TOUCHLESS TOUCH SCREEN TECHNOLOGY

A Technical Seminar Report

Submitted in partial fulfillment of the requirements for

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BACHELOR OF TECHNOLOGY

IN

ELECTRONICS AND COMMUNICATION ENGINEERING

Submitted By

RAMYA SAI KOKKU (16NE1A0471)

DEPARTMENT OF

ELECTRONICS AND COMMUNICATION ENGINEERING

TIRUMALA ENGINEERING COLLEGE

(AFFILIATED TO JNTUK, KAKINADA)

NARASARAOPET – 522601

TIRUMALA ENGINEERING COLLEGE

(AFFILIATED TO JNTUK, KAKINADA)

NARASARAOPET – 522601

DEPARTMENT OF

ELECTRONICS AND COMMUNICATION ENGINEERING

CERTIFICATE

This is to certify that the TECHNICAL SEMINAR entitled ***"TOUCHLESS TOUCH SCREEN TECHNOLOGY"*** is a bonafide work done by **RAMYA SAI KOKKU, REG NO:(16NE1A0471)** submitted in partial fulfillment for the award of the degree of Bachelor of Technology in Electronics and Communication Engineering from Jawaharlal Nehru Technological University Kakinada during the academic year 2019-2020 under our guidance and supervision.

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DECLARATION

I RAMYA SAI KOKKU the student of Tirumala Engineering College hereby declare that this technical seminar report entitled "TOUCHLESS TOUCH SCREEN TECHNOLOGY" being submitted to the Department of ECE, affiliated to JNT University, Kakinada for the award of BACHELOR OF TECHNOLOGY in Electronics and Communication Engineering is a record of bonafide work done by me and it has not been submitted to any other Institute or University for the award of any other degree or prize

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RAMYA SAI . K (16NE1A0471)

ABSTRACT

It was the touch screens which initially created great furore.Gone are the days when you have to fiddle with the touch screens and end scratching up. Touch screen displays are ubiquitous worldwide.Frequent touching a touchscreen display with a pointing device such as a finger can result in the gradual de-sensitization of the touchscreen to input and can ultimately lead to failure of the touchscreen. To avoid this a simple user interface for Touchless control of electrically operated equipment is being developed. EllipticLabs innovative technology lets you control your gadgets like Computers, MP3 players or mobile phones without touching them. A simple user interface for Touchless control of electrically operated equipment. Unlike other systems which depend on distance to the sensor or sensor selection this system depends on hand and or finger motions, a hand wave in a certain direction, or a flick of the hand in one area, or holding the hand in one area or pointing with one finger for example. The device is based on optical pattern recognition using a solid state optical matrix sensor with a lens to detect hand motions. This sensor is then connected to a digital image processor, which interprets the patterns of motion and outputs the results as signals to control fixtures, appliances, machinery, or any device controllable through electrical signals.

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CHAPTER 1

INTRODUCTION TO TOUCHSCREEN

A touchscreen is an important source of input device and output device normally layered on the top of an electronic visual display of an information processing system. A user can give input or control the information processing system through simple or multi-touch gestures by touching the screen with a special stylus and/or one or more fingers. Some touchscreens use 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, zooming to increase 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, electronic voting machines, point of sale systems, 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) and some e-readers.

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.

Optical touchscreens are a relatively modern development in touchscreen technology, in which two or more image sensors are placed around the edges (mostly the corners) of the screen. Infrared backlights are placed in the camera's field of view on the opposite side of the screen. A touch blocks some lights from the cameras, and the location and size of the touching object can be calculated. This technology is growing in popularity due to its scalability, versatility, and affordability for larger touchscreens.

CHAPTER 2

HISTORY OF TOUCHSCREEN

E.A. Johnson of the Royal Radar Establishment, Malvern described his work on capacitive touchscreens in a short article published in 1965 and then more fully—with photographs and diagrams in an article published in 1967. The applicability of touch technology for air traffic control was described in an article published in 1968. Frank Beck and Bent Stumpe, engineers from CERN, developed a transparent touchscreen in the early 1970s, based on Stumpe's work at a television factory in the early 1960s. Then manufactured by CERN, it was put to use in 1973. A resistive touchscreen was developed by American inventor George Samuel Hurst, who received US patent #3,911,215 on October 7, 1975. The first version was produced in 1982. In 1972, a group at the University of Illinois filed for a patent on an optical touchscreen that became a standard part of the Magnavox Plato IV Student Terminal. Thousands were built for the PLATO IV system.

