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Real Time Hand Gesture Recognition For Content Based Image Retrieval

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Abstract- Hand gesture recognition based man-machine interface is being developed vigorously in recent years. In today's world people have huge image database. In order to improve these situations, this system design can easily retrieve images efficiently without mouse and keyboard actions and make it more convenient and easier. This implementation retrieves images from database, where users can operate this system with their hand movements. In this system, various algorithms are used to recognize hand gestures such as image blurring. Vision is central in human perception. Images are everywhere. Real life applications produce and use huge amounts of different types of images. Retrieving an image having some characteristics in a big database is a crucial task. We need the mechanisms for indexing and retrieving images. CBIR (Content Based Image Retrieval) systems perform these tasks by indexing images using the physical characteristics automatically extracted and searching by an image query. Results from a set of experiments indicate that the proposed system with small-scale of hand recognition show good performance in hand gesture recognition. Content based image retrieval (CBIR) is a promising approach because of its automatic indexing retrieval based on their semantic features and visual appearance.

Keywords: image retrieval; hand gesture; automatic indexing; CBIR.

I. INTRODUCTION

Advances in computer and network technologies coupled with relatively cheap high volume data storage devices has brought tremendous growth in the amount of digital images. The digital contents are being generated with an exponential speed. All individuals, business persons, media and government agencies need to arrange images. Nowadays even many doctors save images in storage devices for future reference. Though these images accessing from computer has to repeat the same mouse and keyboard actions, consequently it wastes time and many inconveniences are present. In order to improve all these situations, we present a system that can easily access images without mouse and keyboard actions. This system detects hand region and recognizing hand gesture so that users can control it by hand.

As increase in collection of digital images, the problem in finding a specific image in the database becomes a

difficult task. There is a need to develop an efficient method to retrieve digital images. Nowadays, CBIR is a hotspot of digital image processing techniques. Research on CBIR started in the early 1990's and is likely to continue during the first two decades of the 21st century. In leading universities and companies many research groups are actively working in this area and a fairly large number of prototypes and commercial products are already available. However, the current solutions are still far from reaching the ultimate goal.

There are two approaches to image retrieval: Text-Based approach and Content-Based approach. Today, the most common way of doing this is by textual descriptions and categorizing of images. Different people might categorize or describe the same image differently; it leads to the problem of retrieving it again. This process is a time consuming process when dealing with very large databases. Content based image retrieval (CBIR) is a way to get around these problems. CBIR systems search collection of images based on features that can be extracted from the image files themselves without manual description. In past decades many CBIR systems have been developed, the common ground for them is to extract a desired image. Many different approaches to CBIR have been tried and one of the common things is color histogram is been used.

CBIR systems use visual content such as color, texture, and simple shape properties to search images from large scale image databases. Although they improve text-based image retrieval systems, these systems have not yet received commercial success. One of the major reasons for this limited success is that CBIR depend upon a global view of the image, sometimes leading to a lot of irrelevant image content that is used in the searching technique. A solution for the global view problem can be found in localized CBIR. These systems mainly focus on the part of the image in which the user is interested.

II. BASICS OF IMAGE PROCESSING

3.1 What Is An Image?

- An image is a 2D array of pixels.
- An image is an array, or a matrix, of square pixels (picture elements) arranged in columns and rows.



3.2 What Is A Pixel?

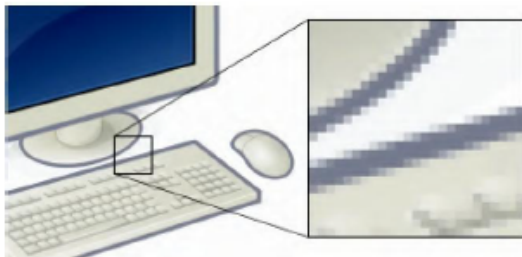
- A pixel is the smallest visual element on a video display screen.
- PIX (for picture) + "EL" (for element).



Pixel's of image.

3.2 More on Pixels

- This example shows an image with a portion greatly enlarged, in which the individual pixels are rendered as little squares and can easily be seen.



3.4 How is a pixel stored?

- Pixels are stored as Integers.
- Most popular are 24 bit color images where 8 bits each for Red, Green and Blue color values are used to represent a 24-bit pixel value.
- 8 bit images are grayscale images where as 32 bit images have an additional transparency channel.

III. SYSTEM ARCHITECTURE

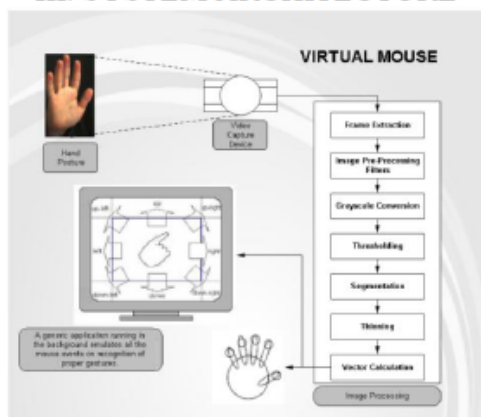


Figure 1: Architecture of System

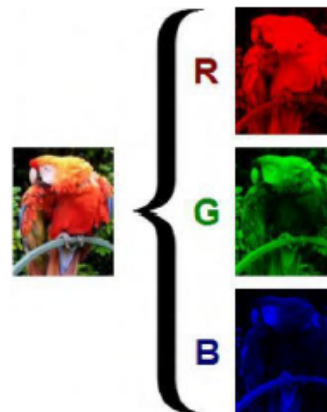
The proposed system consists of hand gesture recognition to retrieve images from huge database as depicted in Figure 1. When user will show the hand posture in front of the web camera a video frame will be captured and recognized with the signature stored in database. When user interacts with camera various image processing techniques will be used for detection and recognition internally in the system. The user can perform various hand gestures as shown in the Figure 1 and perform operations on it. Hand gestures used in system will be 2D and 3D.

