A

Seminar report

On

Touch Screen Technology

Submitted in partial fulfillment of the requirement for the award of degree of ECE

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Acknowledgement

I would like to thank respected Mr…….. and Mr. ……..for giving me such a wonderful opportunity to expand my knowledge for my own branch and giving me guidelines to present a seminar report. It helped me a lot to realize of what we study for.

Secondly, I would like to thank my parents who patiently helped me as i went through my work and helped to modify and eliminate some of the irrelevant or un-necessary stuffs.

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Last but clearly not the least, I would thank The Almighty for giving me strength to complete my report on time.

Preface

I have made this report file on the topic **Touch Screen Technology** ; I have tried my best to elucidate all the relevant detail to the topic to be included in the report. While in the beginning I have tried to give a general view about this topic.

My efforts and wholehearted co-corporation of each and everyone has ended on a successful note. I express my sincere gratitude to ……..who assisting me throughout the preparation of this topic. I thank him for providing me the reinforcement, confidence and most importantly the track for the topic whenever I needed it.

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INTRODUCTION

A **touchscreen** is an electronic visual display that the user can control through simple or multi-touch gestures by touching the screen with a special stylus/pen and-or one or more fingers.Some touchscreens use an ordinary or specially coated gloves to work while others use a special stylus/pen only. The user can use the touchscreen to react to what is displayed and to control how it is displayed (for example by zooming the text size).

The touchscreen enables the user to interact directly with what is displayed, rather than using a mouse, touchpad, or any other intermediate device (other than a stylus, which is optional for most modern touchscreens).

Touchscreens are common in devices such as game consoles, personal computers, tablet computers, and smartphones. They can also be attached to computers or, as terminals, to networks. They also play a prominent role in the design of digital appliances such as personal digital assistants (PDAs), satellite navigation devices, mobile phones, and video games and some books (Electronic books).

The popularity of smartphones, tablets, and many types of information appliances is driving the demand and acceptance of common touchscreens for portable and functional electronics. Touchscreens are found in the medical field and in heavy industry, as well as for automated teller machines (ATMs), and kiosks such as museum displays or room automation, where keyboard and mouse systems do not allow a suitably intuitive, rapid, or accurate interaction by the user with the display's content.

Historically, the touchscreen sensor and its accompanying controller-based firmware have been made available by a wide array of after-market system integrators, and not by display, chip, or motherboard manufacturers. Display manufacturers and chip manufacturers worldwide have acknowledged the trend toward acceptance of touchscreens as a highly desirable user interface component and have begun to integrate touchscreens into the fundamental design of their products.

WHAT IS TOUCH SCREEN TECHNOLOGY?

Touchscreen technology is the direct manipulation type gesture based technology. Direct manipulation is the ability to manipulate digital world inside a screen without the use of command-line-commands.

A device which works on touchscreen technology is coined as Touchscreen. A touchscreen is an electronic visual display capable of 'detecting' and effectively 'locating' a touch over its display area.

It is sensitive to the touch of a human finger, hand, pointed finger nail and passive objects like stylus. Users can simply move things on the screen, scroll them, make them bigger and many more.

HISTORY AND DEVELOPMENT TOUCH SCREEN

In 1971, the first "Touch Sensor" was developed by Doctor Sam Hurst (founder of Elographics) while he was an instructor at the University of Kentucky. This sensor, called the "Elograph," was patented by The University of Kentucky Research Foundation. The "Elograph" was not transparent like modern touch screens; however, it was a significant milestone in touch screen technology. In 1974, the first true touch screen incorporating a transparent surface was developed by Sam Hurst and Elographics.

In 1977, Elographics developed and patented five-wire resistive technology, the most popular touch screen technology in use today. Touchscreens first gained some visibility with the invention of the computer-assisted learning terminal, which came out in 1975 as part of the PLATO project. Touchscreens have subsequently become familiar in everyday life. Companies use touch screens for kiosk systems in retail and tourist settings, point of sale systems, ATMs, and PDAs, where a stylus is sometimes used to manipulate the GUI and to enter data. The popularity of smart phones, PDAs, portable game consoles and many types of information appliances is driving the demand for, and acceptance of, touchscreens.