These touchscreens had a crossed array of 16 by 16 infrared position sensors, each composed of an LED on one edge of the screen and a matched phototransistor on the other edge, all mounted in front of a monochrome plasma display panel. This arrangement can sense any fingertip-sized opaque object in close proximity to the screen. A similar touchscreen was used on the HP-150 starting in 1983; this was one of the world's earliest commercial touchscreen computers. HP mounted their infrared transmitters and receivers around the bezel of a 9" Sony Cathode Ray Tube (CRT). In 1984, Fujitsu released a touch pad for the Micro 16, to deal with the complexity of kanji characters, which were stored as tiled graphics. In 1985, Sega released the Terebi Oekaki, also known as the Sega Graphic Board, for the SG-1000 video game console and SC-3000 home computer. It consisted of a plastic pen and a plastic board with a transparent window where the pen presses are detected. It was used primarily for a drawing software application.

A graphic touch tablet was released for the Sega AI Computer in 1986. Touch-sensitive Control-Display Units (CDUs) were evaluated for commercial aircraft flight decks in the early 1980s. Initial research showed that a touch interface would reduce pilot workload as the crew could then select waypoints, functions and actions, rather than be "head down" typing in latitudes, longitudes, and waypoint codes on a keyboard. An effective integration of this technology was aimed at helping flight crews maintain a high-level of situational awareness of all major aspects of the vehicle operations including its flight path, the functioning of various aircraft systems, and moment-to-moment human interactions.

Most user interface books would state that touchscreens selections were limited to targets larger than the average finger. At the time, selections were done in such a way that a target was selected as soon as the finger came over it, and the corresponding action was performed immediately. Errors were common, due to parallax or calibration problems, leading to frustration.A new strategy called "lift-off strategy" was introduced by researchers at the University of Maryland Human – Computer Interaction Lab and is still used today. As users touch the screen, feedback is provided as to what will be selected, users can adjust the position of the finger, and the action takes place only when the finger is lifted off the screen.

This allowed the selection of small targets, down to a single pixel on a VGA screen (standard best of the time). Sears et al. (1990) gave a review of academic research on single and multi-touch human–computer interaction of the time, describing gestures such as rotating knobs, adjusting sliders, and swiping the screen to activate 8 a switch (or a U-shaped gesture for a toggle switch). The University of Maryland Human – Computer Interaction Lab team developed and studied small touchscreen keyboards (including a study that showed that users could type at 25 wpm for a touchscreen keyboard compared with 58 wpm for a standard keyboard), thereby paving the way for the touchscreen keyboards on mobile devices. They also designed and implemented multitouch gestures such as selecting a range of a line, connecting objects, and a "tap-click" gesture to select while maintaining location with another finger.

