Analysis of Emotion Recognition using Facial Expressions, using Bezier curve

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Abstract: The system like Computer can not recognize the human expression, or it don't have ability to response to human non verbal communication. In this concept we are providing ability to the computer that it can also response to human non verbal communication. Researchers proposed many approaches to recognize human emotions based on facial expressions. In this project we are using new concept which is based on Bezier curve. This paper introducing technique to detect the human expression by using Bezier curve. First, it takes an image, then by skin color segmentation, it detects human skin color, then it detects human face. The image is then converted into binary image, Then it separates the eyes & lip from the face. Then it draws Bezier curve for eyes & lips. Then it compares the Bezier curve of eyes and lips to the Bezier curves of eyes & lips that are stored in the data base. Then it finds the nearest Bezier curve from the data base & gives that data base stored Bezier curve emotion as this image emotion. Our main objective is to get the facial expression of the people. It will compare the Bezier curve of the image from the database and according to that it shows the facial expression of the image. This project can be used for the face detection and also used for the gaming purpose. The challenge in this project is to find the Bezier curve. This project can be used for the security purpose or authentication.

Keywords: Facial expression, Bezier curve, binary image, RGB

I. INTRODUCTION

HCI (Human Computer Interaction) aims to improve the interactions between users and computers by making computers more usable and receptive to users' needs. The human–computer interface can be described as the point of communication between the human user and the computer. There are various ways in which a human can communicate with computer by using graphical user interface (GUI), voice user interface (VUI) etc. the communication on the basis of emotion and expression is come under the non verbal communication. using this non verbal communication the interaction of human and the computer can be possible. the state of emotion is change in every second, this paper is all about to capturing the emotion and compels the computer to identify the particular emotion. When person transform from one state of emotion to the another his facial expression also change .To getting that facial expression of a person through an image and applying Bezier curve on it. This thing can not be possible unless it convert into a binary. For this it is necessary that the curve portion should highlight on the image to make this possible the actual image is convert into a binary image. By doing this, eye, eyebrows, lip, forehead is highlighted on the screen and can apply the Bezier curve on image. The human emotion is classified into six emotion ,surprise, fear, disgust, anger, happiness, and sadness .when emotion change, the muscles of face also change this motion facial muscles of the use to detect the expression. Some emotion can easily identify like anger and happiness while some quite difficult like neutral.

Bezier curve- The cubic Bezier curve is adequate for most graphics application. The cubic Bezier curve has four control point for smoothly extended curve, we cannot add additional point to the Bezier curve but we can construct another curve by picking four point and then attach that curve to first. the curve begins at the first control point and end at fourth if we want to connect two Bezier curve we just make the first control point of the second curve, match the last control point of the first curve. at the start of the curve it is tangent to the line connecting the first and the second control point. Similarly at the end of the curve it is tangent to the line connecting third and fourth control point

Drawing the Curve:1) A look back on drawing a line: Drawing a line is a matter of starting at one end point, and moving directly towards the other end point, drawing as you go. This is also known as linear interpolation.

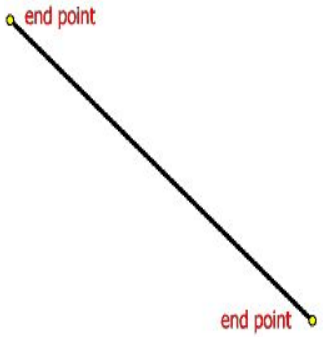
2) For cubic interpolation we choose A and D end point and choose two direction vector for this end point and call them V1 and V2 at the end of this vectors we define two new point

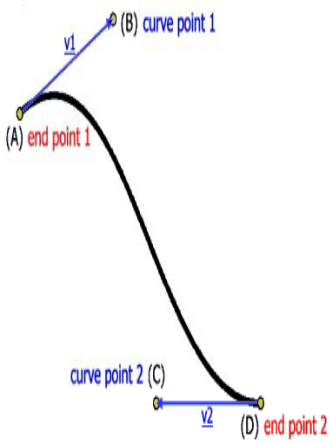
B = A + V1

C = D + V2

<u>Linear Interpolation</u>

```
 procedure
draw_line(point1,
point2)

   loop t from 0 to 1 in
steps of .01

      a = t
      b = 1 - t

      point = (point1 * b)
+ (point2 * a)

      drawpixel (point)

     end of loop

 end of draw_line
```



Cubic Interpolation procedure draw_bezier(A, v1, v2, D) B = A + v1 C = D + v2 loop t from 0 to 1 in steps of .01 a = t b = 1 - t point = $A*b^3 + 3*B*b^2*a + 3C*b*a^2 + D*a^3$ drawpixel (point) end of loop end of draw_bezier	

II. METHODOLOGY

Skin Color Segmentation:-

For skin color segmentation, first we contrast the image. Then we perform skin color segmentation. we have to find the largest connected region. Then we have to check the probability to become a face of the largest connected region. If the largest connected region has the probability to become a face, then it will open a new form with the largest connected region. If the largest connected regions height and width is larger or equal than 50 and the ratio of height/width is between 1 to 2, then it may be face.

Face Detection:-

For face detection, first we convert binary image from RGB image. For converting binary image, we calculate the average value of RGB for each pixel and if the average value is below than 110, we replace it by black pixel and otherwise we replace it by white pixel. By this method, we get a binary image from RGB image. Then, we try to find the forehead from the binary image. We start scan from the middle of the image, then want to find a continuous white pixels after a continuous black pixel. Then we want to find the maximum width of the white pixel by searching vertical both left and right site. Then, if the new width is smaller half of the previous maximum width, then we break the scan because if we reach the eyebrow then this situation will arise. Then we cut the face from the starting position of the forehead and its high will be 1.5 multiply of its width.