From 1979–1985, the Fairlight CMI (and Fairlight CMI IIx) was a high-end musical sampling and re-synthesis workstation that utilized light pen technology, with which the user could allocate and manipulate sample and synthesis data, as well as access different menus within its OS by touching the screen with the light pen. The later Fairlight series III models used a graphics tablet in place of the light pen.

The HP-150 from 1983 was one of the world's earliest commercial touchscreen computer. It did not have a touchscreen in the strict sense; instead, it had a 9" Sony Cathode Ray Tube (CRT)

surrounded by infrared transmitters and receivers, which detected the position of any non-transparent object on the screen.

Until recently, most consumer touchscreens could only sense one point of contact at a time, and few have had the capability to sense how hard one is touching. This is starting to change with the commercialization of multi-touch technology.

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Development

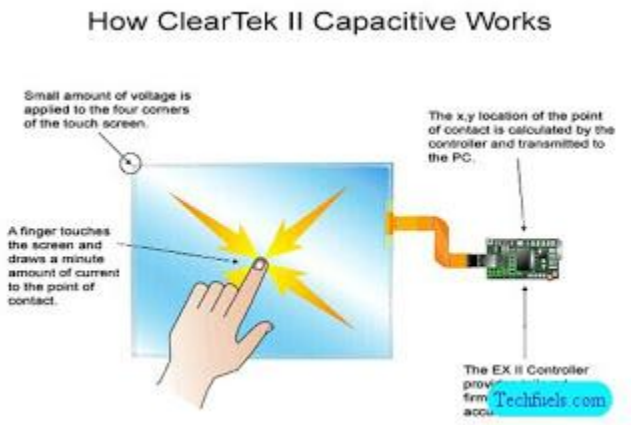
Virtually all of the significant touchscreen technology patents were filed during the 1970s and 1980s and have expired. Touchscreen component manufacturing and product design are no longer encumbered by royalties or legalities with regard to patents and the manufacturing of touchscreen-enabled displays on all kinds of devices is widespread.

The development of multipoint touchscreens 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 touchscreen simultaneously.

With the growing acceptance of many kinds of products with an integral touchscreen interface, the marginal cost of touchscreen technology is routinely absorbed into the products that incorporate it and is effectively eliminated. As typically occurs with any technology, touchscreen hardware and software has sufficiently matured and been perfected over more than three decades to the point where its reliability is proven. As such, touchscreen displays are found today in airplanes, automobiles, gaming consoles, machine control systems, appliances, and handheld display devices of every kind. With the influence of the multi-touch enabled iPhone, the touchscreen market for mobile devices is projected to produce US$5 billion in 2009.

The ability to accurately point on the screen itself is also advancing with the emerging graphics tablet/screen hybrids.

Finger stress



An ergonomic problem of touchscreens is their stress on human fingers when used for more than a few minutes at a time, since significant pressure can be required for certain types of touchscreen. This can be alleviated for some users with the use of a pen or other device to add leverage and more accurate pointing. The introduction of such items can sometimes be problematic, depending on the desired use (e.g., public kiosks such as A.T.M.s). Also, fine motor control is better achieved with a stylus, because a finger is a rather broad and ambiguous point of contact with the screen itself.

WHY USE TOUCH SCREEN

- Enable first-time users to interface with computers instantly, without any training.
- Eliminate operator errors because users make selections from clearly defined menus.
- Eliminate keyboards and mice, which many novice users find difficult to use.
- Rugged enough to stand up to harsh conditions where keyboards and mice can be damaged.
- Provide fast access to all types of digital content.
- Ensure that no space is wasted since the input device is completely integrated into the monitor.

HOW DOES A TOUCHSCREEN WORK?

