STUDY OF TOUCH LESS TOUCH SCREEN TECHNOLOGY

Nilofar E. Chanda
N.B. Navale College of Engineering, Solapur, Maharashtra, India

Abstract
Touch screen displays found everywhere in the world. The touch screen display provides a greater flexibility to user but after some years touch screen display becomes less sensitive which causes failure of touch on touch screen display. If we use a screen protector still dirty marks present on the display to avoid this problem a simple user interface for touch less control of electrically operated equipment is being developed. This paper overcomes the drawback of touch screen display by providing touch less display, also this paper presents a study of touch less display, history of touch screen working of touch less technology with application.

Keywords*:* **Touch screen display, less sensitive, failure of touch, and touch less control.**

I. INTRODUCTION

Touch less touch screen technology uses finger motions without touching a screen. It simply uses hand wave in certain direction, or a flick of the hand in one area. In the touch screen display if the screen is cracked then we cannot operate the device by simply touching a display. The purpose of this touch less technology is to make life simple and more convenient. This system requires a sensor but the sensor is neither hand mounted nor present on the screen. The sensor can be placed either on the table or near the screen. The hardware setup is so compact that it can be fitted into a device like a mobile phone or laptop screen. It recognizes the position of an object from 5 feet

Touch less touch screen technology means without using a finger or without touching a device we can easily operate the system. It is also called as “Don’t touch me” technology. In this technology we have to simply draw a pattern for selecting tool or deleting a tool. This pattern we have to store in the database and the currently shown pattern is compared with the already stored images if pattern matches then the system work properly. Touch less display doesn’t require any special sensors that we wear on our finger or either on our hand. We have to just point at the screen (from as far as 5 feet away), and we can easily operate the system

Microsoft Company rebranded the technology as Pixel Sense once Microsoft introduced its unrelated Surface tablet to consumers. The name "Pixel Sense" refers to the way the technology actually works: a touch-sensitive protection glass is placed on top of an infrared backlight. As it hits the glass, the light is reflected back to integrated sensors, which convert that light into an electrical signal. That signal is referred to as a "value," and those values create a picture of what's on the display. The picture is then analyzed using image processing techniques, and that output is sent to the connected computer.. In this paper the working of touch less display and its applications is mentioned.

II. HISTORY

A.1980’s: The decade of touch

In 1982, the first human-controlled multi touch device was developed at the University of Toronto by Nimish Mehta. It wasn't so much a touch screen as it was a touch-tablet. The Input Research Group at the university figured out that a frosted-glass panel with a camera behind it could detect action as it recognized the different "black spots" showing up on-screen. Bill Buxton has played a huge role in the development of multi touch technology. The touch surface was a translucent plastic filter mounted over a sheet of glass, side-lit by a fluorescent lamp. A video camera was mounted below the touch surface, and optically captured the shadows that appeared on the translucent filter. (A mirror in the housing was used to extend the optical path). The output

of the camera was digitized and fed into a signal processor for analysis.

Touch screens began being heavily commercialized at the beginning of the 1980s. HP (then still formally known as Hewlett-Packard) tossed its hat in with the HP-150 in September of 1983. The computer used MS-DOS and featured a 9-inch Sony CRT surrounded by infrared (IR) emitters and detectors that could sense where the user's finger came down on the screen. The system cost about $2,795, but it was not immediately embraced because it had some usability issues. For instance, poking at the screen would in turn block other IR rays that could tell the computer where the finger was pointing. This resulted in what some called "Gorilla Arm," referring to muscle fatigue that came from a user sticking his or her hand out for so long.

The first multi touch screen was developed at Bell Labs in 1984. [Bill Buxton] reports that the screen, created by Bob Boie, "used a transparent capacitive array of touch sensors overlaid on a CRT." It allowed the user to “manipulate graphical objects with fingers with excellent response time”. The discovery helped create the multi touch technology that we use today in tablets and smart phones.

In 1984, Fujitsu released a touch pad for the Micro 16 to accommodate the complexity of kanji characters, which were stored as tiled graphics.[15] In 1985, Sega released the TerebiOekaki, also known as the Sega Graphic Board, for the SG-1000video game console and SC-3000home computer. It consisted of a plastic pen and a plastic board with a transparent window where pen presses are detected.

