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Touchscreen Using Web Camera

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***Abstract*— In this paper we present a web camera based touchscreen system which uses a simple technique to detect and locate finger. We have used two cameras and regular screen to achieve our goal. By capturing the video and calculating position of finger on the screen, we can determine the touch position and do some function on that location. Our method is very easy and simple to implement. Even our system requirement is less expensive compare to other techniques.**

Keywords— Touchscreen, Webcamera, Computer input-output, H.C.I.

1 INTRODUCTION

At present, touch screen is the technology that is widely used for communication with electronic devices such as computers, laptops, mobile phones, tablets and many more. The advantage of touch screen is that it allows the user to directly interact with the screen without the help of any other intermediate devices such as a mouse. In our proposed system we will develop a less expensive web camera based touch screen system that will use simple finger detection technique. Only a screen and two web cameras are required to accomplish this goal. By using the geometrical area of the screen and the camera positions we may resolve the finger position on screen. Our system will work well under different surrounding environments and the detection method used will able to work with various finger colors and shapes.

There are many types of touch screen techniques. Our touch screen technique is very easy to use. Compairing to other technique the webcam based touch screen technique is less used due to imperfection i.e. the touch point accuracy is very low. To overcome most of the drawbacks of web camera based touchscreen we prefer our own technique in this paper. This paper shows how we can locate the accurate finger point on the screen with the help of two web cameras. For performing the touch screen operation we used two web cameras and single normal screen.

This paper is divided into four section viz introduction, previous techniques, detailed information on our proposed system and our future work.

2 RELATED WORK

Till today many touchscreen systems were developed. Some of these technologies are resistive, capacitive, infrared acrylic projection, optical imaging, glove-based and vision-based gesture technologies etc.

A resistive touch panel contains a thin transparent separated by a space and, most importantly, two thin electrically resistive layer includes a plurality. The distance between the two layers of a thin face. The top of the screen (touch screen that is) is a layer on the surface of the bottom of the screen. But following the same resistive layer on a substrate. Its sides, top and bottom, along the other side of the connection is desirable. A voltage applied to a substrate, and is found. The tip of your finger or stylus to other objects, which presses on the outer surface, when the two layers are connected at that moment to touch the panel then behaves as a pair of voltage dividers, one axis at a time. Quick passing between each layer, a touch on the screen, the status can be read.

Capacitive touch screen utilizes a human body electrical characteristics. Capacitive screens usually and is such as glass coated with a transparent conductive material on the inside, consists of one insulating layer. Human body means electrical conductor that can pass through it, because it is electrically conductive, the screen capacitance, as an input, it is possible to use the conductivity. When you touch the capacitive touch screen with your finger, It cause a change of the electric field of the screen. This change is registered, the position of the touch is determined by the processor.

Longyu Zhang, Jamal Saboune and Abdulmotaleb El Saddik [1] developed a less expensive webcam-based touch screen system based on a simple and generic finger detection approach. Only one web camera and a screen are used to achieve their goal. By using the scene geometry and the camera model, they have determined the position of the finger on the screen. The technique they proposed is simple and works well under various surrounding environments while the detecting method suits many finger colors and shapes. Their approach can also be used for real-time applications.

Qiuyu ZHANG, Jianqiang HU, Moyi ZHANG and Hongxiang DUAN [2] considered the low accuracy instability factors of gesture in case of the hand shape change and background change, an approach to track dynamic deformable hand gesture based on joint spatial-feature space. Using the hand gesture pixel feature information of the spatial domain and color space, the kernel probability density of hand gesture's sample set is calculated, and the moving hand gesture's position in spatial is located by Mean-Shift Algorithm. Their experiment shows that the approach can track dynamic hand gesture accurately in realtime, so it guarantees the stability and continuity of the hand tracking.

