Screen Touch Technology

Chilakalapalli Yaswanthsai[1], Chaduvula sushma rani[2]

[1,2] *Department of Electronics and Communication Engineering, Aditya Institute of Technology and Management, Tekkali, Srikakulam District*

Abstract- **The main purpose of this paper is to illustrate different types of touch technologies. With the emerging of new electronic gadgets, the existing button system is becoming ineffective to operate them. So, there is a need to replace this obsolete system with the touch screen technology. This replacement will make the use of gadgets very comfortable.**

Index terms- **ITO, Acoustic, Infrared**

1.INTRODUCTION

Touch screen is a display which is sensitive to a human touch. It enables a human to select an option on the screen just by giving a touch. This technology is replacing the existing button system. This technology will surely become an inevitable part of most of the electronic gadgets. Basic touch screen is having a touch sensor, a controller, and a software driver as three main components. The touch screen is combined with a display and a PC to make a touch screen system.

1.1 Touch sensor:

The touch sensor generally has an electrical current passing through it and touching the screen causes a change in the electrical current(signal). This change is used to determine the location of the touch of the screen.

1.2 Controller:

Controller is connected between touch sensor and PC. It gets information from sensor and translates it for understanding of PC. The controller decides what type of connection is needed.

1.3 Software driver:

Software driver allows computer and touch screen to work together. It tells operating system how to interact the touch event information that is sent from the controller.

2. HISTORY

In the year 1965, E.A. Johnson developed the first touch screen (capacitive type).In the year 1971, Doctor Samuel Hurst[1]invented a touch sensor at the University of Kentucky. Then, later in the year 1974, the first transparent touch screen was developed. These inventions gave a boost up to this technology. Then, different multinational companies started using this technology for the development of their gadgets. And today we are in a era where it has become difficult to imagine a phone without touch screen.

3. TYPES OF SCREEN TOUCH TECHNOLOGIES

3.1 RESISTIVE SCREEN TOUCH

A resistive touch screen basically comprises of two transparent layers of glass or plastic, facing each other. There inner walls are coated with Indium Tin Oxide (ITO)[2]. This coating makes the inner layer conductive. The conducting are separated by an air gap or the spacers. When we press the screen with our finger, it causes the top and bottom layers to come in contact. Due to this, the circuit gets completed and marks in the flow of an electric current at the point of contact. This results in change of electric field at the point of contact, which is then sensed and the system software executes the option underneath it.
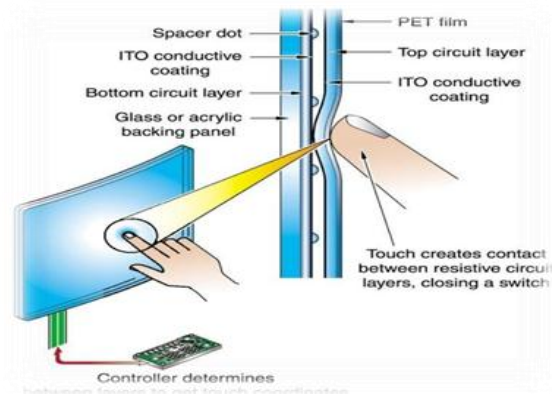

Figure 1. Resistive touch screen view

I. ADVANTAGES OF RESISTIVE SCREEN TOUCH

- Economical
- Responds to touch of anything, including pens, gloved fingers etc.
- Can work in presence of moisture.
- Rarely Detects any accidental touches.

II. DISADVANTAGES OF RESISTIVE SCREEN TOUCH

- Less sensitivity.
- Does not support multi- touch.