A basic touchscreen has three main components: a touch sensor, a controller, and a software driver. The touchscreen is an input device, so it needs to be combined with a display and a PC or other device to make a complete touch input system.

TouchSensor

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 video screen. There are several different touch sensor technologies on the market today, each using a 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 change. This voltage change is used to determine the location of the touch to the screen.

Controller

The controller is a small PC card that connects between the touch sensor and the PC. It takes information from the touch sensor and translates it into information that PC can understand. The controller is usually installed inside the monitor for integrated monitors or it is housed in a plastic case Tor external touch addÃ‚Â¬ons/overlays.

The controller determines what type of interface/connection you will need on the PC. Integrated touch monitors will have an extra cable connection on the back for the touchscreen. Controllers are available that can connect to a Serial/COM port (PC) or to a USB port (PC or Macintosh). Specialized controllers are also available that work with DVD players and other devices.

Software Driver

The driver is a software update for the PC system that allows the touchscreen and computer to work together. It tells the computer's operating system how to interpret the touch event information that is sent from the controller.

Most touch screen drivers today are a mouse-emulation type driver. This makes touching the screen the same as clicking your mouse at the same location on the screen. This allows the touchscreen to work with existing software and allows new applications to be developed without the need for touchscreen specific programming.

Some equipment such as thin client terminals, DVD players, and specialized computer systems either do not use software drivers or they have their own built-in touch screen driver.

TYPES OF TOUCHSCREEN TECHNOLOGY

Let us now give an engineer's eye to this revolutionary technology. A touchscreen is a 2 dimensional sensing device made of 2 sheets of material separated by spacers. There are four main touchscreen technologies:

1) Resistive

2) Capacitive

3) Surface Acoustic Wave

4) Infrared

Resistive Touchscreen Technology

A resistive touchscreen panel is composed of several layers, the most important of which are two thin, metallic, electrically conductive layers separated by a narrow gap. When an object, such as a finger, presses down on a point on the panel's outer surface the two metallic layers become connected at that point: the panel then behaves as a pair of voltage dividers with connected outputs. This causes a change in the electrical current which is registered as a touch event and sent to the controller for processing.

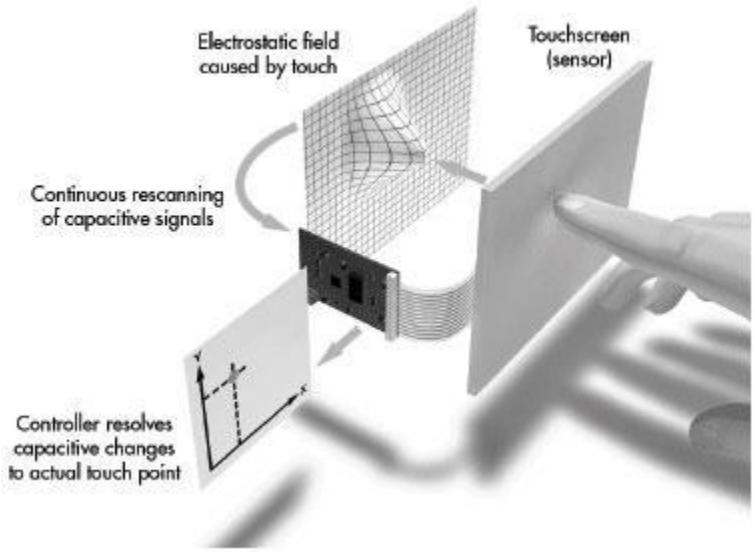
In another way The resistive system consists of a normal glass panel that is covered with a conductive and a resistive metallic layer. These two layers are held apart by spacers, and a scratch-resistant layer is placed on top of the whole setup. An electrical current runs through the two layers while the monitor is operational. When a user touches the screen, the two layers make contact in that exact spot. The change in the electrical field is noted and the coordinates of the point of contact are calculated by the computer. Once the coordinates are known, a special driver translates the touch into something that the operating system can understand, much as a computer mouse driver translates a mouse's movements into a click or a drag.