R. Pradipa, Ms. S. Kavitha [3] discussed on various techniques, methods and algorithms related to the gesture recognition. Their survey mostly focused on two different techniques i.e. Glove-Based gesture and Vision-Based technique. Their proposed system consists of desktop or laptop

interface, the hand gesture may be used by the users may need to wear any data glove, or may use the web camera for capturing the hand image. The initial step towards any hand gesture recognition is hand tracking and segmentation. Sensor devices are used in Data-Glove based methods for digitizing hand and finger motions into multi parametric data. The other sensors will collect hand configuration and hand movements. In contrast, the Vision Based methods require only a camera, thus realizing a natural interaction between humans and computers without the use of any extra devices. These systems tend to complement biological vision by describing artificial vision systems that are implemented in software and/or hardware. The hand gesture is the most easy and natural way of communication. Hand gesture recognition has the various advantages of able to communicate with the Technology through basic sign language. The gesture will able to reduce the use of most prominent hardware devices which are used to control the activities of computer.But in Hand-Gesture recognition systems there were few limitations such as human body postures were restricted, few color recognitions, restricted Gestures, limited screen area etc.

3 PROPOSED SYSTEM

In this section, our proposed system is described in detail, this section consist of objectives to achieve our goal, algorithm of our proposed system and architecture of our proposed system which will show the flow of our system and also the working of our system.

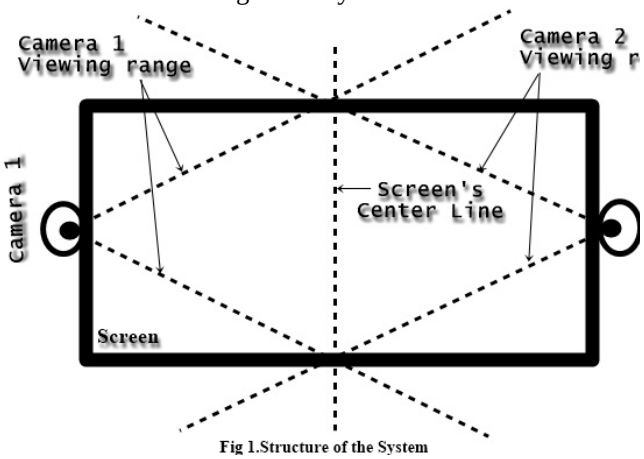

Fig 1.Structure of the System

Fig 1 shows the overall setup of our system i.e. the physical structure of our system.

3.1 OBJECTIVES

Following are the small small achievements that is helping us to reach to our goal.

A. **Finding region of interest:**
Here we aim to find region of interest that is the screen area by eliminating all non-required regions from the input video frames which consist of screen and the background objects.

B. **Detection of finger point**:
Then we detect the finger from the video frame, this will help us to find the finger tip on the screen, which will further be used in giving the precise touch position on the screen.

C. **Tracking of finger point:**
Then we will track the detected finger point to keep the continuity in the program, by tracking the finger point our system will be aware of the position of the finger in the video frame, this improves the system speed as the system does not need to detect the finger point again and again.

D. **Finding location on screen:**
Then we will detect the finger location on the screen and we will find the coordinates (x, y) of the screen where our finger is touching the screen. And will perform some function on it.