B. 1990’s: Touch screens for everyone!

Apple also launched a touch screen PDA device that year: the Newton PDA. Though the Newton platform had begun in 1987, the Message Pad was the first in the series of devices from Apple to use the platform. As Timenotes, Apple's CEO at the time, John Sculley, actually coined the term "PDA" (or "personal digital assistant"). Like IBM's Simon Personal Communicator, the Message Pad featured handwriting recognition software and was controlled with stylus.

IGesture Pad: Westerman and his faculty advisor, John Elias, eventually formed a company called Finger Works. The group began producing a line of multi touch gesture-based products, including a gesture-based keyboard called the Touch Stream. This helped those who were suffering from disabilities like repetitive strain injuries and other medical conditions. Finger Works was eventually acquired by Apple in 2005, and many attribute technologies like the multi touch Track pad or the iPhone’s touch screen to this acquisition.

Figure1-Original Message pad 100

Figure 2-IGesture pad

C.2000’s and beyond

With so many different technologies accumulating in the previous decades, the 2000s were the timefor touch screen technologies to really flourish. The 2000s were also the era when touch screens became the favourite tool for design collaboration.

D. 2001:Alias | Wavefront’s gesture-based Portfolio Wall

As the new millennium approached, companies were pouring more resources into integrating touch screen technology into their daily processes. 3D animators and designers were especially targeted with the advent of the Portfolio Wall. This was a large-format touch screen meant to be a dynamic version of the boards that design studios use to track projects.

Though development started in 1999, the Portfolio Wall was unveiled at SIGGRAPH in 2001 and was produced in part by a joint collaboration between General Motors and the team at Alias|Wavefront.Buxton, who now serves as principal research at Microsoft Research, was the chief scientist on the project. "We're tearing down people the wall and changing the way effectively communicate in the workplace and do business," he said back then. "Portfolio Wall's gestural interface allows users to completely interact with a digital asset. The Portfolio Wall used a simple, easy-to-use, gesture-based interface. It allowed users to inspect and images, animations, and 3D files with just their fingers.. It was also easy to scale images, fetch 3D models, and play back video.

E. 2002: Mutual capacitive sensing in Sony's Smart Skin

In 2002, Sony introduced a flat input surface that could recognize multiple hand positions and touch points at the same time. The company called it Smart Skin. The technology worked by calculating the distance between the hand and the surface with capacitive sensing and a mesh-shaped antenna. Unlike the camera-based gesture recognition system in other technologies, the sensing elements were all integrated into the touch surface. This also meant that it would not malfunction in poor lighting conditions. The ultimate goal of the project was to transform surfaces that are used every day, like your average table or a wall, into an interactive one with the use of a PC nearby. However, the technology did more for capacitive touch technology than may have been intended, including multiple contact points.

Figure 3-Alias|Wavefront's gesture-based Portfolio Wall

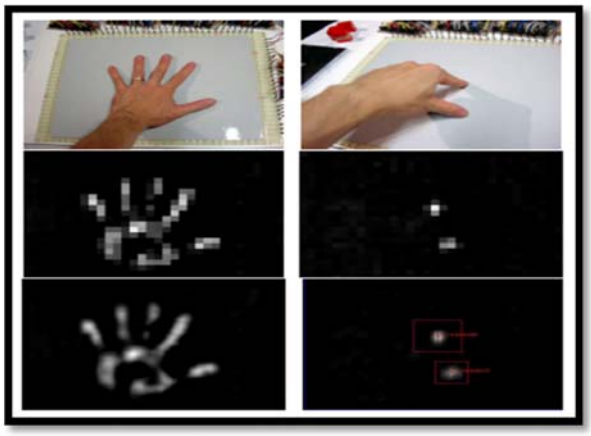

Figure 4-Smart Skin sensed gestures

Jun Rekimoto at the Interaction Laboratory in Sony's Computer Science Laboratories noted the advantages of this technology in a whitepaper. He said technologies like Smart Skin offer "natural support for multiple-hand, multiple-user operations." More than two users can simultaneously touch the surface at a time without any interference. Two prototypes were developed to show the Smart Skin used as an interactive table and a gesture-recognition pad. The second prototype used Smart Skin used as an interactive table and a gesture-recognition pad. The second prototype used finer mesh compared to the former so that it can map out more precise coordinates of the fingers. Overall, the technology was meant to offer a real-world feel of virtual objects, essentially recreating the human use with their fingers to pick up objects and manipulate them.

