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Design of Hybrid Algorithm for Fast and Efficient Image Vector Detection and Recognition.

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Abstract— The digital image processing is used in a number of areas, particularly for feature extraction and recognition of similar features in two separate images. Recognition of features is a problem, and though there are widely available algorithms that are able to recognize the features from images, selection of an appropriate and accurate algorithm is very important.This Paper comprises of designing such a method to easily extract features and compare two different images to check their similarity and to give user the information about the object in image, using hybrid of various algorithms in image processing. Using this scheme, we can recognize the image which user is viewing in the real time at that moment and return back the data about the image to user. These schemes largely depend on the two factors. The first of these is Image capture mode. Another factor is comparison efficiency.

Keywords:-Image Processing, Digital Image Processing, Threshold, Digital Image Processing, Base 64, Fast Feature Detection, Histogram Equalization, Image Comparison.

I. INTRODUCTION

Image recognition is a very basic methodology implemented to undertake many real life applications. Images play a very vital role in today's visual media, by virtue of which many things can be easily conveyed without having to speak a word. In order to understand and deduce the message or information related to the image we need to understand and extract the information from various sources available to us. This process being manual in nature may consume a lot of time and require a lot of work to be done upon. So there is a need for some

System which will reduce this effort and make the information readily available to the concerned person. This paper mainly focuses on implementing a hybrid image recognition technique in real life to simplify the understanding of the surrounding and understand the details of object under observation by making information available on the go.

When some specific information is to be obtained, a person has to manually search for the available data throughout available resources, which increases time span required for obtaining the information.

This paper focuses on eliminating that delay by making the information about the object, person or anything which appears in front of it and is stored in preloaded database. It also reduces the costly nature of the devices or resources as no extra components are used but the everyday and easily available components like smart phones are present with us to observe the output. Working of every electronic device depends on achieving some specific output. Thus making information easily available has become a very important part. To eliminate the above mentioned disadvantage of having a bulky resource to obtain that information, an attempt to design a system which needs no extra components but using the devices we already have thereby reducing the cost and increasing the simplicity of setup is made. Also, this setup is easy to design and implement. Generally the image recognition applications we use in our daily life are task specific. Example: Face recognition, finger print recognition etc.

But these techniques usually do not provide us with the information regarding the target under observation. In the system designed in this paper, an attempt to deliver the information regarding the recognized image in fraction of seconds with visual media is made. User does not need to manually search for the information regarding the frame e has observed by searching for the relevant data based on his perception of the frame. Technically it is simply implemented

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using a module which captures image, a software which compares images and returns an output which is already fed in database, which shows up in case of positive image recognition condition.

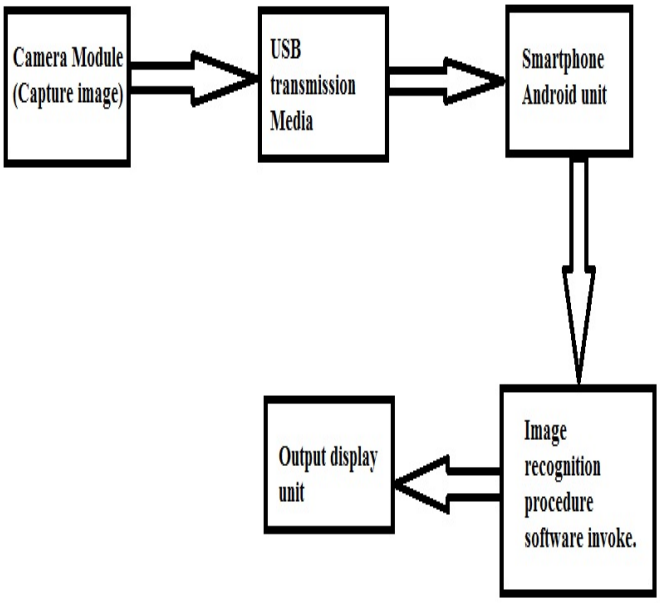

Figure 1: Process Flow

This functional element basically comprises of algorithms which will compare incoming image with that in database and return a signal flag to the database which stores the information about the concerned image.

II. DESIGN SURVEY

A. Selection of Algorithm

a). Histogram Equalization

In general, a histogram is the estimation of the probability distribution of a particular type of data [1]. An image histogram is a type of histogram which offers a graphical representation of the tonal distribution of the gray values in an image. By viewing the image's histogram, we can analyze the number of times per unit time appearance of the different grayscale levels present in the image. The histogram shows us that the image contains only a part of gray levels.