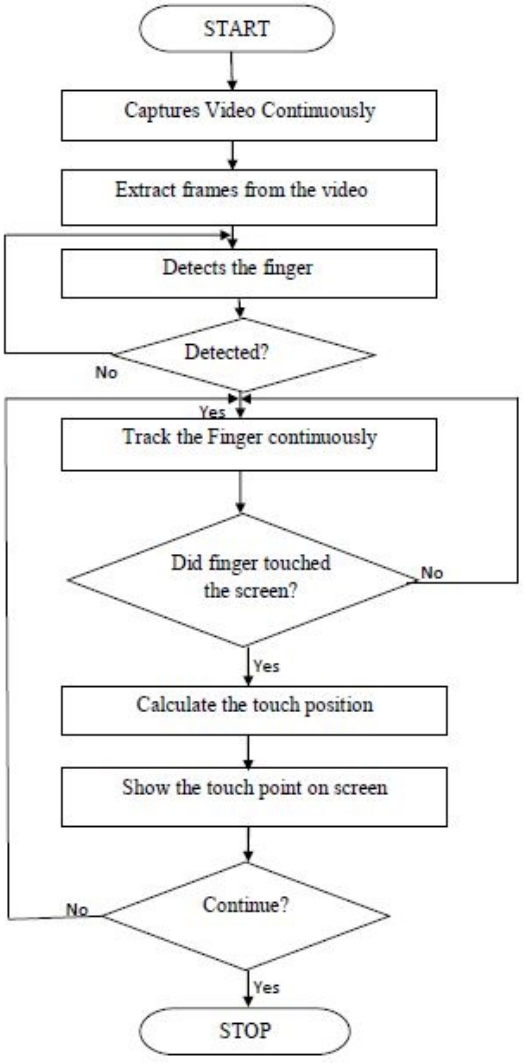

Fig 2. Flowchart of the System

3.2 ALGORITHM

This algorithm is step by step representation of our system also refer Fig 2 for our system's overall flow.

1) Capture the video continuously from the web camera.
2) Extract the frames from the video and send to the program.
3) With the help of web camera detect the finger.

4) If finger is detected then go to step 5 else go to step 3.
5) Track the finger.
6) Did finger touched the screen then go to step 7 else go to step 5.
7) Calculate the touch position on the screen i.e. X and Y co-ordinates on the screen.
8) Then show the touch point on the screen.
9) Stop

3.3 ARCHITECTURE

The Explaination of our architecture is as follows refer Fig 3. The user interacts with the system by touching his finger on the screen, webcam records the video continuously and this video is given as input to the program and the program performs extraction of frames from the video and scans the frame to detect the finger. Once the finger is detected the program perform a function i.e. tracking the finger continuously, during tracking process the program checks if the finger is touching the screen or not if yes then it generates output on the screen.

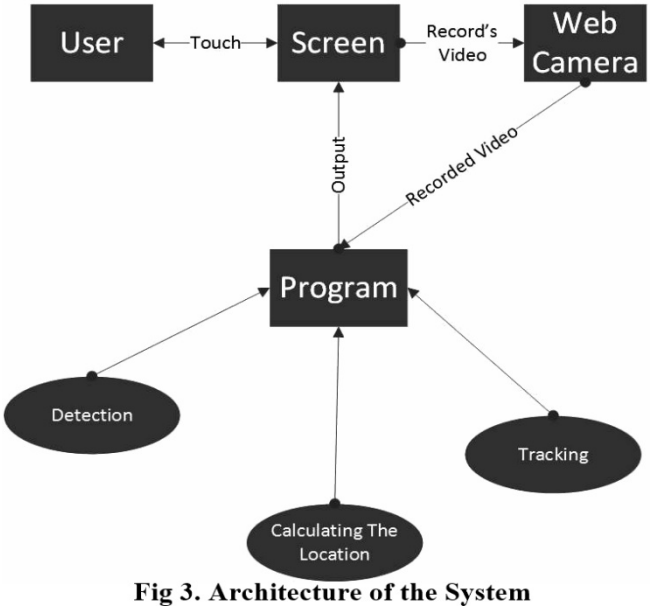

Fig 3. Architecture of the System

4 CONCLUSION

We can conclude that our proposed system can convert the normal screen into touchscreen covering maximum part of the screen with some fruitful output even if colour of finger changes and or the surrounding where it is used changes.

5 FUTURE WORK

Our proposed system is still under research and we shall try to improve the accuracy in locating the exact position on the screen irrespective of the surrounding environment. We shall also try to improve the processing speed of our system and reducing the calibration phase as much as possible.

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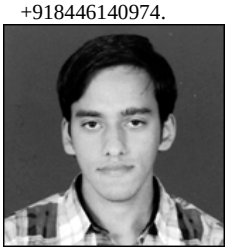

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