CHAPTER 3

WORKING OF TOUCHSCREEN

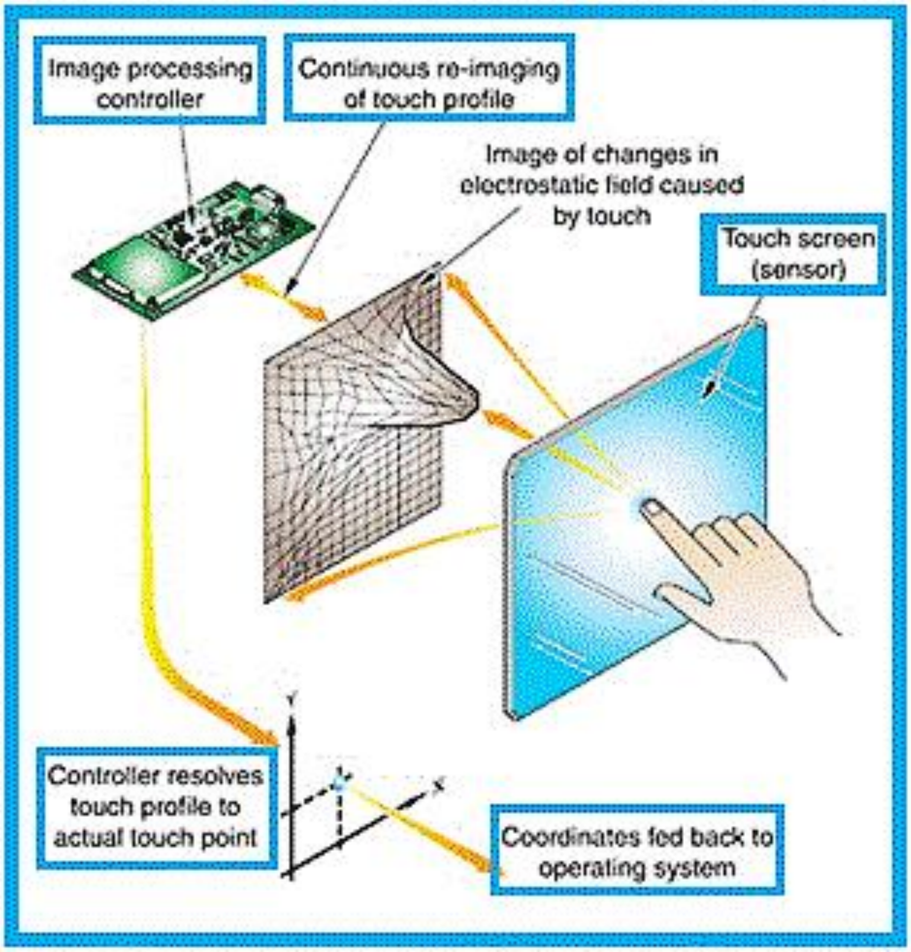


Figure 3.1 Working of touchless touchscreen

A resistive touchscreen panel comprises several layers, the most important of which are two thin, transparent electrically resistive layers separated by a thin space. These layers face each other with a thin gap between. The top screen (the screen that is touched) has a coating on the underside surface of the screen. Just beneath it is a similar resistive layer on top of its substrate. One layer has conductive connections along its sides, the other along top and bottom.

A voltage is applied to one layer, and sensed by the other. When an object, such as a fingertip or stylus tip, 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 dividers, one axis at a time. By rapidly switching between each layer, the position of a pressure on the screen can be read.

A capacitive touchscreen panel consists of an insulator such as glass, coated with a transparent conductor such as indium tin oxide (ITO).As the human body is also an electrical conductor, touching the surface of the screen results in a distortion of the screen's electrostatic field, measurable as a change in capacitance. Different technologies may be used to determine the location of the touch. The location is then sent to the controller for processing.

Unlike a resistive touchscreen, one cannot use a capacitive touchscreen through most types of electrically insulating material, such as gloves. This disadvantage especially affects usability in consumer electronics, such as touch tablet PCs and capacitive smartphones in cold weather. It can be overcome with a special capacitive stylus, or a special-application glove with an embroidered patch of conductive thread passing through it and contacting the user's fingertip.

3.1 Disadvantage Of Touchscreen

1. Low precision by using finger.

2. User has to sit or stand closer to the screen.

3. The screen may be covered more by using hand

4. No direct activation to the selected function.

CHAPTER 4

INTRODUCTION TO TOUCHLESS TOUCHSCREEN

Touch less control of electrically operated equipment is being developed by Elliptic Labs. This system depends on hand or finger motions, a hand wave in a certain direction. The sensor can be placed either on the screen or near the screen. 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, electronic voting machines, point of sale systems ,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) and some e-readers.

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.

The touch less touch screen sounds like it would be nice and easy, however after closer examination it looks like it could be quite a workout. This unique screen is made by TouchKo, White Electronics Designs, andGroupe 3D. The screen resembles the Nintendo Wii without the Wii Controller. With the touchless touch screen your hand doesn't have to come in contact with the screen at all, it works by detecting your hand movements in front of it. This is a pretty unique and interesting invention, until you break out in a sweat. Now this technology doesn't compare to the hologram-like IO2 Technologies Heliodisplay M3, but thats for anyone that has $18,100 laying around.

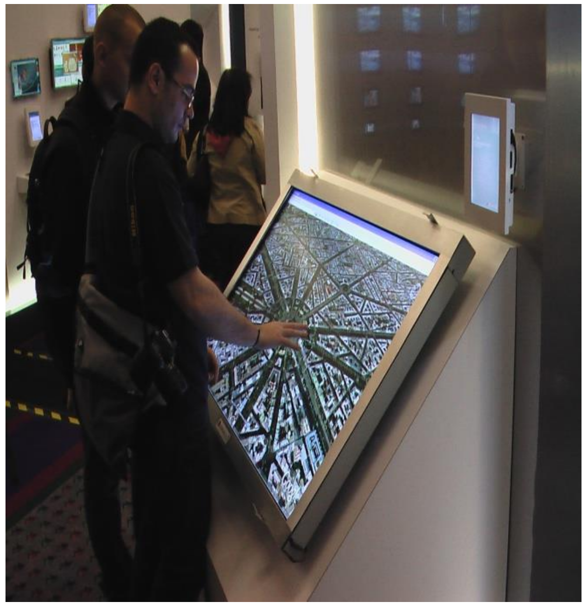


Figure 4.1 Touchless touchscreen

You probably wont see this screen in stores any time soon. Everybody loves a touch screen and when you get a gadget with touch screen the experience is really exhilarating. When the I-phone was introduced,everyone felt the same.But gradually,the exhilaration started fading. While using the phone withthe finger tip or with the stylus the screen started getting lots of finger prints and scratches. When we use a screen protector; still dirty marks over such beautiful glossy screen is a strict no-no. Same thing happens with I-pod touch. . Most of the time we have to wipe the screen to get a better unobtrusive view of the screen

Thanks to EllipticLabs innovative technology that lets you control your gadgets like Computers, MP3 players or mobile phones without touching them. Simply point your finger in the air towards the device and move it accordingly to control the navigation in the device. They term this as “Touchless human/machineuser interface for 3D navigation”.

