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Multitouch and Gesture Recognition Technology Using Computer Interaction

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ABSTRACT

Touch screens are becoming more and more prevalent ,We are using them almost everywhere, including tablets, mobile phones, PC displays, ATM machines and so on. Although multi-touch technology is currently are search focus in the field of Human-Computer Interaction. Multi-touch system is based on touch technology that utilizes touch sensing as an input. It existed ubiquitously in our daily life such as on smart phones or different types of portable devices. In this paper , several foreign multi-touch technologies based on senor and computer vision are introduced and the advantages and disadvantages of these technologies are analyzed briefly. It is important for studying the technology of detection and tracking touch-point in multi-touch. Furthermore the FTIR (Frustrated Total Internal Reflection) and DI (Diffused Illumination) which are based on computer vision multi-touch technology are highlighted. Also, introduces early researches on this area and then focuses on current researches of multitouch and gesture recognition. It discussed about, types of touches, implementation &design, Gesture Sets and Recognition, multitouch gesture. Finally, several crucial techniques in the field of multi-touch technology are also discussed.

Keywords: Multitouch, gestures, user Interfaces, senor, Computer vision, FTIR, DI, multitouch Gesture.

I. INTRODUCTION

A **touch screen** is a display which can detect the presence and location of a touch within the display area. The term usually refers to touch or contact to display of the device by a finger or hand. Touch screens can also sense other passive objects, such as a stylus. However, if the object sensed is active, as with a light pen, the term touch screen is generally not applicable. The thumb rule is: if you can interact with the display using your finger, it is likely a touch screen - even if you are using a stylus or some other object. Up until recently, most touch screens 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 emergence of multi-touch technology a technology that was first seen in the early 1980s, but which is now appearing in commercially available systems. Although as early as 1982, Nimish Mehta of Toronto University, has designed the first Multi-Touch display based on the pressure of fingers[2]. The same year, Bell Labs at Murray Hill published what is believed to be the first paper discussing touch-screen based interfaces. In 2005 Jefferson Y. Han New York University, proposed a FTIR-based low-cost Multi-Touch equipment, which has greatly reduced the research cost of Multi-Touch Technology, this techniques has been brought to the mainstream market since the announcements of Apple's iPhone and Microsoft's Surfacein2007, and became a popular topic in the field of human computer interaction However the multi-touch technology was invented at least 25 years earlier than it being world widely used. Information Technology has advanced tremendously over the past few decades especially on HCI (Human Computer Interaction). Mutitouch technologies are specially used for human computer interaction. Traditional Graphical User Interface (GUI)WIMP(windows, icons, menus, pointing device) is the current main human-computer interaction mode. In this interactive mode ,the mouse is the primary use means of computer operations. But the mouse is only an input device with only 2 choices of freedom input device, therefore it is hard for people to fully apply the hand operating skills learned in their

natural life or day to day life to human-computer interaction to reduce cognitive burden of the interaction, and improve the efficiency of computer operations. Multi touch technology are developed. Multi-touch equipments allow one or more than one user to use multiple fingers interact with computers through graphical user interfaces. Our fingers are different way types of choices freedom and can touch directly without any media, which greatly enhances the efficiency our interaction with computer. Multi-touch technology is an advanced human-computer interaction technique that recognizes multiple touch points and also includes the hardware devices that implement it, which allow users to compute without conventional input devices . Multi-touch consists of a touch screen (screen, table, wall, etc.) or touchpad, as well as a software that recognizes multiple simultaneous touch points, as opposed to the standard touch screen which recognizes only one touch point at a time. Multi touch using Frustrated Total Internal Reflection is a simple, inexpensive, and scalable technique for enabling high-resolution multi-touch sensing on rear-projected interactive surfaces. Different applications for multi-touch interfaces both exist and are being proposed. Some uses are individualistic eg . iPhone, iPod touch, Mac Book Pro, Mac Book Air. The use of multi-touch techno log is expected to rapidly become common places. There are various methods to implement a touch system, which are normally categorized into two types: Sensor-based and Vision based. In the early days, resistive touch method is frequently used. This method required minimum space between the screen and sensor. When user applies pressure on the surface, touch coordinate will be detected using different signals. This method is able to detect inputs from any object, but the touch sensitivity is poor and the touch screen has low resolution. It is mainly because the sensor is placed above the screen. Recently, capacitive touch sensor has replaced resistive touch sensor as the most frequently used touch sensing technology, as seen on different touch devices. The touch surface is coated with conductive material. When a small voltage is applied to this layer via some conductive object such as fingers, the coordinate of the object can be detected. It is able to detect multiple touch points, but it greatly depends on the conductive material. Yet, this method still possesses many restrictions on touching . Non-conductive object will not trigger the touch action. On the other hand, there are different methods in vision based touch system too. The most frequently used methods are FTIR (Frustrated Total Internal Reflection),DI (Diffused Illumination) and LLP (Laser Light Plane Illumination). All of these methods have a common characteristic which is IR (Infrared). Sensor with IR Emitter are being used. Each method is differentiated by the IR sensor's position and the IR emitting method.

