Touch Screens

Disadvantages:

- Not as accurate.
- Multi-touch is much more complex.
- Usually there is no discretion between stylus and finger.
- More pressure is needed.

B. Capacitive Touch Screens

It consists of Insulators (Glass or Air), Glass panel with conductive Indium Tin Oxide (ITO) layer. It is also of two types as Surface and Projected. Small amount of voltage is applied to four corners of the Touch Screen.



Advantages:

- It Has Durable Surface Material.
- High Endurance
- Very Accurate
- Good Optical Quality

Disadvantages:

- Trigged only by bare finger or active stylus

C. Surface Acoustic Wave (Saw) Screens

Surface consists of glassy overlay with transmitting and receiving transducers. Electrical signals sent to the transmitting transducers converts to ultrasonic waves. Waves are directed across screen by reflectors then directed to receiving transducers.

Working:

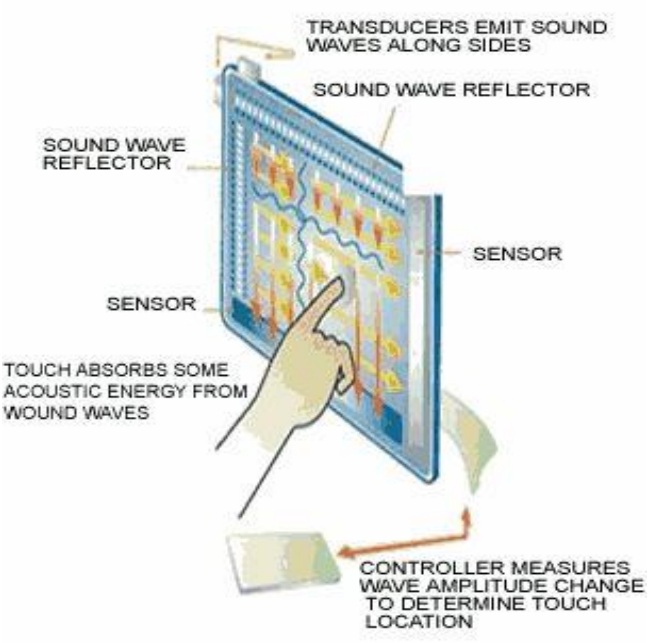
When finger touches the screen it absorbs waves. This change in the ultrasonic waves registers the position of the touch event and sends this information to the controller for processing.

Advantages:

- Durable glass construction
- High optical clarity
- Activated by a finger, gloved hand or soft tip stylus

Disadvantages:

- Moving liquids or condensation can cause false touches
- Solid contaminants create non-touch areas until removed
- Does not supports drag or draw effectively



D. Infrared Led or Optical Touch Screens

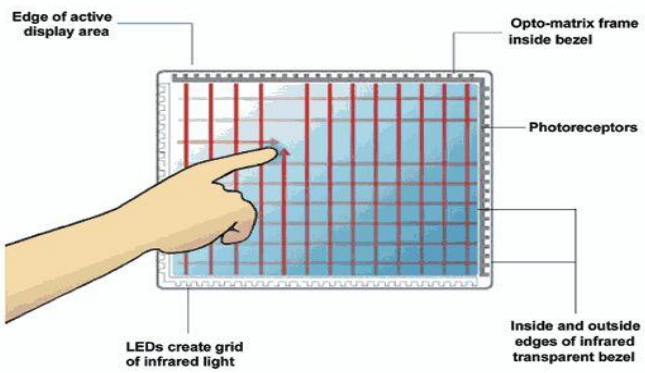
Optical touch screen use infrared LED's and matching photo detectors. Touching screen interrupts LED's. Cameras detect reflected LED caused by touch. Controller able to calculate coordinates from camera data.

Advantages:

- High optical clarity
- Durable surface
- Supports multi-touch
- Can scale to large sizes

Disadvantages:

- More expensive
- Cameras can get out of alignment



Touch Screen Technology Comparison Chart

	Resistive	Infrared	SAW	Capacitive
Touch Resolution	High	High	Average	High
Clarity	Average	Good	Good	Good
Operation	Finger or Stylus	Finger or Stylus	Finger or Soft-tipped Stylus	Finger only
Durability	Can be Damaged by Sharp Objects	Highly Durable	Susceptible to Dirt and Moisture	Highly durable

Overall Advantages Of All Touch Screens:

- A touch screen is easy to use as the user can touch what he/she want to display on the screen.
- Save spaces as no buttons are required.
- Touch screens are faster pointing devices.
- Touch screen have easier hand eye coordination than buttons.
- Touch screens are durable.

Overall Disadvantages Of All Touch Screens:

- Screen has to be really big when pressing with your fingers.
- Big screens lead to low battery life.
- Most user interfaces are not optimized for thumb operations, so a stylus is necessary and this means using two hands.
- Screen gets very dirty often.
- These devices require massive computing power which leads to slow devices.

CONCLUSION

Thought of touch screen technology contains some of the limitations. It is very user friendly, fast, accurate and more fun to operate. It has been widely accepted. And now by just modifying the mouse and key boards completely in near future.

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