Capacitive Touchscreen Technology

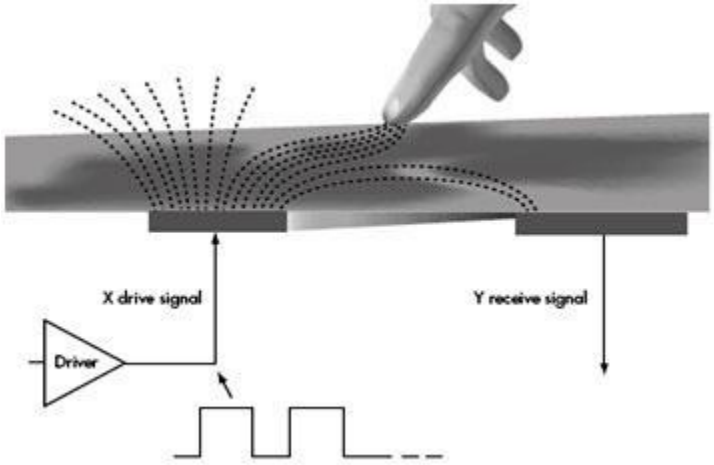
The Capacitive Touchscreen Technology is the most popular and durable touchscreen technology used all over the world at most. It consists of a glass panel coated with a capacitive (conductive) material Indium Tin Oxide (ITO). The capacitive systems transmit almost 90% of light from the monitor. Some of the devices using capacitive touchscreen are Motorola Xoom, Samsung Galaxy Tab, Samsung Galaxy SII, Apple's iPad. There are various capacitive technologies available as explained below.

Surface-Capacitive screens, in this technique only one side of the insulator is coated with a conducting layer. While the monitor is operational, a uniform electrostatic field is formed over the conductive layer. Whenever, a human finger touches the screen, conduction of electric charges occurs over the uncoated layer which results in the formation of a dynamic capacitor. The computer or the controller then detects the position of touch by measuring the change in capacitance at the four corners of the screen.

Pros and Cons: The surface capacitive touchscreen is moderately durable and needs calibration during manufacture. Since a conductive material is required to operate this screen, passive stylus cannot be used for surface capacitive touchscreen.



In the Projected-Capacitive Touchscreen Technology, the conductive ITO layer is etched to form a grid of multiple horizontal and vertical electrodes. It involves sensing along both the X and Y axis using clearly etched ITO pattern.

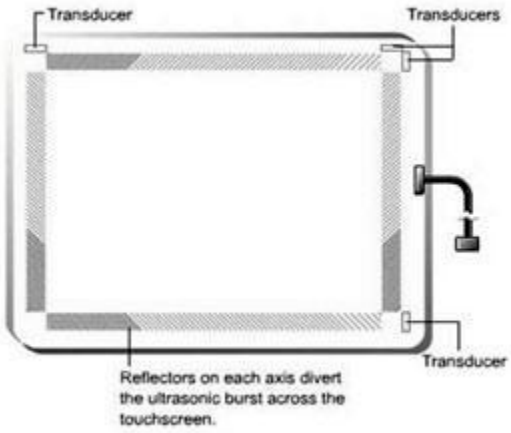


The projective screen contains a sensor at every intersection of the row and column, thereby increasing the accuracy of the system. There are two types of projected capacitive touchscreen: Mutual Capacitance and Self Capacitance.

Surface Acoustic Wave Touchscreen technology

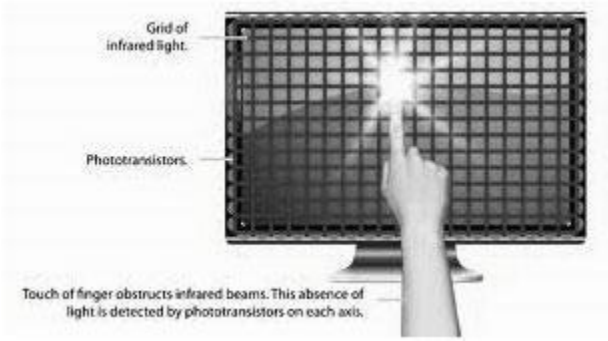
The Surface Acoustic Wave Touchscreen technology contains two transducers (transmitting and receiving) placed along the X-axis and Y-axis of the monitor's glass plate along with some reflectors. The waves propagate across the glass and are reflected back to the sensors. When the screen is touched, the 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 throughput and image clarity.