1. Evolution of Multi-Touch Technology

It's not often when one devises a new technology by observing rife, regular principles of science working around. which are generally used natural or daily life. But this man did, and did it in a manner which left his audience biting their nails over his first presentation at TED. In 2006, Jeff Han; the then research scientist at NYU came up with his Multi-Touch table based on the principle *of Frustrated Total Internal Reflection* (FTIR). He observed that in a glass of water, the light reflects differently on the areas where the hands contact the glass. Here, visible light is entrapped inside the glass owing to total internal reflection. Whenever a finger or palm touches the glass, light diffuses or gets frustrated at the point of contact. This effect is called FTIR. That time firstly introduced this technology. Multi-touch technology dates back to 1982, when the University of Toronto developed the first finger pressure multi-touch display. The same year, Bell Labs at Murray Hill published what is believed to be the first paper discussing touch-screen based interfaces. In 1984 Bell Labs engineered a multi-touch screen that could manipulate images with more than one hand. The group at the University of Toronto stopped working on hardware and moved on to software and interfaces, expecting that they would have access to the Bell Labs work. A breakthrough occurred in 1991, when Pierre Wellner published a paper on his multi-touch "Digital Desk", which supported multi-finger and pinching motions. In 2007, Apple Inc. came up with its revolutionary *multi-touch technology* in mobile phones; the iPhone. The mobile phone is a soft-touch based interface. iPhone uses capacitive coupling to sense multiple touch points. Multi point touches the surface of phone in different ways. Apple's rivalry Microsoft also released, in the same year the astounding Microsoft Surface based on DI Technology. Some other breakthrough in multi-touch technology include MERL's Diamond Touch, TISCH, Fraunhofer multi-touch table, Microsoft wall, Thin sight, N trig and touch pad Surface 2.0.

II. METHODS AND MATERIAL

1. Background Literature View

Flexibility

Although touch screen technology has made the interactions between human and machine closer than ever, the capability of detecting only a single point of contact is not enough for more complex operations due to its lack of degree of freedom. A single-touch screen with no pressure sensors can only give a binary state of a position on the screen, namely whether it's touched or not. With such limitation it's even difficult to detect user drawing a line since the system can hardly tell when user starts drawing without being proper signaled [11]. As a result, adding pressure sensor will increase the degree of freedom to some extent. Indeed researchers have investigated the possibility of using force and torque sensors to enhance the interactive. But obviously the more direct way is to add the support of detecting multiple points of contact. The touch screen allows user to interact with machine without an extra layer of mechanics, therefore users are free to use up to ten fingers to operate on the touch screen. In fact, simultaneous touches are considered as a necessity in some contexts just like playing a piano [11]. For example, a keyboard shortcut usually involves the operation of holding one key while pressing another key. To simulate the keyboard and such shortcuts on a touch screen, it is required that the touch screen is capable of sensing more than one point of contact [12]. Another example is to operate a set of slide potentiometers, the operator need to control each slide with a finger at the same time [11].

Efficiency

It is common that our two hands are assigned to separate, continuous work in daily life, therefore it can be assumed that, if designed properly, two-hand touch will generally performs single touch. Indeed, two experiments were carried out by Buxton and Myers to test the efficiency of bimanual operation[10]. The first experiment asked subjects to do positioning with one hand and scaling with the other hand, and recorded the time engaged in parallel activity. The result showed that subjects were operating in parallel nearly half of the time, which indicated that such bimanual operations are indeed natural for human. The second experiment asked subjects to navigate to and select a specific part in a document. Subjects were divided into two groups: one group used only one hand on a scroll bar while the other group used one hand to control scrolling and the other hand control text jumping in the document. The result showed that the two-handed group out-performed the single-handed group regardless of whether the subjects are novices or experts. This gives strong evidence to support that multi-touch tends to have better performance over single-touch dealing with same objectives.

Precision

The precision problem is a long-existing and inherent problem of the touch screen technology. In early days there solution of the underlying sensing hardware is the main cause for the precision problem and later on the size of the finger inevitably hinders touch screen from being accurate on targeting and selection. To solve the precision problem, researchers have been exploring different strategies and gestures for precise selection over the twenty years. Before multi-touch technology is available, some research has already been done in finding the best strategy of detecting selection with single point of contact [13] gives a brief introduction of the two commonly used strategies called land-on and first-contact. Land-on strategy detects selection by comparing the touch location and the target location. It is a quite naïve approach and therefore lacks of accuracy and tends to have high error rate. Whenever user fails to touch the target at the first try the user has no way to amend the mistake except taking another try. The first-contact strategy mitigates such situation by utilizing continuous feedback about the touch location.

2. Types of touch technology

A. **Capacitive touch technologies**:

A capacitive touch screen panel is coated with a material, typically indium tin oxide that conducts a continuous electrical current across the sensor. The sensor therefore exhibits a precisely controlled field of stored electrons in both the horizontal and vertical axes - it achieves capacitance. The human body is also an electrical device which has stored electrons and therefore also exhibits capacitance. When the sensor's normal capacitance field (its reference state) is altered by another capacitance field ,i.e., someone's finger,

electronic circuits located at each corner of the panel resultant distortion' in the sine wave characteristics of the reference field and send the information about the event to the controller for mathematical processing. Capacitive sensors can either be touched with a bare finger or with a conductive device being held by a bare hand. Capacitive touch screens are not affected by outside elements and have high clarity. The Apple iPhone is an example of a product that uses capacitance touch screen technology.

