Interaction through Computer Vision Air Canvas

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Abstract— **The material and presenting it on the screen using the application is a part of the interaction that is possible through the computer vision air canvas. Having the various colours present is also a part of this interaction. The varied colour schemes make it easier for the user to identify things and provide greater clarity. Accessing the built-in web camera on the laptop or the independent web camera that was installed is required to accomplish this. This contributes to a better overall knowledge and provides the user with a more concise description of the air. In addition to that, this is utilised for text visualisation and drawing for the audience. This has the potential to serve as a stepping stone for more innovative streams and material that is engaging in the future. Simply moving your finger through the air will allow you to draw your creative ideas, which does make use of computer vision technology. In the respective paper, we construct a screen through which the information or text that we draw by waving is displayed appropriately on the screen for which is done by employing shooting the motion of finger using internet digital camera. This is accomplished in a manner similar to how a touch screen works. The detection of the colours, tracking of the marker, and establishment of the coordinates are the objectives of this particular piece of writing.**

Keywords- ***Air Canvas, HSV color space, fingerwaving, color detection, color tracking.***

I. INTRODUCTION

Visualizing the data in order to learn and understand it can be accomplished through a variety of methods, such as the more traditional methods of teaching, which make use of a marker and a white board. As a result of advances in technology, we have shifted from the more traditional classroom setting to one in which lessons are delivered via an online interface. Even in the midst of the pandemic, students have continued to rely on online classes as their primary educational resource. We are able to increase the interaction through the use of interfaces by utilising computer vision. In this section, we develop intelligent user interfaces, which allow us to draw different sketches using a variety of coloured markers for the purpose of making it simple for everyone to comprehend and see data. The user can sketch or write utilising the air canvas that is provided by this paper. There is no need to make any touch with the computer; all that is required is for the user to wave their finger in the air. This makes the process easier to understand and carry out for everyone; it can now be done with no difficulty at all.

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II. LITEATURE SURVEY

Regarding the literature survey for the paper these are the following points. The authors of [1] proposed a technique for identifying the shape of a hand that makes use of the colour and depth information provided by the Kinect sensor. The Kinect sensor presents an issue that is extremely difficult to solve in terms of gesture detection. It performs quite well when attempting to track a huge object such as a human body. However, it is quite challenging to keep track of anything as small as a finger. In [2], an LED is attached to the user's finger, and a web camera is used to track the position of the user's finger. A comparison is made between the character drawn and the one already stored in the database. It gives back the alphabet that corresponds to the design that was drawn. It required a pointed light source that was red in colour and made of LEDs to be attached to the finger. In addition to this, it is presumed that the LED light is the only thing of a reddish hue that is inside the field of view of the web camera. The authors of [3] suggested an augmented segmented desk interface technique for the purpose of interaction. This system makes use of a video paper or a charge- coupled device (CCD) camera so that users can operate desktop applications using their fingertips. Alternatively, this system might also use a video projector. In this arrangement, each hand is responsible for a particular set of activities. While the right hand is used to pick objects to be manipulated, the left hand is used to choose items from radial menus. This is accomplished by the utilisation of an infrared camera. Because determining the fingertip requires a significant amount of processing power, this method makes use of search windows to locate fingers.

III. PROPOSED METHODOLOGY

The proposed machine right here we will construct an air canvas which could draw some thing on it by means of simply shooting the movement of a coloured marker with a digital camera. Right here a colored item on the tip of the finger is used due to the fact the marker. In this specific paper we Could be using the computer vision strategies of Open CV using python [5] .Here color detection And tracking are used with a view to obtain the objective of the paper. Color detectors are used to detect the colors used in the air canvas. In this firstly the colored bead is inentified, and Bead is tracked . marker is defined by its color then track it by defining the boundaries of the color to track our marker. Through this we

can paint and write in open space [6,7]. Here we shall input live feed and capture the movement of our marker. So, now by just waiving your finger in the air you can draw on the screen using different colors. Coordinates are being detected using the bead so that if it goes in the range of blue color or red or yellow or green it changes to the color and the text is represented in the respective color chosen. The process includes reading the frames and converting captured frames to HSV color space .The input that is the text or images you have drawn in the air are then converted into commands and perform related task in real time.

The advantage consists mostly in the ability to track the particular marker that corresponds to each pointer on the air canvas [8]. It keeps track of the marker's coordinates and then displays the colours on the screen as you write [9,10]. It also has the ability to draw in a variety of colours that are present on the air canvas, and these colours may be adjusted to the user's preferences in a comfortable manner. This also has the benefit of being able to clear the screen immediately by just selecting the clear all box when it appears on the display, which is another bonus. Additionally, it motivates the user to enter text immediately after the canvas is filled with text and to desire to write anything new even though the canvas is already full of text [11]. After the paper programme is finished, all of these activities may be performed by simply sketching in the air, and there is no need to make any kind of physical touch with the computer at any point. Therefore, it shouldn't be too difficult for any user to gain access to this.