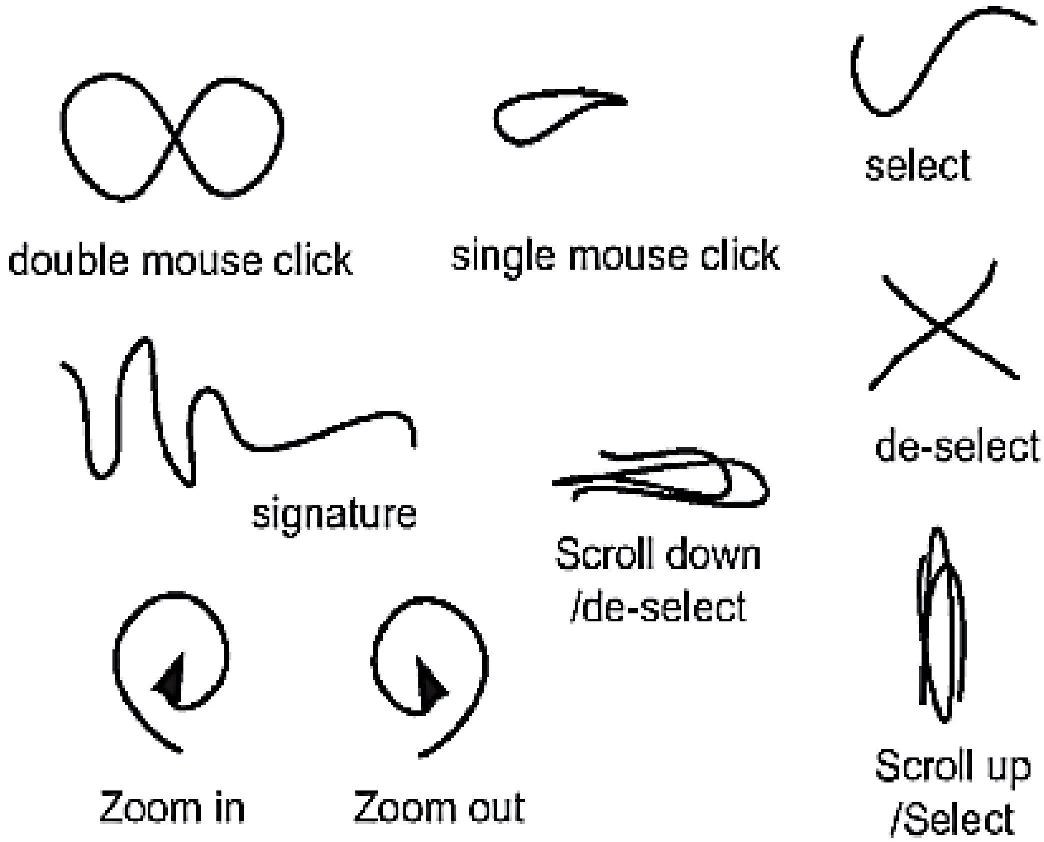


Figure4.2 3D Navigation of Hand Movements in Touchless Screen

4.1 TOUCHLESS MONITOR

Sure, everybody is doing touchscreen interfaces these days, but this is the first time I've seen a monitor that can respond to gestures without actually having to touch the screen.The monitor, based on technology from TouchKo was recently demonstrated by White Electronic Designsand Tactyl Services at theCeBIT show. Designed for applications where touch may be difficult, such as for doctors who might be wearing surgical gloves, the display features capacitive sensors that can read movements from up to 15cm away from the screen. Software can then translate gestures into screen commands.