3.5 RGB Color Model

- The RGB color model is an additive color model in which red, green, and blue color is added together in various ways to reproduce a broad array of colors.
- In computing, the component values are often stored as integer numbers in the range 0 to 255. These may be represented as either decimal or hexadecimal numbers.

3.6 RGB Color Images

- Color images are composed of three different channels viz. Red, Green and Blue.
- One can also imagine three overlapped 8-bit images to compose a final 24-bit color image.



3.7 RGB Color Example

- Sample PIXEL value in HEX = 0EDEB5
- In programming the hex numbers are represented as 0x0EDEB5. 0x prefix is for hex notation.
- Then individual color channels:
- 0E (red) - DE (green) - B5 (blue)
- 00001110 – 11011110 – 10110101

IV. CBIR(Content Based Image Retrieval)

The advances in CBIR systems have led the researchers for new approaches in information retrieval for image databases. It has already met some degree of success in unconstrained problems in medical applications. Notwithstanding the progress already achieved in the few frameworks available here is still a lot of work to be done in order to develop a commercial system able to

fulfill image retrieval/diagnosis comprehending a broader imagedomain.

Recently, advances in Content Based Image Retrieval prompted researchers towards new approaches in information retrieval for image databases. In medical applications it already met some degree of success in constrained problems. The generic framework is

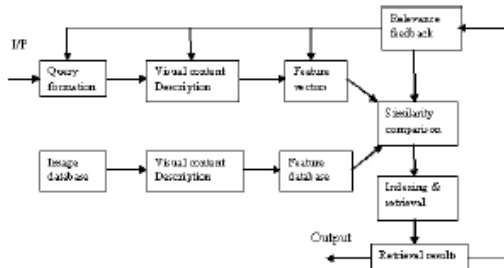


Figure 2 : Diagram for content-based image retrieval system

V. ALGORITHMS

4.1 RGB to Grayscale Conversion

Algorithm:-

- Step1. Traverse through entire input image array.
- Step2. Read individual pixel color value (24-bit).
- Step3. Split the color value into individual R, G and B 8-bit values.
- Step 4. Calculate the grayscale component (8-bit) for given R, G and B pixels using a conversion formula.
- Step 5. Compose a 24-bit pixel value from 8-bit grayscale value.
- Step 6. Store the new value at same location in output image.

4.2 Blurring

Definition:-In image terms blurring means that each pixel in the source image gets spread over and mixed into surrounding pixels.

- Another way to look at this is that each pixel in the destination image is made up out of a mixture of surrounding pixels from the source image.



4.2.1 Why should we create a Blurred Image?

Blurring an image reduces the sharpening effect; this makes the detection more accurate.

- There two type of blurring an image

- Gray scaled blur.
- Color blur.

Algorithm:-

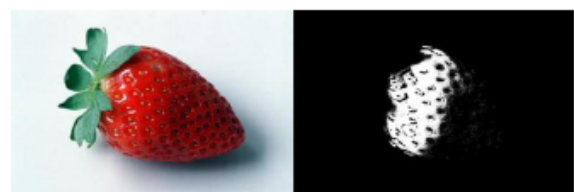
- Step1. Traverse through entire input image array.
- Step 2. Read individual pixel color value (24-bit).
- Step3. Split the color value into individual R, G and B 8-bit values.
- Step 4. Calculate the RGB average of surrounding pixels and assign this average value to it.
- Step 5. Repeat the above step for each pixel.
- Step 6. Store the new value at same location in output image.

4.3 Thresholding

- Thresholding is the simplest method of image segmentation.
- From a grayscale image, thresholding can be used to create binary images i.e. image with only black or white colors.
- It is usually used for feature extraction where required features of image are converted to white and everything else to black. (Or vice-versa)

Algorithm:-

- Step1. Traverse through entire input image array.
- Step2. Read individual pixel color value (24-bit) and convert it into grayscale.
- Step3. Calculate the binary output pixel value (black or white) based on current threshold.
- Step4. Store the new value at same location in output image.



VI. EXPERIMENTAL RESULT

The aim of system is to achieve accuracy and fast retrieval of images from the huge database using various hand gestures.

VII. FUTURE SCOPE AND APPLICATIONS

- Can be used in developing aids for the hearing impaired.
- Can be used in developing techniques for forensic identification.

- Navigating and manipulating in virtual environments.
- Can be used to develop Medical based application.
- Vision based application.
- Gaming application.

VIII. CONCLUSION

This paper describes the design and implementation of a hand gesture recognition system using just one color camera. The developed system can obtain a high recognition rate of hand gestures. Our current research mainly focuses on the single hand static gestures for the simplicity. However, we are far from building a general-purpose gesture recognition system.

The dynamic gestures and two-handed gestures should also be explored in the future, since they are more expressive and allow more natural interaction. The system implementation shown above adopted by the detection of hand or highlighting hand posture in the input image using calibration, motion detection, and resulted with segmented hand posture is defined with results. As in case of recognition techniques video processing needs speed and higher intensity in providing experience of virtual and real time experience. So we have studied and described how efficiently and effectively we can retrieve images in database by using real time hand gestures.

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