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Intelligent Virtual Touch Screen Showing Finger Movement

V.R. Vaidya[1], P.L. Paikrao[2], Dr. D.S. Chaudhari[3].
[1] Student M.Tech II year, Department of E&TC, gcoea, Amravati, Maharashtra, India 444604
[2] Assistant professor, Department of E&TC, gcoea, Amravati, Maharashtra, India 444604
[3] Associate professor, Head of Department of E&TC gcoea, Amravati Maharashtra, India, 444604

Abstract- ***Touch screen is the demanding technology in recent world. Most of the digital operations are performed using touch screens. These techniques improve the operating system of computers, laptops, cell phones, tablets pc, etc. and gives better performance of operation. Various complex operations are easily performed using touch screen. The touch screen operated on physical existence of contact on the touch surface. The touch screen operation required physical existence of touch event. A physical contact is essential for the operation of touch devices. The physical touch does not possible in those operations where the screen is far located away from users and no possibility of direct contact, or user have no time to go toward the screen. At this situation virtual touch screen give determinant solution regarding the operation. The virtual touch screen operates on the movement of finger without any physical existence. Webcam provides generated depth image which is used for identification and correction. Here proposed virtual touch screen which operated according to user's finger. The algorithm shows the image extraction and segmentation process. This work gives human computer interaction for movements of finger in virtual environments.***

Keywords- **Depth Image, Gesture Recognition, Haptic Technology Mixed Reality, Webcam.**

I. INTRODUCTION

Researches on haptic technology gives man machine interfaces. It shows interaction of human with computer. This technique implements the communication of man and machines. This technology gives the creation of real input and shows the interaction of human with computer [1]. This communication is gives lot of advantages for developing modern technologies. Haptic techniques enhance the communication of man and machine. Mixed reality deals with addition of virtual object with real scene. The virtual reality changes the way for human operators interact with computer. Virtual reality provide working environment to interact with object. In virtual environment all objects are graphics model that follow no physical restriction.. The technology is camera based provides depth image information. The depth image is the image generated by camera. when finger comes in surrounded area tracking action performed and touch event detection occurred.. A virtual touch screen is implemented by means of image processing technique. When the object initially comes in suspected area of initial sense contact is provided by the touch receptor in the skin which provides information on the contact surface geometry. The haptic system must issue motor command that exerts a force on object this force uses for object manipulation and it is highly dependent on the type of grasping. Virtual touch screen recognize gesture of human finger and gives sense of touch on screen.

II. TOUCH SCREEN IMPLIMENTATION

This system is based on virtual wall concept. The virtual wall is the work surface in which object tracking actions are performed. The virtual wall is computational frame work of generic depended module for arbitrarily static scenes. The virtual wall consists of generic dependent virtual module responsible for computation on static scene within the cell. The interaction of finger is occurred within the wall without any physical contact surface in place; a virtual touch screen generates a virtual touch at a given distance from the camera and recognizes the touch events of a object on the screen. The implementation of virtual screen is obtained using a webcam and work surface. Here proposed a camera-based virtual touch screen, which derives the two dimensional (2D) position of finger image input from fixed camera and recognize the touch point [3]. When a finger is interacting within the surface area a webcam tracks the finger and this touch is recognize by screen. The floating finger shape also sets the initial position for the finger tracking process. If snapshot taken is good enough for resolution user's finger could be also used for identification and verification purposes. The finger identity is already stored in the form of gesture. The gesture is for the image identification. The data regarding user's identity is stored in this engine. The snapshot of the object is then passed on to a recognition engine for identification. A 2D environment designer allows the user to define the geometry of the environment surfaces.