Eye Detection:-

For eyes detection, we convert the RGB face to the binary face. Now, we consider the face width by W. We scan from the W/4 to (W-W/4) to find the middle position of the two eyes. The highest white continuous pixel along the height between the ranges is the middle position of the two eyes.

Lip Detection:-

For lip detection, we determine the lip box. And we consider that lip must be inside the lip box. So, first we determine the distance between the forehead and eyes. Then we add the distance with the lower height of the eye to determine the upper height of the box which will contain the lip. Now, the starting point of the box will be the ¼ position of the left eye box and ending point will be the ¾ position of the right eye box. And the ending height of the box will be the lower end of the face image. So, this box will contain only lip and may some part of the nose. Then we will cut the RGB image according the box.

Apply Bezier Curve on Lip:-

So, we convert the skin pixel to white pixel and other pixel as black. We also find those pixels which are similar to skin pixels and convert them to white pixel. Here, if two pixels RGB values difference is less than or equal 10, then we called them similar pixel. Here, we use histogram for finding the distance between the lower average RGB value and higher average RGB value. If the distance is less than 70, then we use 7 for finding similar pixel and if the distance is getter than or equal 70 then we use 10 for finding similar pixel. So, the value for finding similar pixel depends on the quality of the image. If the image quality is high, we use 7 for finding similar pixel and if the image quality is low, we use 10.

Apply Bezier Curve on Eye:

For apply Bezier curve on eyes, first we have to remove eyebrow from eye. For remove eyebrow, we search 1st continuous black pixel then continuous white pixel and then continuous black pixel from the binary image of the eye box. Then we remove the 1st continuous black pixel from the box and then we get the box which only contains the eye

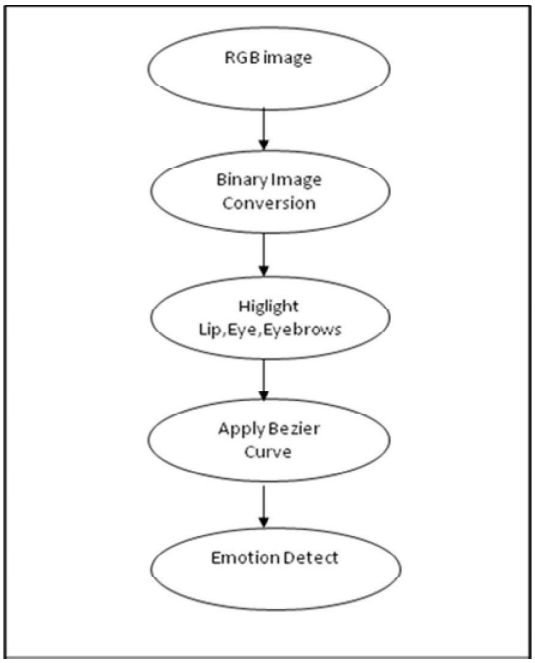


Fig1.Data Flow Diagram For Detect Emotion

The RGB color model is an additive color model in which red, green, and blue light are added together in various ways to reproduce a broad array of colors. The name of the model comes from the initials of the three additive primary colors, red, green, and blue. The main purpose of the RGB color model is for the sensing, representation, and display of images in electronic systems, such as televisions and computers, though it has also been used in

conventional photography. Before the electronic age, the RGB color model already had a solid theory behind it, based in human perception of colors. The RGB color model is one of the most common ways to encode color in computing, and several different binary digital representations are in use. The main characteristic of all of them is the quantization of the possible values per component (technically a Sample (signal)) by using only integer numbers within some range, usually from 0 to some power of two minus one (2n – 1) to fit them into some bit groupings. Encodings of 1, 2, 4, 5, 8, and 16 bits per color are commonly found; the total number of bits used for an RGB color is typically called the color depth.

III. RESULT & DISCUSSION

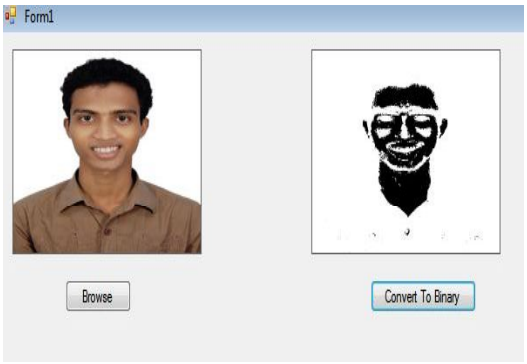


Fig2.RGB Image To Binary Conversion

Many method has been use to detect the human emotion, some of has good accuracy while some has very poor. Method use in this concept are

1) Emotion recognition by speech
2) Emotion recognition by bimodal data

Speech recognition system is based on pitch-related system. In this method three classifier used Maximum Likelihood Bayes classifier (MLB), Kernel Regression (KR), and K-nearest Neighbors (KNN). Roy and Pentland classified emotions using a Fisher linear classifier . Using short-spoken sentences, they recognized two kinds of emotions: approval or disapproval. They conducted several experiments with features extracted from measures of pitch and energy, obtaining an accuracy ranging from 65% to88%.

In analysis of emotion no classifier is used the technique used to classify is the RGB image to binary conversion. This technique has chances of accuracy is 70% to 80%.

IV. CONCLUSION

This research analyze the state of human emotion by using facial muscles movement. the research in this field show that it is feasible to recognize human affective states with high accuracy by the use of Bezier curve. human can provide intelligence to computer to improve the performance in this field and also improve the Human computer interface.

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