B. Resistive touch technologies:-

A resistive touch screen panel is composed of several layers. The most important are two thin metallic electrically conductive and resistive layers separated by thin space. When some object touches this kind of touch panel, the layers are connected at certain point; the panel then electrically acts similar to two 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.

C. Surface acoustic wave:-

Surface acoustic wave(SAW) technology uses ultrasonic waves that pass over the touch screen panel. When the panel is touched, a portion of the wave is absorbed. This change in the ultra sonic waves registers the position of the touch event and sends this information to the controller for processing. Surface wave touch screen panels can be damaged by outside elements. Contaminants on the surface can also interfere with the functionality of the touch screen.

D. Infrared touch technologies:-

An IR touch screen panel employs one of two very different methods. One method uses thermal induced changes of the surface resistance. This method is sometimes slow and requires warm hands. Another method is an array of vertical and horizontal IR sensors that detect the interruption of a modulated light beam near the surface of the screen.

E. Optical touch technologies

It is used an interactive video wall or a tabletop PC, chances are, you have also used a touch screen that was built using optical touch technology. Optical touch technology uses CMOS infrared cameras placed on top of the panel to continuously monitor the field of view. Optical touch screens also use infrared light, similar to infrared touch screen technologies, but the layout of the emitters and sensors is what differentiates it. Most optical touch screens use two cameras placed in the corners at the top of the screen. These cameras are used to look across the entire touch surface for touch events. When an object touches the screen, it blocks some of the light being received by the sensors in the cameras. The location of the touch is then calculated by using the information from both cameras and the mathematical principles of triangulation. Optical touch screens fall into categories: passive and active. Passive screens use light that is generated by the cameras and reflected back by the side and bottom edges, while active screens use light that is emitted directly from LEDs along the side and bottom edges. Both systems rely on the cameras to detect the light and determine the location of the touch event.

3. Working of Multitouch

Multi-touch is essentially a type of technology that allows a device to recognize and process multiple touches simultaneously. Most touch screen devices are only capable of recognizing a single touch. In multitouch, place the fingers on two different areas of the device at the same time when camera is used to capture touches in the screen, The size touch surface predefined already in the application. The image capture by the camera and transferred to the processor that convert it 8bit grayscale for simplified processing. Then processor identified where bright spot in the image. to do that, image must be mono chrome. each pixel white and black. simple event are somewhat Like mouse event that is used to change the position. new touch point or new touch disappeared. Typically, the multi-

touch technology works in conjunction with an ASIC sensor that is fixed on the device's surface. The sensor identifies the point or points of touch, relaying this information to the device's on-board computer system. Devices that support multi-touch technology, for instance, can be implement functionality like pinch-to-zoom, the activation of subroutines which are attached to gestures, additional controls and much more.

4. Design and Implementation of Multitouch

The multitouch technology is designed using the FTIR technology.FTIR describes the internal reflection of light. The basic design of Hardware and Software part. The hardware mostly requires IR led, acrylic, camera, projector and a computer. Computer application are necessary to communicate between a multitouch display and a computer. The multitouch technology mostly used the computer field. In multitouch technology has various way to interacting the computer. Multi-touch has been implemented in several different ways, depending on the size and type of interface. The most popular form are mobile devices, tablets, touch tables and walls. Both touch tables and touch walls project an image through acrylic or glass, and then back-light the image with LEDs. Touch surfaces can also be made pressure-sensitive by the addition of a pressure-sensitive coating that flexes differently depending on how firmly it is pressed, altering the reflection. Handheld technologies use a panel that carries an electrical charge. When a finger touches the screen, the touch disrupts the panel's electrical field. The disruption is registered as an computer event (gesture) and may be sent to the software, which may then initiates a response to the gesture event.

5. Classification of Multitouch Technology

Sensor-Based Systems

Many Multi-Touch Devices based on sensor technology can simultaneously detect multiple touch points to identify the multiple points of input[1,16]. Unlike some of the computer-vision-based systems, sensor based systems area almost impossible to build from off-the-shelf components. The cost is prohibitively high, and the environment temperature and humidity will affect the system performance. However, because the sensor can be integrated in the surface, it can be used for mobile phones, PDAs and other small-screen handheld Devices .In sensor based system, FMTSID (Fast Multiple-Touch-Sensitive Input Device) is used. it is one of the first multi-point touch sensor-based devices. The system consists of a sensor matrix panel, the ranks of select register, A / D converter and a control CPU component. It can detect finger touch points by measuring the changes in capacitance. FMTSID can accurately detect multiple finger touch position, and finger contact pressure. The Diamond Touch is a multi-user touches sensitive surface. Diamond Touch is multi-touch system which allows multiple users and a front multi-touch camera. It is human interface device that has the capability of allowing multiple people to interact simultaneously while identifying which person is touching where .while identifying which person is touching where.[] Smart Skin is a Multitouch system of higher resolution ratio. The system of grid-shaped transmitter/receiver/. It can not only identify the number of hand contact position and their shape, but also calculate the distance between the hands and contact surfaces through capacitive sensing and grid antenna. The Apple iPhone [16] released in 2007 is the first mobile device with access to multi-touch technology. iPhone uses capacitive coupling to sense multiple touch points. iPhone can achieve multi-touch with limited dimensions, allow people to operate by mere hands, and allow typing through a virtual keyboard, the dial of telephone numbers and the "pinching" technique. these devices are used in sensor based system.