Histogram is related to image enhancement. The histogram gives us a general overview on some useful image statistics Like mode, and dynamic range of an image. It is possible to predict the intensity characteristic of an image. If the plot is concentrated on the lower side of intensity mode graph, the image is a dark image. In the either case the image is a bright image. If the plot is in narrow dynamic range, the image has poor contrast [2] .

The Probability Distribution Function(PDF) for the histogram is given by Following equation[3]

$$p(X)\ n(k) / N, \text{ for } k=0, 1, \ldots, L\text{-}1 \qquad \ldots\ldots (1)$$

where N is the total number of samples in the image

The Cumulative Distribution Function (CDF) for the histogram is given by following equation.[4]

$$c(X_k) = \sum_{j=0}^{k} p(X_j) \quad \text{for } k=0, 1, \ldots, L\text{-}1 \qquad \ldots\ldots (2)$$

The Flow of process for histogram is designed as follows.The Image is taken and is processed for histogram equalization using following steps and the equations (1) and (2) stated in section II.A.1

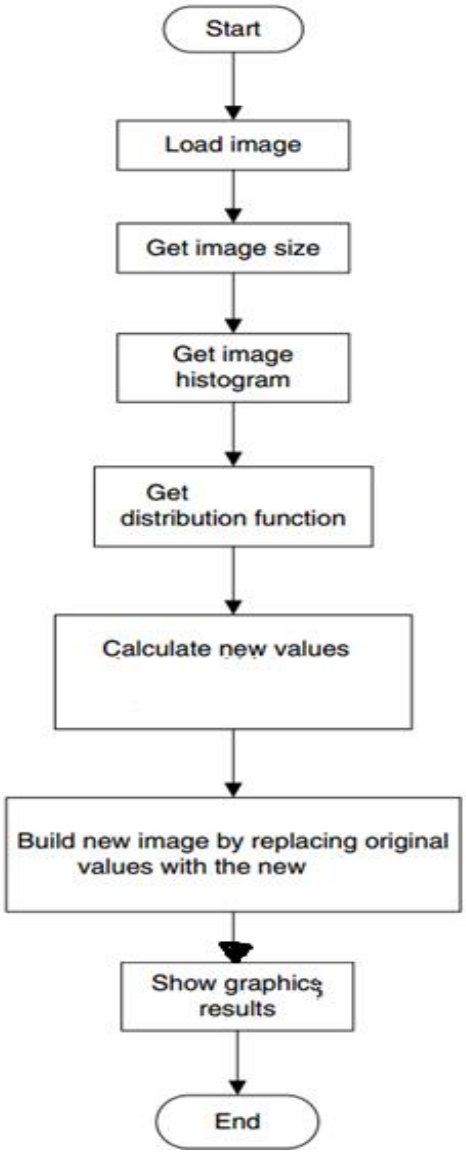

Figure 2: Process Flow of Histogram Equalization

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But since the histogram equalization is very much dependent upon approximation and cumulative distribution, it is less precise. This creates a need for development of some different algorithm.

b). Key point or Feature Detection

Correct method to complete a matching task significantly depends on the type of image to be matched and in the variations within an image and its matching pair in one or many of the following parameters.

But none of the algorithms have truly accomplished total immunity to these parameters. Researchers in this area are trying to incorporate to the existing algorithms the necessary tools to achieve complete invariance to these type of problems. However, it is sometimes needed to combine all the elements into one algorithm without increasing computational cost. The properties like scale, occlusion, orientation, clutter, illumination are very important to consider while undertaking feature detection [5].

This detection method is based on the principles behind the Laplacian transform of Gaussian (LOG) operator.

The LOG will respond to regions of high curvature in the scale-space image

$$L(x, y, \sigma) = G(x, y, \sigma) * I(x, y) \quad \ldots\ldots\ldots \quad (3)$$

This is a needed property of a feature detection algorithm because it searches for sections where the image gradients are changing quickly. The problem with this technique is that its computational complexity. It makes it slow in execution.

c). Base 64

Base 64 is a method of interpreting bits of data in order to transmit those bits over a text only path. In the standard 8-bit ASCII character set, there are 256 characters. These characters are used to format text. But, only a fraction of these characters are actually printable and readable. We need a method to convert unreadable characters into readable characters and convert them back to their original format once their intent is complete.

The characters in ASCII set are numbered 0 to 256. This is assigned a 28,8 binary memory. This means only a byte is needed to represent the data at an instance. Hence we need to interpret data one byte at a time.

The problem with this is that there are not 256 readable ASCII character in the ASCII character set.