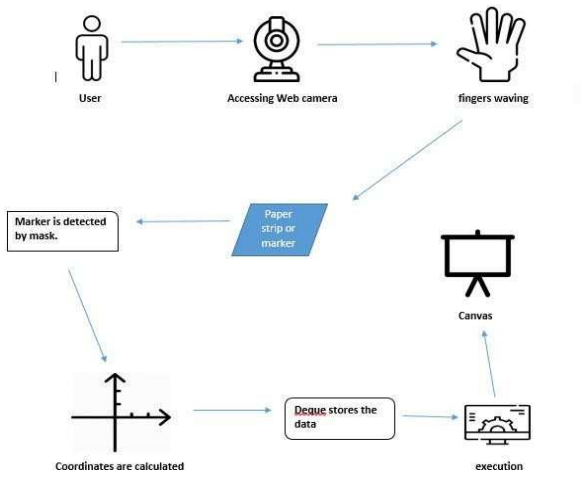

Fig. 1. Proposed System Architecture

User interface: User have to have the color bead on their finger as the bead color which has been initialized in the program. Now the user needs to make sure that there is no other color as the bead color in the background which may cause some disturbance. Now making sure above guidelines to be followed the user can access the air canvas with much ease.

Web camera accessing: It is crucial to have access to a live feed from the camera while working with the air canvas because the paper itself is the primary medium for live classes and instruction. As a result, the user has the option of using the camera that is already installed on the laptop, an external web cam, or anything else that is suitable to their needs. Because of this, the web camera needs to be turned on in order to access or analyse the movements of the user's finger while they are using this. Drawing is done by waving, It is crucial to have access to a live feed from the camera while working with the air canvas because the paper itself is the primary medium for live classes and instruction. As a result, the user has the option of using the camera that is already installed on the laptop, an external web cam, or anything else that is suitable to their needs. Because of this, the web camera needs to be turned on in order to access or analyse the movements of the user's finger while they are using this. Drawing is done by waving, which ensures that there is as little direct physical contact with the computer as is humanly feasible; this is why we name it "air canvas." Because of this, the user is able to write on the canvas by monitoring the bead or the colour marker that is now attached to their finger.

Detecting coordinates: After the WE camera has been enabled, the waving can be detected using the bead that has been placed on the finger; this allows the bead to be followed, which ultimately results in the formation of the coordinates in the form of a mask. When the finger is waved around in the appropriate manner, the coordinates for each of them are identified so that the text can be rendered in the appropriate format according to the preferences of the user.

Color detection: Because writing or sketching with multiple colours will be simpler, this paper screen primarily contains red, blue, green, and yellow. These colours were chosen because they are easy to understand while using different colours. Therefore, the names of the colours are displayed at the top of the screen alongside a representation of the colours so that the user may easily use the colours in the manner that best suits their needs. Therefore, each colour has its own unique set of coordinates, and when a colour marker enters the range of a particular colour, that color's coordinates are applied, and the marker's colour is changed to match the colour of the selected colour.

Screen wiping: It's possible that the screen, which has been filled in or scribbled on, needs to be wiped clean. In order to perform such an operation, the option to clear all rectangle boxes has been provided here. This is located at the very top of the screen and has been given the coordinates that are identical to those used for the colours. The user's input will cause the typeface to be removed, and the screen will be cleared if it is within the range of the clear all option.

Displaying the canvas: Through the use of the live stream, the user is able to view the canvas. By accessing a web camera, detecting a colour maker, and providing a bead for the formation of the mask, then writing by waving fingers via which coordinated are being detected, and the colour being identified by the given coordinates, everything is presented on the screen.

IV. EXPERIMENTAL EVALUATION AND RESULTS

Step 1:Firstly, read the frames that are tracked and convert those captured frames to HSV (hue, saturation, value) color space.

Step 2:Then implement the air canvas frame where we draw gestures through colored markers.

Step 3:Put various colored markers in appropriate co-ordinates in the air canvas .

Step 4:Adjusting the track bar values for finding the mask of the colored marker.

Step 5:Preprocess the mask with various operations like eroding and dilation.

Step 6:We use Deque which is array like structure which is used to store various co-ordinates present on the air canvas.

*Step71:*Finally draw the co-ordinates or points located in an deque and canvas to the interface to display.

Fig. 2. Creating mask for co-ordinates

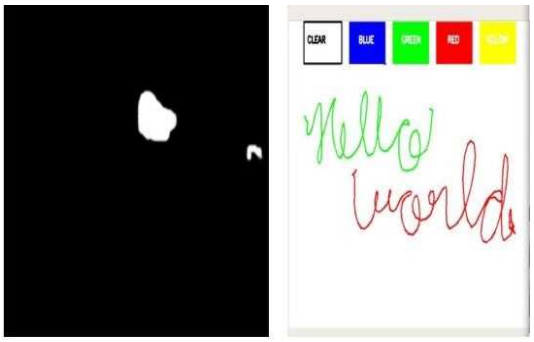

Fig. 3.Detection of marker gestures

CONCLUSION

In this paper, we developed a air canvas where we can detect marker gestures also it can be tracked and we implemented different colored markers for creative design and for engaging content. In this paper we implemented various colored markers and clear all button which is used to clear entire screen. Further we implement another clear button which is used to clear specific marker gestures and also we implement various colored markers for more engaging interacting content for learning.

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