6. COMPUTER-VISION-BASED SYSTEM

Due to the decreasing cost and improved performance of computers, computer vision technology has been greatly improved, which enables us to process real-time, and high speed video signals, and is sufficient to meet the real-time interaction and human-computer interaction requirements. Thus researchers have put forward a number of Multi-Touch systems based on computer vision. it has used two system.

- ***Purely-Vision-Based System:-***

Purely-vision-based multi-touch systems is image processing techniques to identify touches and their positions. Multi-touch systems which employ this technique can be used on any flat surface without the need for a dedicated display device and are of very high portability However, the flexibility of pure vision systems comes at the cost of precision. a computer-

vision-based system called the Everywhere Display .The system uses a camera and projector to turn a common touch screen into an interactive display screen through image processing technology. Microsoft's Play Anywhere is a relatively compact and well mobile desktop interactive system with a front camera in these system, contributed many image processing techniques for the desktop interactive system with a front camera based on computer vision. Most notably is the shadow-based touch detection algorithm, which can accurately and reliably detect touch events and their contact position.

- ***Computer Vision- and Optical-Based System:-***

Devices based on computer vision and optical Multi-touch technology has good scalability, and a low cost relatively, but they have a larger volume. Here are two kinds of computer vision and optical-based Multi-touch systems.

- Frustrated Total Internal Reflection (FTIR)
- Diffused Illumination (DI).

7. Different techniques used multitouch technology

- Frustrated Total Internal Reflection(FTIR)
- Diffused illumination(DI)
- Diffused Screen Illumination(DSI)
- Laser Light Plane (LLP)

Frustrated Total Internal Reflection

It is a name used by the multi-touch community to describe the multi-touch methodology developed by Jeff Han (Han 2005)[5] Frustrated Total Internal Reflection is a kind of optical phenomenon. Beams of LED (light-emitting diode) reach the surface of the screen from the touch-screen cross-section will reflect. However, if there is a relatively high refractive index material (such as a finger) suppressing the acrylic materials, the panels, the conditions of total reflection will be broken. Some of the beams would project onto the surface of fingers through the screen surface. The tough finger surfaces cause scattering(diffuse reflection), and the scattered light would be read by the infrared camera set under the acrylic board through the touch screen. The corresponding touch information can be detected through corresponding software (Touch lib). Touch lib is a set of software library developed by NUI Group for the multitouch system development, which implements the majority of computer vision algorithms. This technique can detect multiple touch points and the location of exposure by using only a simple Blob detection algorithm. FTIR principle has been used to produce a number of input devices, such as a fingerprint reader. And it is also very useful for implementing multi-touch displays.

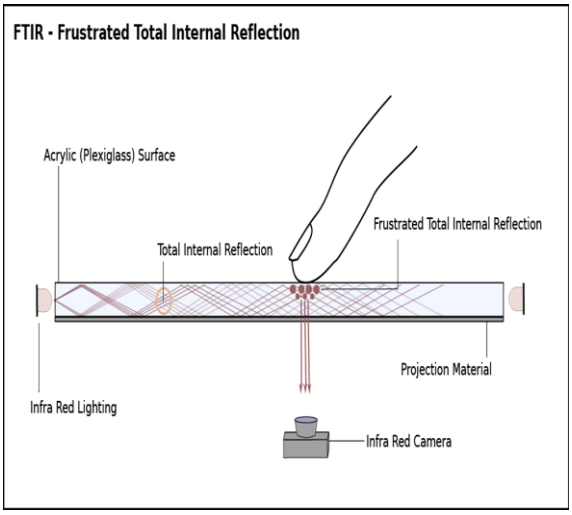


Figure1: Frustrated Total Internal Reflection

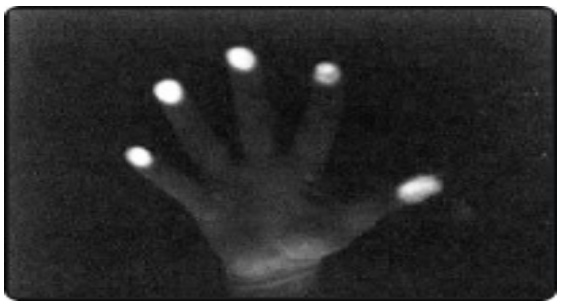


Figure 2: multitouch screen(FTIR)