3.2 SURFACE CAPACITIVE TOUCH SCREEN

The capacitive screen touch consists of three layers. The top most layer is the protective layer. Under it, lies the bonding layer [2]. The next layer is very thin one, which comprises of the driving lines (these lines carry the flowing charge). And the next layer contains the sensing lines (these lines sense the amount of charge being carried). When a body which is capacitive in nature, touches the screen, then some of the charge gets transferred to that body. This results in the increased capacitance at that point, which decreases the potential drop at the point. Then the sensing lines sense the point, after which the system software implements the option under it.
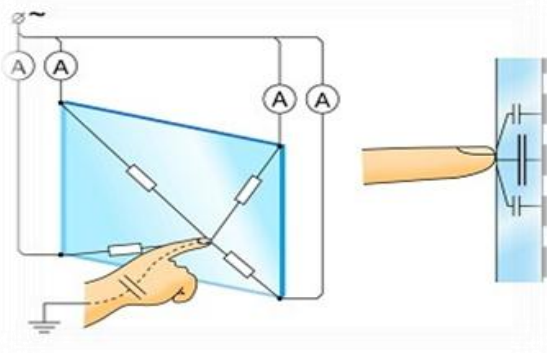

Figure 2. Illustration of capacitive touch screen

I. ADVANTAGES OF CAPACITIVE TOUCH SCREEN

- Highly sensitive to touch.
- Supports multi-touch.
- Capable of fast typing.

II. DISADVANTAGES OF CAPACITIVE TOUCH SCREEN

- It does not work when the user wears gloves.
- expensive
- prone to breakage

3.3 PROJECTED CAPACITIVE TOUCH SCREEN

It is simply an upgraded version of surface capacitive touch screen. It consist of a sheet of glass, which has an IC chip and a transparent electrode film embedded in it. This creates a 3D electrostatic field, so that when a finger meets the screen, it lets the device to determine the precise co- ordinates of the touch points. Due to this, Projected Capacitive touch screens can be operated even if the user is wearing thin cotton gloves or surgical gloves.

3.4 INFRARED TOUCH SCREEN

The screen consists of light emitting diode at the two adjacent edges. These emit infrared light across the screen, which builds an invisible net [3]. And the other two adjacent edges consist of photo detectors. These act as the sensors which can identify a break due to any obstacle. So, When we touch the screen, we block the transmission of two are more beams. This results in loss of light, which is used to detect the location of the touch. mostly these are used in the applications in ATM, factory automation, plant control system, ticketing machines, medical equipment, Kiosk, POS, interactive whiteboard and office automation.
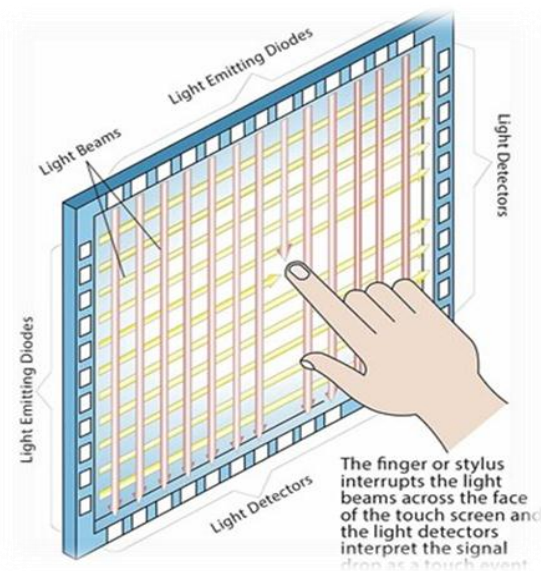

Figure 3. Illustration of Infrared touch screen

I. ADVANTAGES OF INFRARED TOUCH SCREEN

- Has good image clarity as well as light transmission.
- Advantageous for big touch screen display.
- It detects the touch with a bare finger, gloved finger and stylus.

II. DISADVANTAGES OF INFRARED TOUCH SCREEN

- Expensive.
- Accuracy of touch detection decreases in presence of moisture.