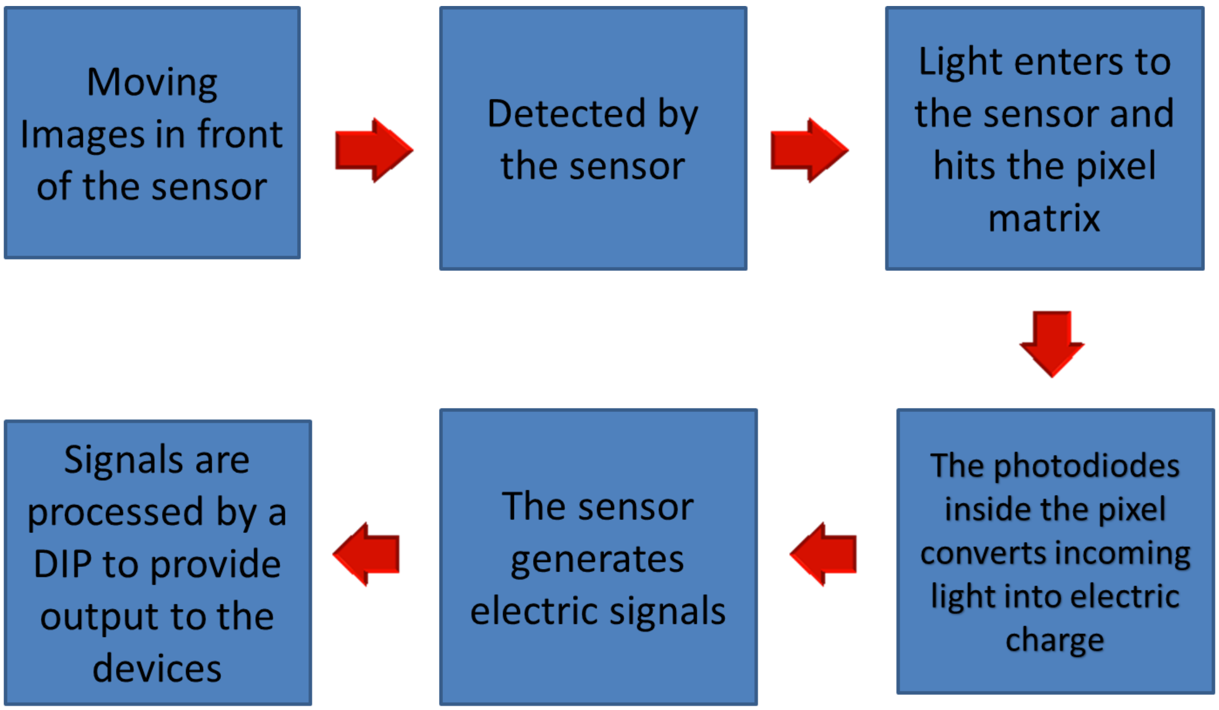
Touchscreen interfaces are great, but all that touching, like foreplay, can be a little bit of a drag. Enter the wonder kids from Elliptic Labs, who are hard at work on implementing a touchless interface. The input method is, well, in thin air. The technology detects motion in 3Dand requires no special worn-sensors for operation. By simply pointing at the screen,users can manipulate the object being displayed in 3D. Details are light on how this actually functions, but what we do know is this:

It obviously requires a sensor but the sensor is neither hand mounted nor present on the screen. The sensor can be placed either onthe table or near the screen. And the hardware setup is so compact that it can be fitted into a tiny device like a MP3 player or a mobile phone. It recognizes the position of an object from as 5 feet.

CHAPTER 5

WORKING OF TOUCHLESS TOUCHSCREEN

5.1 Block diagram



The system is capable of detecting movements in 3-dimensions without ever having to put your fingers on the screen. Sensors are mounted around the screen that is being used, by interacting in the line-of-sight of these sensors the motion is detected and interpreted into on-screen movements. The device is based on optical pattern recognition using a solid state optical matrix sensor with a lens to detect hand motions.