Diffused Illumination(DI)

While the hardware for diffused illumination based multi-touch surface emulates that of FTIR, the principle used here is different. Here, the IR illuminators are also placed behind the touch screen along with the camera. But the rear illumination of the surface does not account for uniform distribution of light over surfaces. As the name suggests, in DI technique a diffuser layer is mounted either below or above the touch surface to assuage the effect of direct light to the camera (Note: A diffuser diffuses light, hence reflects lesser). When the user touches the surface, light is reflected and an image of the touch is created. This image is sensed by the digital camera integrated at the bottom of the surface. It is to be noted that the object reflects more light than the diffuser; this makes the camera to easily detect the

surplus amount of light coming to it. One important advantage with DI technique is that it is not limited to human interaction; it can also sense the touch of objects hovering over the touch surface.

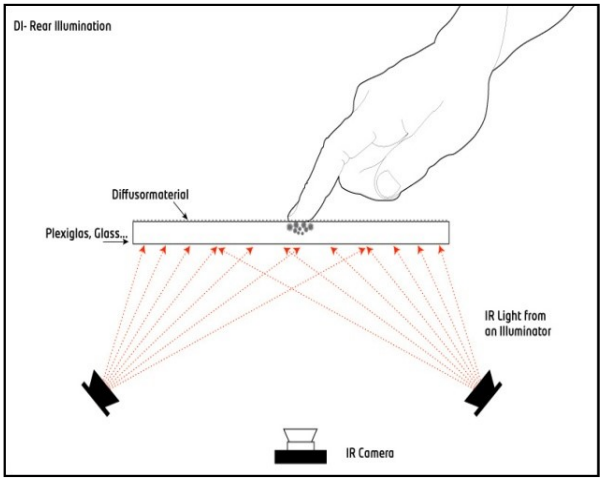


Figure 3: Diffused illumination

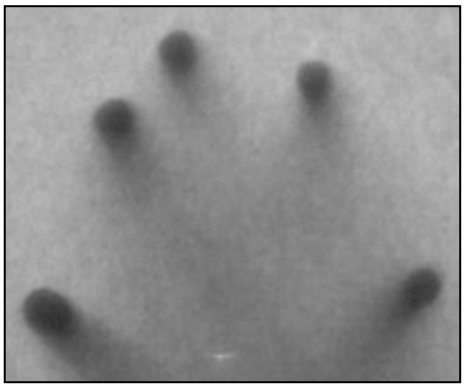


Figure 4 : multitouch screen(DI)

Diffused Screen Illumination(DSI)

This technique addresses the problem of uniform distribution of light in DI. The hardware setup is similar to FTIR except that a special type of acrylic pane is incorporated here. The acrylic used here is fitted with n number of small particles that act as mirrors which reflects light and illuminates the surface uniformly. The principle for detection of touch is similar to DI.

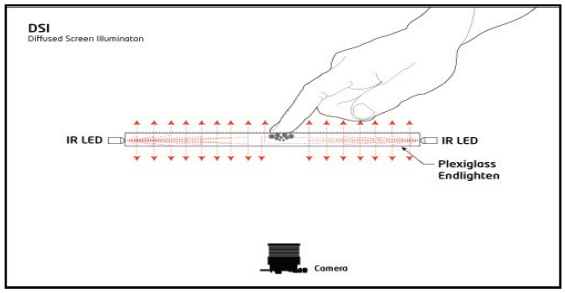


Figure 5: Diffused Screen Illumination

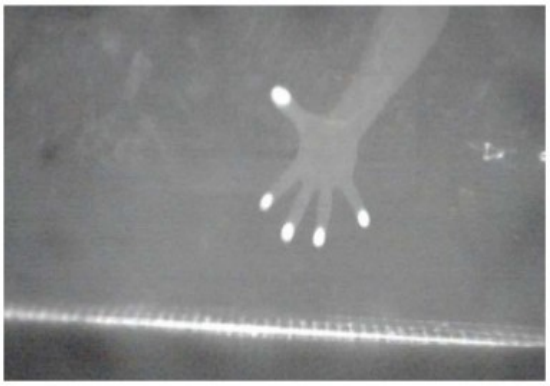


Figure 6 : Multitouch Screen(DSI)

Laser Light Plane (LLP)

In the laser light plane technique, infrared laser source is used to illuminate the surface. Certain parameter about the power wattage of the laser source has to be maintained so that it does not exceed the safety limits. The laser lights used here create a plane of light above the surface and not on or below the surface. When this plane of light is obstructed by an object, the light is scattered and picked by the camera mounted downwards. One major disadvantage of LLP technique is that with only one or two laser light source objects placed on the surface may obstruct light for other objects on the same surface.