3.5 SURFACE ACOUSTIC TOUCH SCREEN

This technology uses sound to sense a touch [3]. It has two transmitting transducers placed along the x and the y axis. The two transducers transmit ultrasonic sound and the other two receivers at the opposite edges, captures the waves reflected from the reflecting surface [4]. When an obstacle interrupts the transmission, then based on drop of amplitude of sound wave, a touch is detected.
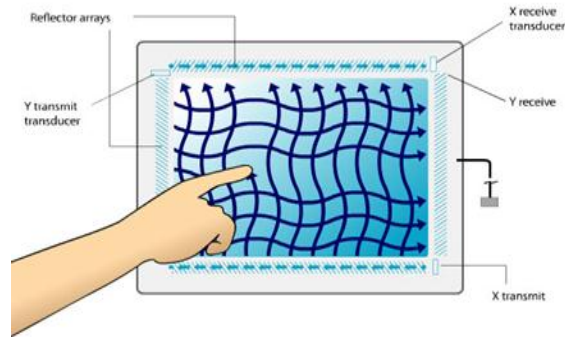

Figure 4. Illustration of surface acoustic touch screen

I. ADVANTAGES OF SURAFACE ACOUSTIC TOUCH SCREEN

- Commendable optical clarity.

II. DISADVANTAGES OF SURAFACE ACOUSTIC TOUCH SCREEN

- Doesn't support pen or any other hard material.
- Gives a slow response for multi touch.
- Malfunctions in the presence of dirt, oil, or droplets on the screen.

Figure 5. Illustration of surface acoustic touch screen
Table 1. Comparison

	RESISTIVE	CAPACITIVE	INFRARED	SAW
Touch sensitivity	Moderate	high	high	high
clarity	Moderate	moderate	high	high
operation	Finger or Stylus	Only finger	Finger or stylus	Finger or soft tipped stylus
durability	Moderate	moderate	high	high

3.6 LATEST TRENDS AND TECHNOLOGIES
I. MICROSOFT FREE TOUCH TECHNOLOGY

This technology can predict where our finger is going to make a touch on the screen [5]. It also lets the smart phone better differentiate between accidental and deliberate touch.
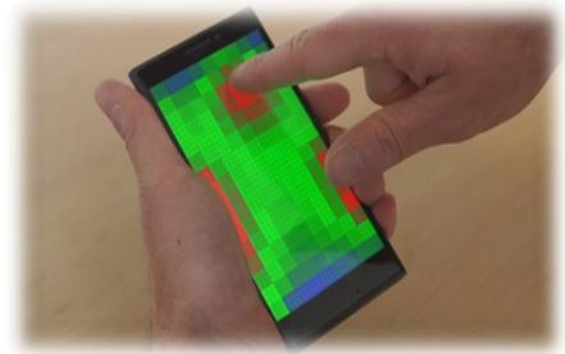

Figure 6. Illustration of Microsoft's Pre-Touch Technology

II. APPLE PHONE'S FINGER PRINT SCANNER

Finger print scanner of iPhone can distinguish between the touch of a live person and dead person[6]. It does it on the basis of change of capacitance at the point of touch.

4. CONCLUSION

The popularity of smart gadgets, tablet computers, portable video game consoles and many types of information appliances are increasing the demand and acceptance of common touch-screens. Overall, this study shows that touch screen technology has a good impact on some key aspects of usability. Still, the users are facing some problems using the touch screen devices, thus there is still a scope for improvement in touch screen technology

REFERENCES

[1] https://en.wikipedia.org/wiki/Touchscreen

[2] Anjul Jain, Diksha Bhargava,Anjani Rajput "TOUCH- SCREEN TECHNOLOGY" in International Journal of Advanced Research in Computer Science and Electronics Engineering (IJARCSEE) Volume 2, Issue 1, January 2013 .

[3] Prof. Kamalakannan J, Chepuri Saikiran "Different paradigm for Touch-Screen technology: A Survey" in research gate.

[4] https://www.elprocus.com/touch-screen-technology-definition-working-types-applications/

[5] https://www.androidauthority.com/microsoft-pre-touch-690379/

[6] https://www.engadget.com/2013/09/16/why-a-disembodied-finger-cant-be-used-to-unlock-the-touch-id-se/