Survey on Touchless Touch Screen Technology using Hand Gestures
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Abstract:
Touch Screen is an important source of input or output device layered on top of an electronic visual device. A user gives the input or control the information processing through single or multi-touch gestures by touching the screen. Frequent touching a touchscreen display with a pointing device such as a finger or if there is any scratch caused due to major problems can result in malfunctions of Touch Screen, a simple user interface for Touchless control of electrically operated equipments being developed. Unlike other systems sensor or sensor selection depends on distance of hand 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.

1. INTRODUCTION
Touch Screen is an important source of input or output device layered on top of an electronic visual device. A user gives the input or control the information processing through single or multi-touch gestures by touching the screen. It enables the user to interact directly with what is displayed, rather than using any intermediate device. 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 screen is made by TouchKo, White Electronics Designs, and Group 3D. It works by detecting your hand movements or hand wave in certain directions in front of it. To avoid malfunctions of Touch Screen, a simple user interface for Touchless control of electrically operated equipments being developed. Elliptic Labs innovative technology make our control our gadgets like Computers, MP3 players or mobile phones without touching them. A simple user interface for Touchless control of electrically operated equipment is used. Unlike other systemssensor or sensor selection depends on distance of hand 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 and movements. The device is based on optical pattern recognition using a solid state optical matrix sensor with a lens to detect hand motions and movements. The sensor in matrix is then connected to a digital image processorand output the results as signals to control fixtures, appliances, machinery or any device controllable through electrical signals. This system depends on the finger or hand motions, hand wave in certain direction, with this your hand doesn’t have to come in contact with the screen. It requires a sensor, the sensor can be either placed near the screen or on the table. Elliptic Labs named as “Touch Less Human or Machine User Interface for 3D Navigation”. Touch screen technology is an electronic visual display is used to detect the presence and location of a touch within the display area. The term generally refers to touching the screen of the device with finger or hand. Touch-screens can also sense other passive objects such as stylus,etc. Touch screen are common in devices such as computers, tablet computers and smart-phone. This touch screen displays can be attached to computers or to networks as terminals. They also spend time in a prominent role in the design of digital appliances such as personal digital assistant, satellite navigation devices, mobile phones and video games[1]. Human hand gestures provide the significant and effective resources of non-verbal communication with the human and computer. Hand gestures are meaningful expressive body motions that are actions of fingers and hands. Hand gestures ranges from simple identical or static gestures that are used to point to the objects around, with the more complex gestures or dynamic gestures that express person’s thoughts and allows to communicate with others.Several Hand gesture recognition techniques have already exited and most of them are based on Hidden Markov Models [6]. Gesture is the physical movement might be small or huge right from the clap of hand to a roundhouse kick, or a nod of head, sometimes voice is also considered as a gesture. Gesture recognition is the ability of a devise to capture the human body movements and compute the data or command given by the user and execute the output accordingly. Gesture is usually used are a form of input to a devise, this makes the interaction of human more natural with the computers. Gesture input is the most comfortable way to convey to computer what command we are willing to execute. Gesture recognition is widely implemented in 3D-gaming technology, virtual reality and simulation modeling environment [7].

2. LITERATURE SURVEY
User interface exists everywhere e.g. washing machine which we use on the top surface there are various buttons that is nothing but a UI. You can stop the machine or turn ON just by the selecting proper button on the UI. User interface comes in very handy where user can’t actually go e.g. chemical industry. User interface should be easy to understand, speedy in operation. Just for understanding a UI no special training should be required. If we considered our smart phone UI they are easy to understand even a small baby play with it and under- stand. In this paper different types of UI are explained and com- pared. Also why touch screen is best it is explained further. Different touch screen technologies are compared and why capacitive touch screen is preferred is explained. Also UI is designed and developed also few parameters like threshold, response time and crosstalk are explained in the paper. The user interface or UI is nothing but helps the user to control the machine. The UI are classified as follows:-Button type, GUI type, Touchtype. The touch screen based UI are preferred
because they are compact in size, speedy in operation and just by the symbol or the label you can understand the operation. From this touch screen technology infrared and capacitive is famous [2]. In recent years, a mobile device is more friendly and powerful. The trends of new developed mobile device are focusing on big screen and thinness. The intuitive operation input is gradually becoming an important topic. With the advance of PC and mobile device technology, more and more new human machine interfaces are invented. Electronic mouse enables the user to control the position of the mouse cursor on the screen and give commands such as menu selection or editing the document on the screen. Touchscreen sensor technologies, including capacitive, resistive, magnetic or surface acoustic wave types, let the user be able directly to point out a position on the screen and move the objects across the screen. Some other devices, such as air mouse, 3D mouse or IR LED and proximity sensor are applied to control the cursor of the screen by detecting the movement in the air. The most intuitive way to interact with devices is to operate right in the center of the screen. In our system, we use the proximity sensor to detect the infrared from IR LED. The operation area in our system is limited between the sensors. The maximum operation distance from devices is affected by the emitting power of IR LED. The proposed system allows a bare hand or finger to trace a screen position touchless in a certain distance from a device. In some situation, the touchless control ability is useful. For example, when the hand is dirty after performing mechanic works, or greasy after handling food, users will have the requirement of interacting with the PC or mobile devices touchlessly [4]. Computer information technology is increasingly able to make a way into the hospital domain. One such hospital domain where in the information technology has been unavoidable is Interventional Radiology. Interventional Radiology (IR) is one of the rapidly growing areas of medicine that provides solutions to common problems affecting men and women of all ages. This is a minimally invasive treatment for vascular and non-vascular disease, using small catheters and catheter-based instruments guided by radiological imaging techniques such as x-rays, fluoroscopy, ultrasound, MRI and CT. These non-surgical techniques are advancing medicine and improving outcomes for a range of patients with life-threatening conditions. Interventional radiologists are physicians who specialize in minimally invasive, targeted treatments that are performed using imaging guidance. The interventional radiologist or surgeon performing this procedure needs to interact frequently with an increasing number of computerized medical systems before and during surgeries in order to review medical images and records. However, the computers and their peripherals are difficult to sterilize, so usually during a surgery, an assistant or nurse operates the mouse and keyboard for such interactions. This mouse and keyboard interaction suffers from communication problems and misunderstandings. This is one of the main reasons why, in recent years, touch-less interactions has been considered for use in operation theatres [3]. Nowadays, the interest has been increased in creating wearable device interaction approach Technology like Novel emerging user interface have the capacity to significantly affect market share in PC, smartphones, tablets and latest wearable devices such as head wearable device (HWD), i.e Google Glass, since the miniaturization of mobile computing devices permits anywhere access to the information. Therefore, displacing these technologies in smart devices is becoming a hot topic. Google Glass has many impressive characteristics, and will not meet the occlusion problem and the fat finger problem, which frequently occurs in direct touch controlling mode [5].