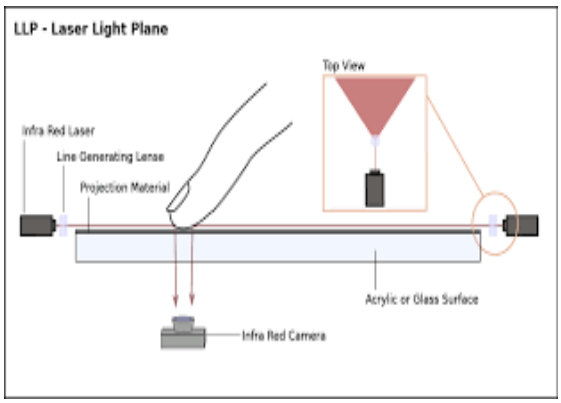


Figure 7 : Laser Light Plane (LLP)

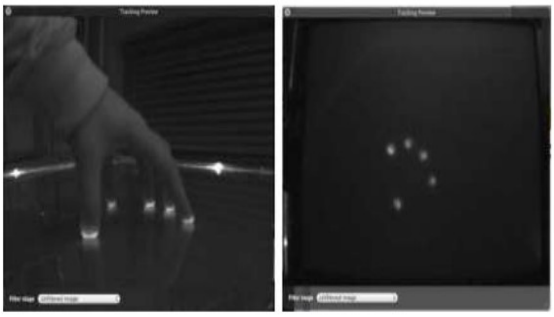


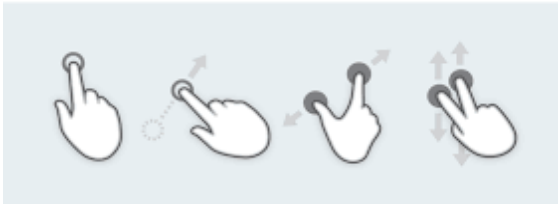
Figure 8: Multitouch screen(LLP)

III. RESULTS AND DISCUSSION

Gesture Sets and Recognition

In multitouch technology the gestures are also used. to achieve better user experience of multitouch interactions, researchers are designing different gesture sets. They have already proposed several touch gestures sets and solved the corresponding recognition problems. One of the most important problems in gesture sets and recognition problem is the contact shapes. The easiest approach is to ignore the actual shape of the contact areas, simply treat them as points. There are many techniques designed for it. Bump Top[14] is one of the gestural techniques that only deals with point of contacts. However, if we could detect the gesture beyond finger counting, the touch screen would get more information and provide more friendly user interface. Smart Skin to recognize multiple hand positions and shapes and calculates distance between the hand and the surface(screen). Shape Touch explored the interactions that directly utilize the contact shapes on interactive surfaces to manipulate the virtual objects. Gesture set generally used multitouch interaction. Murugappan et al. defined the concept of *extended multitouch interaction* [8]. The sensing was achieved by mounting a depth camera above a horizontal That enables the *extended multitouch interaction* detect multiple touch points on and above a surface, recover finger, wrist and hand postures, and distinguish between users interacting with the surface. *Extended multitouch interaction* is a very powerful technique, of touch that makes the system very "smart". Because it can recover finger, wrist and hand postures, which increases the degree-of-freedom of gestures. Multi-point touch pads make this type of interaction possible. By touching different parts of the interaction surface, users of these touch pads can control many more parameters than they can with traditional pointing devices. In addition, it is able to distinguish different users, which is an amazing contribution to multi-touch interaction. This feature enables interaction of multiple users at the same time. With the surface/screen only, the information it can detect is the contact areas. We can still design many useful gesture sets using the contact areas only.

1. Multitouch Gesture



A multi-touch gesture consists of a sequence of finger configuration changes, and each finger configuration might produce a series of repetitive motions. A motion is repetitive when any of its segments triggers the same type of action as its whole. The research community and industry have used "touch gesture" broadly to refer to various interaction behaviors on the touch screen or surface of a touch-sensitive device. Overall, touch gestures tend to fall into one of the following two categories. A large body of work was concerned with gestures that have a predefined trajectory or shape, e.g., recognizing handwriting symbols for text entry or gesture shortcuts for invoking commands or detecting the crossing over a series of targets to trigger a specific action. These gestures are often produced with a single finger or the stylus. The interaction behaviors associated with this type of gesture are one-shot—an action is triggered only when the gesture is finished. The second category of gestures refers to those for direct manipulation of interfaces, e.g., tapping to activate, swiping to scroll, pinching to zoom, or twisting to rotate, which are more prevalent in commercial products. These gestures may involve more than one finger and typically do not concern the exact trajectory of the finger movement. In multitouch technology are use different multi touching gestures. Gestures are defined as a movement or position of the hand, and the use of such movements to express thought, emotion, etc. or arm...that is expressive of an idea, opinion, emotion, etc A gesture is a result of moving a finger or other touch point across a screen he action that is preformed by the system. These are seen as the ground works of touch screen manipulation and interaction. They allow users to interact with touch screens in ways that are specified by the developers. Each device has its own gestures and interactions. a multitouch device is a surface where multiple active contact points can be sensed at the same time. Wigdor et al. resented a new multi-touch gesture technique called Rock& Rails that improved the direct multi-touch interactions with shape-based gestures [9] .The most important characteristic of Rock & Rails is that it utilizes non-dominant hand to mode actions of the dominant hand. In other words, non-dominant hand is the action selector of the dominant hand. This

technique is actually commonly used in mouse/keyboard interface. By pressing a keyboard button, people can change the action mode of mouse (e.g. Mac OS, Windows, Photoshop). However, it is not widely used in multi-touch interface, so Rock & Rails is a great try to transfer keyboard/mouse techniques to multi-touch interface. multitouch gestures was mainly defined using characteristics of hand and finger movement.