So instead of a whole byte, the focus is shifted to half a byte that is 4 bits at a time. Sixteen readable characters can be used to represent each variation in half byte. Thus making this a Hex translation in nature. The following tables show the conversion values [6].

Value:	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
base64:	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Value:	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
base64:	Q	R	S	T	U	V	W	X	Y	Z	a	b	c	d	e	f
Value:	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47
base64:	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v
Value:	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63
base64:	w	x	y	z	0	1	2	3	4	5	6	7	8	9	+	/

Figure 3: Base 64 Conversion Sheet 1

Character:	H	e	l	L	o	[space]
ASCII Value:	72	101	108	108	111	32
Binary Value:	01001000	01100101	01101100	01101100	01101111	00100000
Character:	W	o	R	L	d	!
ASCII Value:	87	111	114	108	100	33
Binary Value:	01010111	01101111	01110010	01101100	01100100	00100001

Figure 4: Base 64 Conversion Sheets 2

III. ALGORITHM AND SOTWARE LAYOUT DESIGN

Taking all the drawbacks and advantages of feature detection, histogram equalization and base 64 algorithms, this hybrid algorithm can be implemented to attain a higher efficiency for image recognition.
But to design an algorithm first the software layout is designed.

A. Software Layout

Database for image comparison block consists of the images and their vectors such that this database can be accessed and compared with the input image so that the similarities between both the images can be pointed out and recognition is undertaken as shown in figure III.A.1 below.

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Database for storing image information is created once the image is recognized. The information regarding that image is stored. For the information to be displayed, it should be present in our memory unit. This block holds the information of every image which is expected to be displayed at output end.

Display unit is the functional block where user will be presented with requested information about the recognized image.

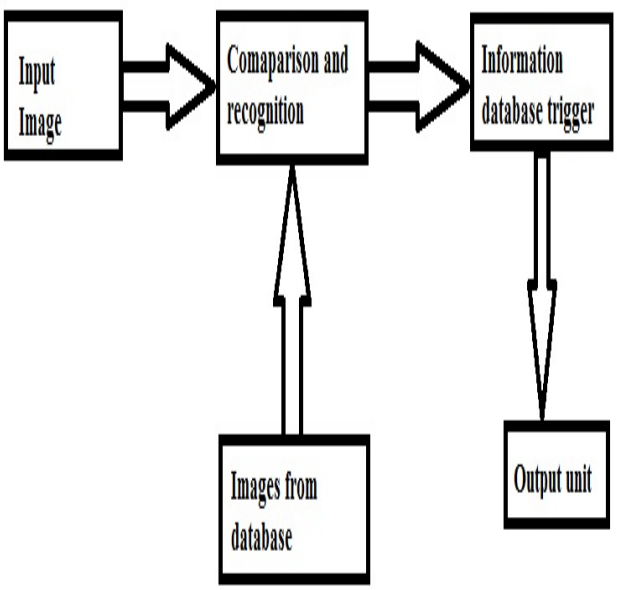

Figure 5:

Based on this basic software layout, a hybrid of algorithms mentioned in Section II.A is deduced.

B. Hybrid Algorithm

The algorithm used to design this application is basically a mixture of three main types as discussed in. Feature detection, Histogram equalization and base 64 encoding.
Steps followed in this mixed algorithm are:

Step 1: Target image is broken down into sections.
This I done using the inbuilt image sectioning parameters like width and height of the image, color depth and image format.
Feature vector detection using equation (3) in LOG (section II.A.2) is triggered.

Step 2: These sections are parameterized on the basis of their RGB values. This is the stage where histogram equalization initiates. Equation (1) and equation (2) are incorporated.

Step 3: Histogram is formed. Equation (1) and equation (2) are incorporated (Section II.A.1).

Step 4: Equalization and toning of histogram is done.

Step 5: The RGB data and histogram parameters are then encoded in base 64 according to figure II.A.3.(1/2).

Step 6: The string of input image is formed.
Step 7: The string from image in database is compared with the created string of incoming image.

Step 8: If the comparison result is positive, the output is displayed with the details of that image.

Step 9: If image comparison fails, threshold is reduced and the steps from beginning are followed again.
In this way the algorithm is incorporated.

IV. EXPERIMENT RESULTS

The image captured from the exernal camera is stored in gallery. As the drivers of the camera are not available openly, we need to manually trigger the process of image comparison by selecting the captured image from gallery.