3. WORKING

Figure consists of a IR sensors which are mounted near the screen. When the light strikes to the 3D object, the light gets reflected. It consists of a solid state optical matrix sensor with a lens which recognizes the optical pattern the hand motions with the help of that reflected light. In each of these sensors there are matrix pixels. Each matrix pixel is coupled to photodiodes incorporating charge storage regions. The reflected IR light enters to the sensors and hits the pixel matrix. When the photon of sufficient energy present in the light strikes the photo diode, it create electron-hole pair. If the absorption occurs in depletion region, this carriers are swept from the junction by the built-in electric field of depletion region. Thus holes move towards the anode and electrons towards the cathode, and current is produced which results in the electric charge. Which is given by, I = Q/t Where, I = Current

\[ Q = \text{Charge} \]
\[ t = \text{time} \]

Thus, the sensor generates electric signals. This signals are in the form of analog. Thus these signals are converted into digital signals with the help of analog to digital converter for further processing. The digital output of ADC (Analog to Digital Converter) is given to the host controller (HC). The host controller controls the transmission of packets on the bus. Frames of lms are used. At the start of each frame in the transmission the host controller generates a Start of Frame (SOF) packet. To synchronize the start of the frame and to keep track of the frame number SOF packet is used. It also controls depth map i.e. an image that contains information relating to the distance of the surfaces of scene objects from a viewpoint. Host controller give its output to the sequence controller. Sequence controller controls the user actions and computer logic that initiate, interrupt, or terminate transaction. Sequence controller allow users to take initiative and control their interaction with the computer; try to anticipate user requirements and provide appropriate user control options and computer responses in all cases. The output of sequence controller is given to the both pixel matrix and modulator for controlling the action. The digital modulator maps the input binary sequence of 1’s and 0’s to analog signal waveform. It modulates the digital output of sequence controller. Thus the 3D movement are detected and interpreted into the electric signals which are processed by the digital image processor to
provide output to the devices, thus controlling the navigation according to the user's hand gestures. In this way the touchless screen technology works.

4. PROPOSED METHOD

(i) Gesture of Hand Movements:
System depends on the finger or hand motions, hand wave in certain direction, with this your hand doesn’t have to come in contact with the screen. Leap motion controller is used to translate hand movements into computer commands. Initial tests were conducted to establish how the controller worked and to understand their basic interaction. The controller is used to test the recognition of sign language. The finger spelling alphabet was chosen for the relatively simplicity of individual signs, and for the diverse range of movements involved in the alphabet. The main focus of these tests is to evaluate the capabilities and accuracy of the Controller to recognize hand movements. There is a particular meaning for different motions or gestures.

(ii) Detection of Movements using Sensors:
Sensors are placed around the display 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 in touchless screen is based on optical pattern recognition using a solid state optical matrix sensor to detect hand motions with the help of lens. The device in touchless screen 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, movements and outputs the result as signals. In each of these sensors there is a pixels of matrix. Each pixel in matrix is coupled to photodiodes incorporating charge storage regions. The reflected IR light enters to the sensors and hits the pixel matrix. When the photon of sufficient energy present in the light strikes the photo diode, it creates electron-hole pair. If the absorption occurs in depletion region, these carriers are swept from the junction by the built-in electric field of depletion region. Thus holes move towards the anode and electrons towards the cathode, and current is produced which results in the electric charge. Thus, the sensor generates electric signals.

(iii) Convert Electric Signals using DIP:
The digital modulator maps the input binary sequence of 1’s and 0’s to analog signal waveform. It modulates the digital output of sequence controller. Thus the 3D movement are detected and interpreted into the electric signals which are processed by the digital image processor to provide output to the devices, thus controlling the navigation according to the user's hand gestures.

5. RESULTS
The digital modulator maps the input binary sequence of 1’s and 0’s to analog signal waveform and it modulates the digital output of sequence controller. Thus the 3D movement are detected and interpreted into the electric signals which are processed by the digital image processor to provide output to the devices. And outputs the results as signals to control fixtures, appliances, machinery, or any other devices which are controllable through electrical signals.

The standard deviations of the x-axis and y-axis are 0.06 cm and 0.024 cm respectively at a fixed reference point. The positioning accuracy is affected by undesired objects.

6. CONCLUSION
Today’s thoughts are again around user interface. Efforts are put to better the technology day-in and day-out. The Touchless 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 virtual mouse, virtual keyboard and what not, Our body may be turned in to an input device. The distance information can be directly obtained between each sensor and the hand. Since the positioning algorithm fully utilizes all distance information from all sensors, the positioning results of hands is much more reliable.

7. REFERENCES