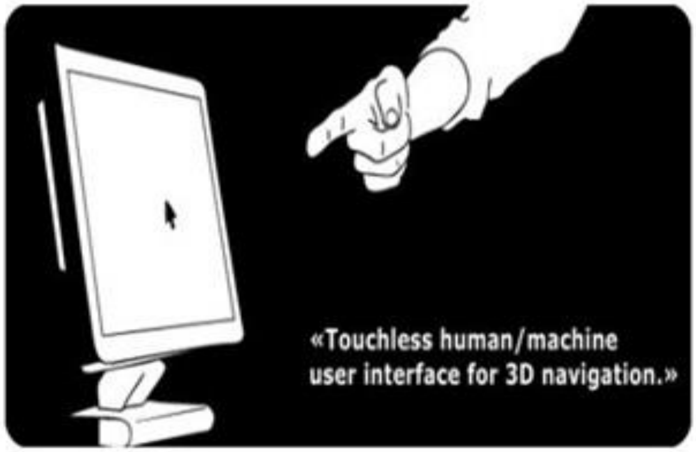
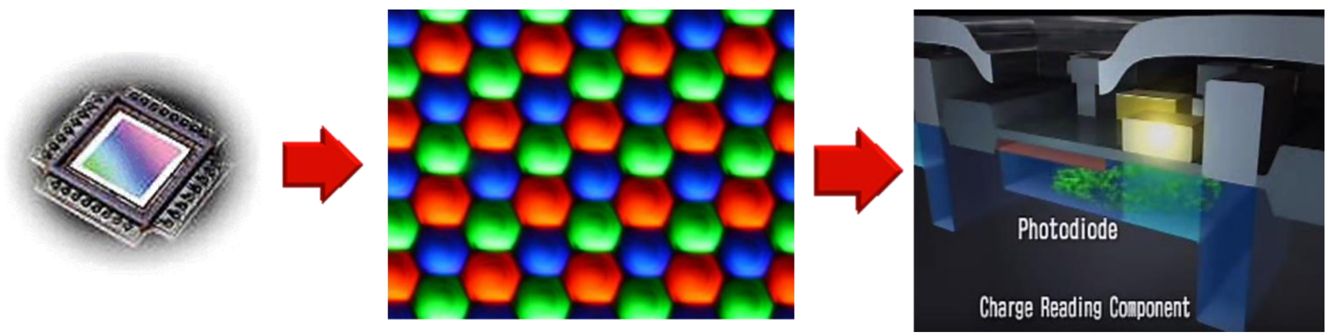


Figure.5.1 Touchless touchscreen

This sensor is then connected to a digital image processor, which interprets the patterns of motion and outputs the results as signals to control fixtures, appliances, machinery, or any device controllable through electrical signals. You just point at the screen (from as far as 5 feet away), and you can manipulate objects in 3D.Itconsists of three infrared lasers which scan a surface. A camera notes when something breaks through the laser line and feed that information back to the Plex software.

The Leap Motion controller sensor device that aims to translate hand movements into computer commands. The controller itself is an eight by three centimeter unit that plugs into the USB on a computer. Placed face up on surface, the controller senses the area above it and is sensitive to a range of approximately one meter. To date it has been used primarily in conjunction with apps developed specifically for the controller. One factor contributing to the control issues is a lack of given gestures, or meanings for different motion Controls when using the device, this means that different motion controls will be used in different apps for the same action, such as selecting an item on the screen. Leap Motion are aware of some of the interaction issues with their controller, and are planning solutions. This includes the development of standardized motions for specific actions, and an improved skeletal model of the hand and fingers.

5.2 Optical matrix sensor



This is based on optical pattern recognition using a solid state optical matrix sensor. This sensor is then connected to a digital image processor, which interprets the patterns of motion and outputs the results as signals.In each of these sensors there is a matrix of pixels.Each pixel is coupled to photodiodes incorporating charge storage regions

5.3 GBUI(Gesture-Based Graphical User Interface)

A movement of part of the body, especially a hand or the head, to express an idea or meaning Based graphical user interphase.

Figure 5.3 GBUI Symbols

A Leap Motion controller was used by two members in conjunction with a laptop and the Leap Motion software development kit. Initial tests were conducted to establish how the controller worked and to understand basic interaction. The controller is used to tested for the recognition of sign language. The finger spelling alphabet was used to test the functionality of the controller. The alphabet was chosen for the relative simplicity of individual signs, and for the diverse range of movements involved in the alphabet. The focus of these tests is to evaluate the capabilities and accuracy of the controller to recognize hand movements. This capability can now be discussed in terms of the strengths and weaknesses of the controller.

CHAPTER 6

TOUCHLESS UI

The basic idea described in the patent is that there would be sensors arrayed around the perimeter of the device capable of sensing finger movements in 3-D space.

Figure 6.1 Touchless UI

UI in their Redmond headquarters and it involves lots of gestures which allow you to take applications and forward them on to others with simple hand movements. The demos included the concept of software understanding business processes and helping you work. So after reading a document - you could just push it off the side of your screen and the system would know to post it on an intranet and also send a link to a specific group of people

.6.1 Touch-less SDK

The Touchless SDK is an open source SDK for .NET applications. It enables developers to create multi-touch based applications using a webcam for input. Color based markers defined by the user are tracked and their information is published through events to clients of the SDK.