F. 2002-2011: Failed tablets and Microsoft Research's Touch Light

Multi touch technology struggled in the mainstream, appearing in specialty devices but never quite catching a big break. One almost came in 2002, when Canada-based DSI Datotech developed the HandGear + GRT device (the acronym "GRT" referred to the device's Gesture Recognition Technology). The device's multipoint touchpad worked a bit like the aforementioned iGesture pad in that it could recognize various gestures and allow users to use it as an input device to control their computers.

Hand Gear also enabled users to "grab" three-dimensional objects in real-time, further extending that idea of freedom and productivity in the design process. The company even made the API available for developers via Auto Desk. Unfortunately, as Buxton mentions in his

overview of multi touch, the company ran out of money before their product shipped and DSI closed its doors. Two years later, Andrew D. Wilson, an employee at Microsoft Research, developed a gesture-based imaging touch screen and 3D display. The Touch Light used a rear projection display to transform asheet of acrylic plastic into a surface that was interactive. The display could sense multiple fingers and hands of more than one user, and because of its 3D capabilities, it could also be used as a makeshift mirror. The Touch Light was a neat technology demonstration, and it was eventually licensed out for production to Eon Reality before the technology proved too expensive to be packaged into a consumer device.

2006: Multi touch sensing through “frustrated total internal reflection”. In 2006, Jeff Han gave the first public demonstration of his intuitive, interface-free, touch- screen at a TED Conference in Monterey, CA. In his presentation, Han moved and manipulated photos on a giant light box using only his fingertips. He flicked photos, stretched and pinched them away, all with a captivating natural ease. "This is something Google should have in their lobby," he joked. The demo showed that a high-resolution, scalable touch screen was possible to build without spending too much money.

Han had discovered that the "robust" multi touch sensing was possible using "frustrated total internal reflection" (FTIR), a technique from the biometrics community used for finger print imaging. FTIR works by shining light through a piece of acrylic or plexil glass. The light (infrareds’ commonly used) bounces back and forth between the top and bottom of the acrylic as it travels. When a finger touches down on the surface, the beams scatter around the edge where the finger is placed, hence the term "frustrated." The images that are generated look like white blobs and are picked up by an infrared camera. The computer analyzes where the finger is touching to mark its placement and assign a coordinate. The software can then analyze the coordinates to perform a certain task, like resize or rotate objects.

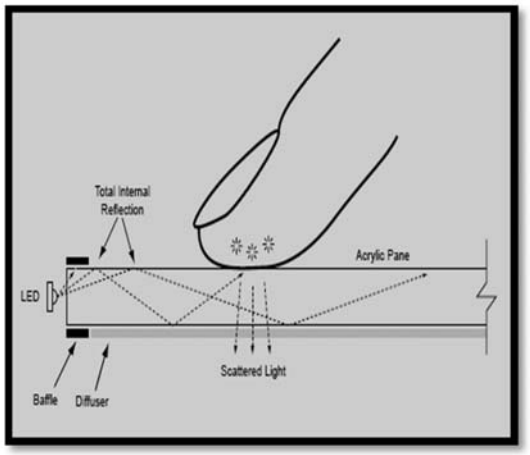

Figure 5- Touching to display

In 2007, the Microsoft Surface was essentially a computer embedded into a medium-sized table, with a large, flat display on top. The screen's image was rear-projected onto the display surface from within the table, and the system sensed where the user touched the screen through cameras mounted inside the table looking upward toward the user. As fingers and hands interacted with what's on screen, the Surface's software tracked the touch points and triggered the correctactions. Later in its development cycle, Surface also gained the ability to identify devices via RFID.