2. Structure of Gesture

The goal of the gesture library was for it to be easy to maintain, as well as easily scalable in terms of adding new gestures to it. The applications (i.e. the listeners) should also be separated from Touch Lib,[15] so that they just will have to listen to gestures, apart from listening to gesture - and finger events. The gesture library listens to finger events and provides the application with the gestures it detects. The application is separated from the Touch Lib and the inheritance structure of the gesture classes provides for the scalability. Every new type of gesture is just added as a new sub class to the *Gesture* base. The application inherits from the *Gesture Listener* class and registers itself as a listener at the *Gesture Handler*. The application will have to let the gesture library know what objects it will take into account when it comes to analyzing the gestures being performed on them, as well as updated and oriented extreme points of the same objects. One thing all the visible objects in every application have in common is a screen position. *Gesture Analyzer* is the class located closest to the hardware. It inherits the Touch Lib interface and gets to implement the pure virtual functions that are important for further analysis. *Gesture Analyzer* is a Singleton class, meaning that a new instance of the class is created if one does not exist. Every application registers as a listener in *Gesture Handler*, from where an instance of *Gesture Analyzer* is being created. The *Gesture Handler* serves as an interface between the application and the Touch Lib, separating the two for the reasons mentioned above [6].

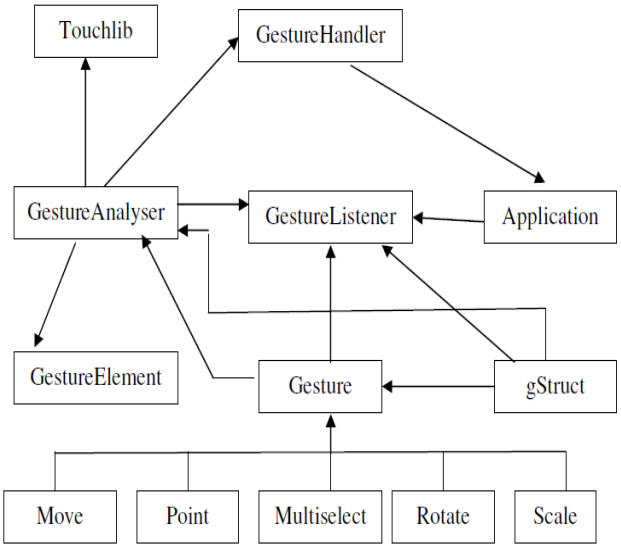


Figure 9 : design model of gesture

3. Different Gestures Set

The multiouch different gestures are used. some gestures are as follows:

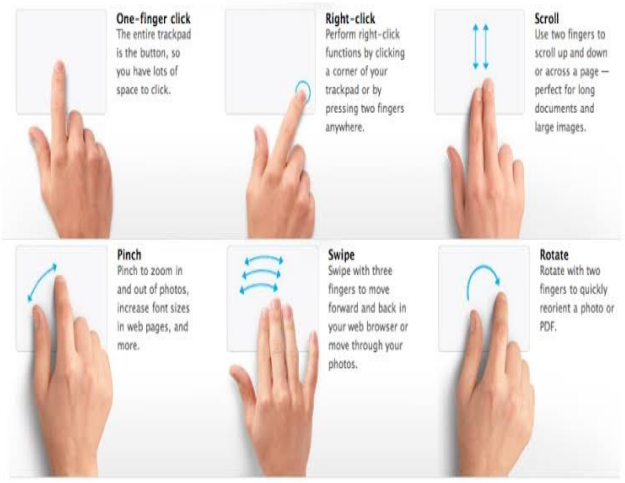


Figure10. multi touch gesture set

Tap:-

It is used touch panel with single touch or multitouch. One-finger touch and quick release. it is performing select the application.

Hold:-

It is used touch panel with single touch or multitouch. One-finger touch, maintain the same touch contact point for a brief time.

Double tap:-

It use single or multitouch. Two one ginger touches in quick succession. it is used execute a program.

Pan(one finger):-

One finger touch and slow movement. it used move object.

Flick:-

one finger touch ,quick movement in a line, and release. it used to scroll.

Pan(two fingers):-

Two finger touch, move fingers together(pinch) or apart(stretch).it used zoom in or zoom out.

Swipe:-

Swipe with three fingers to move forward and back in our browser or screen.

Rotate:-

Requires a minimum of two fingers to perform. The fingers are placed on the screen and moved in a rotating manner.

Multi Select:-

It is a gesture that makes it possible to select a number of objects in one stroke. That is used to from traditional interfaces.

Scale:-

Scaling requires at least two fingers and is an example of simultaneous inputs. To scale an onscreen object, grip it with the fingers and bring them together to scale down, or separate them to scale up.