Figure.6.2. Touchless SDK

In a nutshell, the Touchless SDK enables touch without touching. Well, Microsoft Office Labs has just released “Touchless,” a webcam-driven multi-touch interface SDK that enables “touch without touching.” Using the SDK lets developers offer users “a new and cheap way of experiencing multi-touch capabilities, without the need of expensive hardware or software. All the user needs is a camera,” to track the multi-colored objects as defined by the developer.Using the SDK lets developers offer users “a new and cheap way of experiencing multi-touch capabilities, without the need of expensive hardware or software. All the user needs is a camera,” to track the multi-colored objects as defined by the developer. Just about any webcam will work.Using the SDK lets developers offer users “a new and cheap way of experiencing multi-touch capabilities, without the need of expensive hardware or software. All the user needs is a camera,” to track the multi-colored objects as defined by the developer.

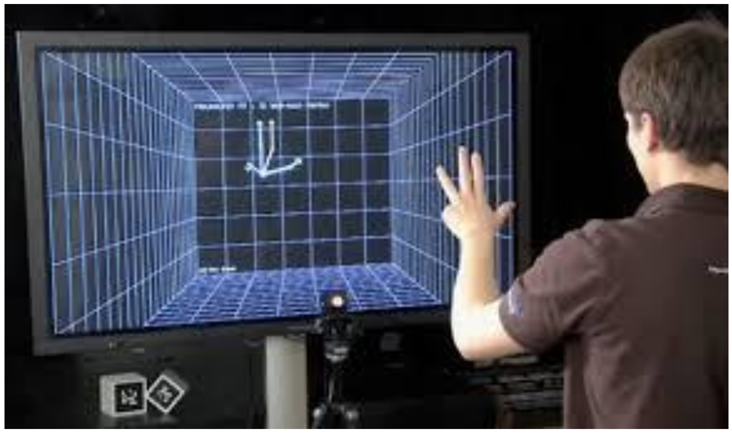


Figure.6.3.Digital matrix

6.2 Touch-less demo

The Touch less Demo is an open source application that anyone with a webcam can use to experience multi-touch, no geekiness required.

Figure 6.4 touchless demo

The demo was created using the Touch less SDK and Windows Forms with C#. There are 4 fun demos: Snake - where you control a snake with a marker, Defender up to 4 player version of a pong-like game, Map - where you can rotate, zoom, and move a map using 2 markers, and Draw the marker is used to guess what…. draw!Mike demonstrated Touch less at a recent Office Labs' Productivity Science Fair where it was voted by attendees as "most interesting project." If you wind up using the SDK, one would love to hear what use you make of it!

6.3 Touch wall

Touch Wall refers to the touch screen hardware setup itself; the corresponding software to run Touch Wall, which is built on a standard version of Vista, is called Plex. Touch Wall and Plex are superficially similar to Microsoft Surface, a multi-touch table computer that was introduced in 2007and which recently became commercially available in select **AT&T** stores.

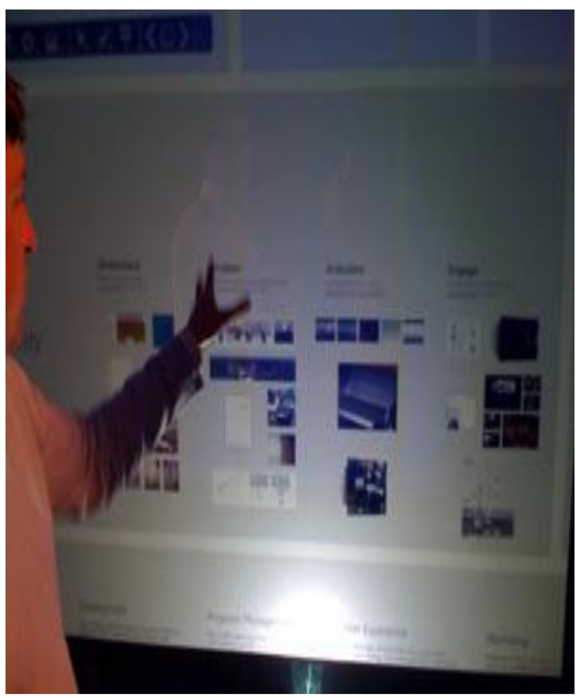


Figure 6.5 Touch wall

It is a fundamentally simpler mechanical system, and is also significantly cheaper to produce. While Surface retails at around $10,000, the hardware to "turn almost anything into a multi-touch interface" for Touch Wall is just "hundreds of dollars".

Touch Wall consists of three infrared lasers that scan a surface. A camera notes when something breaks through the laser line and feeds that information back to the Plex software. Early prototypes, say Pratley and Sands, were made, simply, on a cardboard screen. A projector was used to show the Plex interface on the cardboard, and a thesystem worked fine. Touch Wall certainly isn't the first multi-touch product we've seen (see iPhone). In addition to Surface, of course, there are a number of early prototypes emerging in this space. But what Microsoft has done with a few hundred dollars worth of readily available hardware is stunning.