In 2011, Microsoft partnered up with manufacturers like Samsung to produce sleeker, newer tabletop Surface hardware. For example, the Samsung SUR40 has a 40-inch 1080p LED, and it drastically reduced the amount of internal space required for the touch sensing mechanisms. At 22-inches thick, it was thinner than its predecessors, and the size reduction made it possible to mount the display on a wall rather than requiring a table to house the camera and sensors. It cost around $8,400 at the time of its launch and ran Windows 7 and Surface 2.0 software.

III. WORKING

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. The touch less display can detect the 3D motions without putting your fingers on the screen.

Sensors are placed around the screen. First the moving image comes like finger or hand in front of the sensor.

The sensor detects the image and then light enters to the sensor and hits the pixel matrix, after hitting to pixel matrix the pixel converts incoming light into electric charge with the help of photodiode. The sensor then generates electric signals and theses electric signals are processed to provide the output to user.

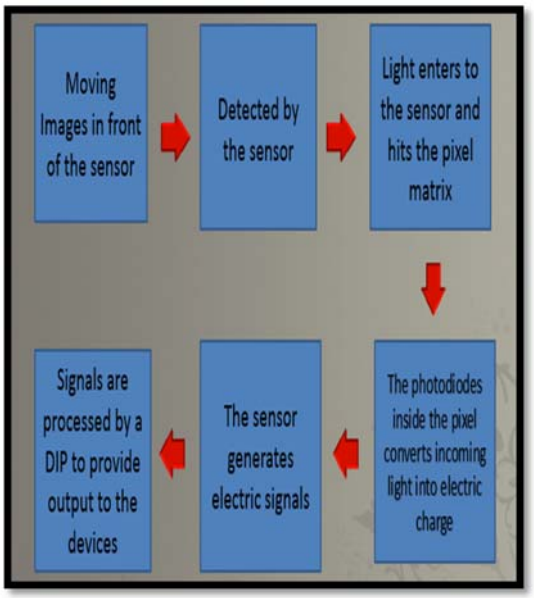

Figure 6-Working of touch less screen

IV APPLICATION

A. TOUCH LESS MONITOR

Touch less monitor is designed for applications where mouse fails to work or touch may be difficult such as for doctors who might be wearing surgical gloves. This monitor is made by TouchKo was recently demonstrated by White Electronic Designs.

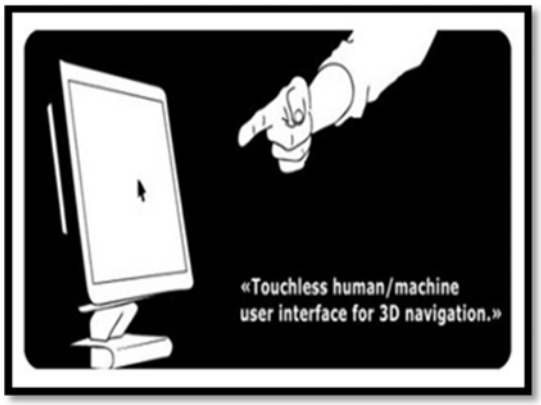

Figure 7- Touch less monitor

IV. CONCLUSION

This paper provides an overview of touch less touch screen technology. With the use of this technology the user gets flexibility to use the system appropriately. The proposed touch less touch screen technology is suitable for android mobile phone, laptop, ATM machine etc. By using this technology maintenance work of touch screen display can reduce.

REFERENCES

[1]"Touch less Touch Screen" International Conference on Advanced Computing (ICAC-2016) College of Computing Sciences and Information Technology (CCSIT) ,Teerthanker Mahaveer University , Moradabad -2016

[2]"Touch less Touch Screen User Interface" International Journal of Technical Research and Applications e-ISSN: 2320-8163, Issue 43 (March 2017), PP. 59-63

[3]: http://www.studymafia.org/

[4]:http://www.etre.com/blog/2008/02/elliptic_labs_touchless_user_interface/

[5]]:http://en.m.wikipedia.org/