Move:-

It is performed by grabbing and dragging the object(s) across the screen.

4. Advantages of Multitouch Technology

1.It is a simple and inexpensive technique. It constructs a multi touch display with the available and less costly materials.

2.Scalable technique that enables high-resolution graphics. It provides support to any resolution possible as all multiple points could be generated on a camera.

3. Multi-touch refers to the multi-point or multi-users interactive mode on the same interface, discarding keyboard and mouse. Users can see single-point touch via hands, and achieve click, double click, pan, pressing, rolling, rotating and other different gestures to arbitrarily manipulate touch screen .

4. multi-touch can be equipped with relevant touchpad, touch software as well as multi-media system. It also matches professional graphics software. Cell phone, PC all can be available to multi-touch.

5. It is scalable to large installations. Any kind of applications can be made to suit multitouch using FTIR. Allows us to create sophisticated multi-point widgets for applications

6. In addition, multi-touch features strong entertainment, which can be shown from the representative of iPad and touco's multi-touch entertainment platform.

7. iPad is more convenient in entertainment, surf internet and e-mail. The picture, videos, music and the irresistible games make it more appealing to.

5. Application

1) A multitouch display can be used in personal computer, laptops, tabletops, graphics tablets**.**
2) It supports both LCD and CRT monitors.
3) Telephones, Watches, PDA's, Mobile Phones.
4) An advanced multi touch gaming with high graphics support.
5) Governmental, Offices and business purposes.
6) Enhanced multimedia experience including audio, video and photo sharing

IV. CONCLUSION

Touch screens are the interface for the 21st century. Touch screens address the conflicting demands for smaller portable electronics with larger displays, by eliminating traditional buttons without sacrificing screen size. Touch technology has multiple advantages but few disadvantages. The main issue is that some devices are more touch sensitive than others. The multi-touch has created a major impact on the current Innovations. multitouch technology provided multiple touch point and more flexibility of computer interaction. In this paper, Early researches and current researches on multitouch and gestures are involved. Firstly, brief introduction of multitouch technology provided as background literature review. Then Different types of touch technology that are show how to different way touching technology are used in the devices like tablet, mobile phone etc. several foreign multi-touch technologies based on senor and computer vision are introduced and the advantages and disadvantages of these technologies are analyzed briefly. It is very meaningful for us to build the interactive platforms. The multitouch technology developing new approach techquies are using. This technique using FTIR is simple and easy to implement. It provides any resolution displays supported with high graphics. A drawback of the approach is that, being camera-based, it requires a significant amount of space behind the interaction surface and also diffused illumination , Laser Light Plane (LLP) are using developing multitouch then gesture recognition are used

multitouch technology, different types of multitouch gestures are defined and working of multitouch gesture are described.

V. REFERENCES

[1]. Rong Chang, Feng Wang and Pengfei You, "ASurvey on the Development of Multi-touch Technology", IEEE, (2010).

[2]. B. Buxton, "Multi-Touch systems that I have known and loved," Microsoft Research, (2009).

[3]. Microsoft.Surface.http://www.microsoft.com/Surface/Index.html.18S. Do-Lenh, et al., "Multi-Finger interactions with papers on augmented.

[4]. Liwen Xu, Multitouch and Gesture: A Literature Review of Multitouch and Gesture University of Toronto Bahen Centre, 40 St. George Street, Room 4242,Toronto, Ontario M5S 2E4xuliwenx@cs.toronto.edu.

[5]. Low-Cost Multi-Touch Sensing through FTIR by Jefferson Y. Han.

[6]. Mrs. Mrudula Nimbarte," multi-touch screen interfaces and gesture analysis: a study" Advanced Computing: An International Journal (ACIJ), Vol.2, No.6, November (2011).

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

[8]. Murugappan, S., Vinayak, Elmqvist, N. and Ramani, K.Extended multitouch: recovering touch posture and dif- ferentiating users using a depth camera. In Proc.UIST '12. 487-496.

[9]. Wigdor, D., Benko, H., Pella, J., Lombardo, J., Williams, S. Rock & Rails: Extending Multi-touch Interactions with Shape Gestures to Enable Precise Spatial Manipulations. In Proc. CHI 2011, ACM Press(2011), 1581-1590.

[10]. Buxton, W., Myers, B. A study in two-handed input. Proc. CHI '86, (1986), 321-326.

[11]. Buxton, W., Hill, R. Rowley, P. Issues and techniques in touch-sensitive tablet input. Proc. SIGGRAPH'85, Computer Graphics, 19(3), (1985), 215-223.

[12]. Sears A., Plaisant C., Shneiderman B.: A new era for high precision touchscreens. Advances in human-computer interaction (vol. 3), (1993), 1-33.

[13]. Potter, R.L., Weldon L.J., Shneiderman B. Improving the accuracy of touch screens: an experimental evaluation of three strategies. Proc. CHI'88, (1988),27-32.

[14]. Agarawala,A.andBalakrishnan,R.2006.Keepin'it real: Pushing the desktop metaphor with.

[15]. Nuigroup. Touchlib. http://nuigroup.com/touchlib