Pros and Cons: 100% clarity is obtained as no metallic layers are present on the screen, it can be operated using passive devices like stylus, glove or finger nail. Screen can get contaminated with much exposure to dirt, oil which may haunt its smooth functioning.



Infrared Touchscreen Technology

In the Infrared Touchscreen Technology, an array of X- and Y- axes are fitted with pairs of IR Leds and photo detectors. The photo detectors detect any change in the pattern of light emitted by the Leds whenever the user touches the monitor/screen.



The starred assets..!!

The potential novice touchscreen technology has many advantages over the conventional QWERTY keyboard and monitor. It is very flexible as opposed to its physical counterparts since the digital displays can be configured anytime at will of the user as per the functionalities. Touchscreen allows users to customize the interface for example alteration of language and size. By adjusting the size of the keyboard, user can utilize the spare area for display and other uses. With the decreasing size of computers and tablets these days, touchscreen is an added advantage. Multiple functions has to be performed on a small screen, touchscreen allows switching to a function at user's will. For example, virtual keyboard which is an application of touchscreen is displayed on the screen only when the user allows it to be.

However, there is also the other side of the coin where there some functionality which cannot be performed using a regular touchscreen like cut-and-paste, right click menu options, drop-down menus.

APPLICATION OF TOUCH SCREEN

Informational kiosks

Trade show displays

Museum / tourism displays

Point-of-sale terminals

Restaurant systems

Employee time clocks

Industrial process controls

World Wide Web access kiosks

Home automation systems

Casino and other gaming systems

Computer access for the physically disabled

ADVANTAGES OF TOUCH SCREEN

- Switch and buttons are not physically required. Device makers can make and modify various input interfaces creatively by software.
- With multi-touch function, various operations/inputs (eg: zoom-in/zoom-out, rotation) are possible.
- Because a user operates an electronic device by directly touching the images on the display he is seeing, the operation will be intuitive, thus anyone can operate it from first use.
- The whole unit is space-saving because display and input space are integrated. There is a lot of flexibility in design.
- Unlike keyboard or physical switch, there will be no dirt, dust, and moisture getting into the spaces between buttons. Thus, it is easy for maintenance.

DISADVANTAGES OF TOUCH SCREEN

- Screen has to be really big not to miss things when pressing them with your finger: I only like HTC Touch HD, screen size wise, and big screen means increased size of the device
- Big screen leads to low battery life
- Touchscreen means screen can't be read too well in direct sunlight as it applies an additional not 100% transparent
- Touchscreen devices usually has no additional keys (see the iPhone) and this means when an app crashes, without crashing the OS, you can't get to the main menu as the whole screen becomes unresponsive
- Touchscreens usually have low precision, virtual QWERTY keyboards being one of the most annoying things
- Most user interfaces are not optimized for thumb operation, so a stylus in necessary, and this means using two hands
- Screens get very dirty
- These devices require massive computing power which leads to slow devices and low battery life

CONCLUSION

Touch systems represent a rapidly growing subset of the display market. The majority of touch systems include touch sensors relying on vacuum-deposited coatings, so touch coatings present opportunity for suppliers of vacuum coatings and coating equipments.

Touch sensor manufactures currently require thin films in the areas of transparent conductors, optical interference coating and mechanical protective coatings. Touch sensors technical requirements dovetail well with those of the flat panel and display filter markets.

The reality should provide value added opportunities to operations participating in these areas.

REFERENCE

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