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III. DEPTH IMAGE

The webcam take the image of object by emitting a laser or LED light. The light molecules are returns towards the camera after touching the object in the respective area. The time taken for this path is recognized and the distance is calculated by observing the speed of light molecules. In built sensor are used as time identifier. The in built sensor recognized the time taken for the light molecules returning toward the camera after touching the object [4]. This touch event gives the output as 2D depth images. The input is simply taken by interaction of fingers with work surface. This image is used for recognition of touch event and there occurrence. If the correction is true then we determined the object interfering with screen. fig 2 represents an image used in calculating the tip moment of the finger area and tracking the area that reaches the virtual touch screen. This technique used for the implementation of a virtual screen.

Fig1 Depth Image

Threshold Value for Images

The input touch points kept their identity on pixel. The pixel is landmark for detection of input events. All the analysis is performed on the pixels and object tracking is occurred within the pixel. The pixels provide the motion of finger and input touch events. The threshold value retains the object in surrounded area of image. This threshold value gives the boundary for the touch event. The image shows point mark when the subtraction of image pixels occurs from gray scale data. The setting a threshold value of depth image for extraction of the useful data from input image, and used in calculating the central moment of the finger area.

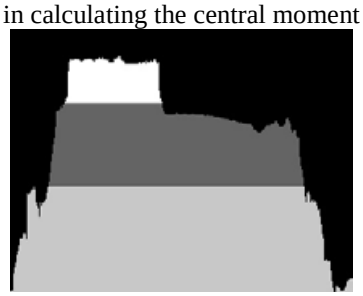

Fig 2. Threshold Image

IV. GESTURE RECOGNITION

A gesture can be realized by incorporating an object trajectory database extraction system and a gesture recognition system for the implementation of virtual touch screen. An object trajectory database extraction system consists of gesture input, gesture image correction, and feature extraction units. gives the information of data obtained from image. Hence object tracking is achieve by means of these type of recognition

A. Gesture Input

The gesture gives the information for input touch event. the touch event gives the path for traveling data in gesture. After the detection of touch is detected input touch points are saved to create a gesture database. Whenever a touch action is performed, calculation is done at each frame to determine whether the respective frames are touched or not. If touches are performed on a continued basis, the touched points are saved in the memory. The gesture is ended only the occurrence of untouched frames.

B. Gesture Image Correction

Gesture image correction is process performed after the gesture input is over. There are several phases should be carried out to correct the gesture of image. On this image even the same gestures may take place different position and size. Thus the individual gesture is needed for the correct identity of image. For this purpose, the end points on the four sides of each gesture image are identified, and the image of the area is projected onto a 100×100 image. That means any image which is smaller than 100 pixels in width or length is enlarged, and image which is greater than 100 pixels are reduced in size. These processes give the exact identification of gesture.

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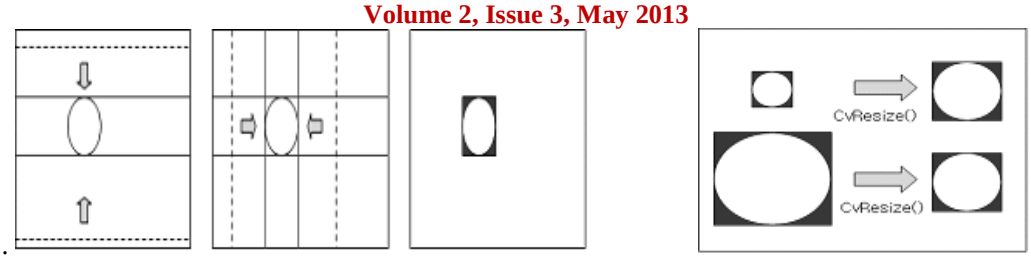

Fig 3. Gesture Correction

C. Gesture extraction

Gesture extraction process carried out with distributed the size of pixels. The pixels are distributed structure of image. The pixel is the basic structure of bounding image together. The working on these pixels gives the interaction and working in the image, For this working place is required this working place is obtained by extracting touched image from entire image. So the required portion of image is subtracted from gray scale image which gives the real analysis of image. The real input is generated on working with these pixels. When the color image is divided in small pixels and observing every pixel.