It's also clear that the only real limit on the screen size is the projector, meaning that entire walls can easily be turned into a multi touch user interface. Scrap those white boards in the office, and make every flat surface into a touch display instead. You might even save some money.

CHAPTER 7

MINORITY REPORT INSPIRED TOUCHLESS TECHNOLOGY

i. Tobii Rex

Tobii Rex is an eye-tracking device from Sweden which works with any computer running on Windows 8. The device has a pair of infrared sensors built in that will track the user's eyes.

Figure.7.1. Tobii Rex

ii. Elliptic Labs

Elliptic Labs allows you to operate your computer without touching it with the Windows 8 Gesture Suite.

Figure.7.2. Elliptic Lab

iii. Airwirting

Airwriting is a technology that allows you to write text messages or compose emails by writing in the air.

Figure.7.3. Airwriting

iv. Eyesight

EyeSight is a gesture technology which allows you to navigate through your devices by just pointing at it.

Figure.7.4. EyeSight

v. MAUZ

MAUZ is a third party device that turns your iPhone into a trackpad or mouse.

Figure.7.5. MAUZ

vi. Point Grab

Point Grab is something similar to eyeSight, in that it enables users to navigate on their computer just by pointing at it.

Figure.7.6. Point Grab

vii. Leap Motion

Leap Motion is a motion sensor device that recognizes the user's fingers with its infrared LEDs and cameras.

Figure.7.7. Leap Motion

viii. Myoelectric armband

Myoelectric armband or MYO armband is a gadget that allows you to control your other bluetooth enabled devices using your finger or your hands.

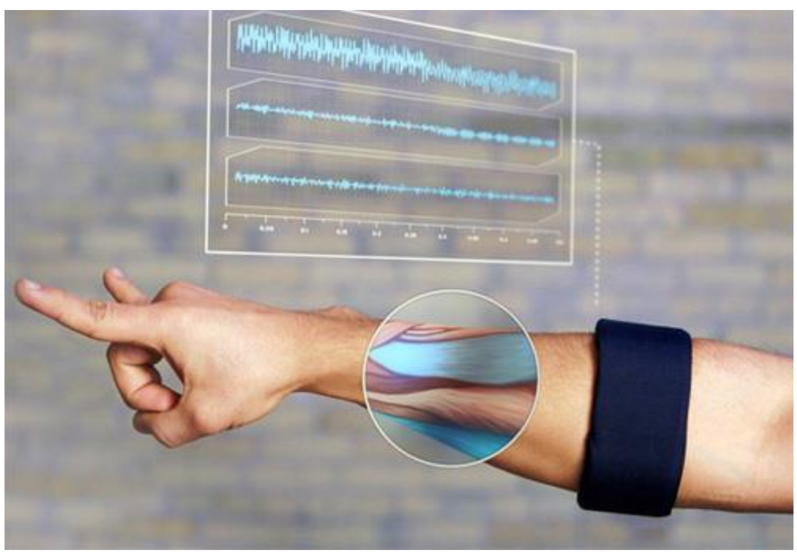


Figure 7.8 Myoelectric armband

ix. Microsoft Kinect

It detects and recognizes a user's body movement and reproduces it within the video game that is being played.

Figure7.9 Microsoft kinect

CHAPTER 8

ADVANTAGES

- No de-sensitization of screen.
- Can be controlled from a distance.
- Usefull for physically handicapped people.
- Easier and satisfactory experience.
- Gesturing and cursor positioning.
- No drivers required

CHAPTER 9

APPLICATIONS

i. Touch less monitor

ii. Touch less user interface

iii. Touch less SDK

iv. Touch less demo

v. Touch wall

CHAPTER 10

CONCLUSION

Touchless Technology is still developing. Many Future Aspects. With this in few years our body can become a input device. The Touch less touch screen user interface can be used effectively in computers, cell phones, webcams and laptops. May be few years down the line, our body can be transformed into a virtua l mouse, virtual keyboard ,Our body may be turned in to an input device.It appears that while the device has potential, the API supporting the device is not yet ready to interpret the full range of sign language. At present, the controller can be used with significant work for recognition of basic signs, However it is not appropriate for complex signs, especially those that require significant face or body contact. As a result of the significant rotation and line-of sight obstruction of digits during conversational signs become inaccurate and indistinguishable making the controller (at present) unusable for conversational However, when addressing signs as single entities there is potential for them to be trained into Artificial Neural Networks.

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