V. TRACKING

Algorithm

This algorithm is for identifying the virtual point and rotate point according to finger movements. The brief explanation of algorithm is explained here. Following steps involves for tracking the virtual point in real time.

- Captures video frames.
- Set the properties of video object.
- Start video acquisitions.
- Subtract real component from gray scale image.
- Assigns threshold value for pixels.
- Labeling the image component.
- Use median filter to filter out noise.
- Bound the object in determine area.

The images which are produce by camera causes error in finger segmentation process. In order to make error free segmentation a tracking algorithm added with time and representing the finger state in time(t) & s^(t) by means of vector

$$s^{\wedge}(t)= (p^{\wedge}(t),w^{\wedge}(t),u(t)) \quad \ldots\ldots\ldots\ldots\ldots\ldots(1)$$

Where p^ = (px, py) is the finger position in the 2D image. w^ = (w,h) is the size of the hand in pixels u is the hand's angle in the 2D image plane. Now the finger state is taken First, from the finger state in time (t) built an hypothesis of the h^= (p^ (t+1), w^ (t)u(t)). The dynamic model of constant velocity is

$$P^{\wedge} (t+1)-p^{\wedge} (t) = p^{\wedge}(t)-p^{\wedge}(t-1) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots(2)$$

The equation expresses a dynamical model of constant velocity. If we assume that at time t, M blobs have been detected b= [b1.bj.bm…] where each blob correspond to a set of connected skin-color pixels, the tracking process has to set the relation between the finger hypothesis, and the observations bj over time.

$$D (x^{\wedge}, h)=\|n^{\wedge}\|-\|c^{\wedge}\| \quad \ldots\ldots\ldots\ldots\ldots\ldots(3)$$

Where $n^{\wedge}=n^{\wedge} (n_x, n_y)$.

$C^{\wedge}= (c_x , c_y)$

The expression (3) gives the distance which can be seen as the approximation of distance from a point in the 2D space to a normalized ellipse. The distance value is equal or less than 0 if it riches inside the hypothesis h, and greater than 0 if it is outside. Therefore, considering the finger hypothesis a point x belonging to a blob b, if the distance is equal or less than 0, the blob b supports the existence of the hypothesis finger is selected to represent the state. This tracking process could also detect the presence or the absence of finger and the appearance of input in the image [5].

VI. CONCLUSION

This paper states that haptic technology allows the creation of real input and interface humans with computer. Mixed reality interfaces play important role in the communication of man and machine. The system state the multiple operations performed on single screen, and identified the virtual object on real time images and by gesture of an object. Virtual touch screen is very reliable techniques for handling complex operation. The

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absence of physical existence state the faster performance of operation, and it required less time. Virtual touch screen is a long distance object tracking system. Here state the virtual operation along with object tracking process. The system is very effective for performing long distance operations.

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AUTHOR BIOGRAPHY

Vivek R Vaidya is a student of M.Tech in Electronics System and Communication from Government College of Engineering, Amravati. He received his B.E. in Electronics from K.I.T.S. Ramtek in 2009

Prof. P. L. Paikrao is an Assistant Professor at Government College of Engineering, Amravati, and Maharashtra, India. he receive M Tech in electronics with over 15 years of experience in teaching field. He is lfe member of ISTE. His research area is digital image processing.

Dr. D. S. Chaudhari is an Associate Professor and Head of Electronics and Telecommunication Department in Government College of Engineering, Amravati. He received his Ph.D. from IITB, Powai, and Mumbai. He is life member of ISTE, fellow member of IE and IETE. He has been granted two patents and has published more than hundred research papers. He was also a visiting faculty in Asian Institute of Technology, Bangkok, Thailand and has received many awards such as Best Engineering College Teacher for Maharashtra State (ISTE), IETE- R. S. Khandpur Gold Medal Award Lecture and many more. His area of research includes Biomedical Engineering and Signal Processing.