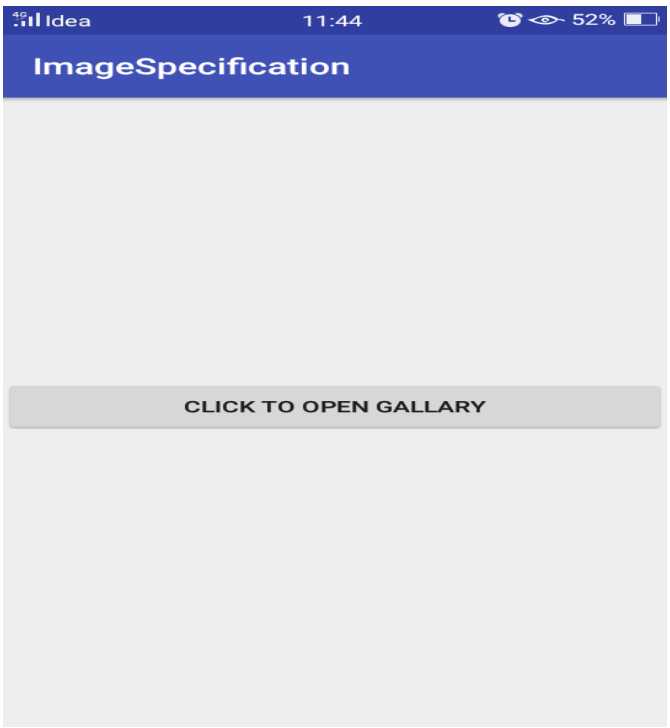

Figure 6: User Interface

The real time Implementation in terms of live camera in application is not feasible at this stage due to unavailability of SDK for an external camera. So we need to trigger the gallery manually.

An image is selected from gallery to compare with the images stored in database. This image is alread trained to device.

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Figure 7: Image Uploaded

As soon as the image is uploaded, the comparison with images in database is automatically triggered.
The upload takes 5-10 seconds on an average scale.

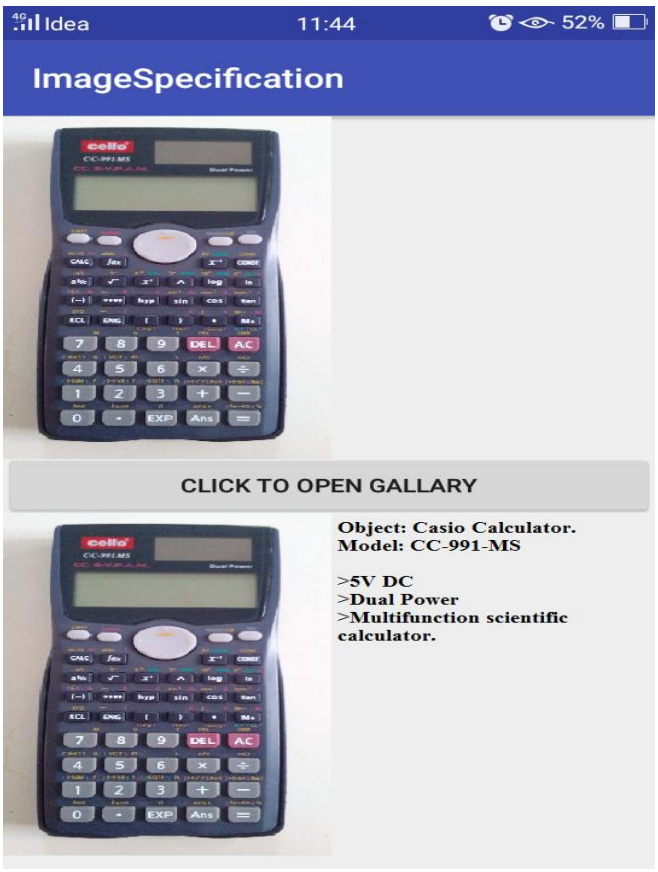

Figure 8: Successful Image Recognition With High Accuracy

The Images are compared using the designed hybrid algorithm in section III.B.

As soon as the successful comparison is obtained, the information about the object is displayed on the same screen on the bottom part of the interface.In this way, the data about the target object is displayed to user and the intent of application is completed.

V. CONCLUSION

Digital image processing is an important aspect of image recognition technology. There are a many techniques that provide variety in feature extraction algorithms.The feature extraction stage of any algorithm is most significant. A bad set of features will realize poor comparison sets. At the primary stage of advancement, the application performs well in terms of accuracy or speed but not better. It is possible to achieve high accuracy and speed in both image processing and comparison only if we are able to harness the best properties of each algorithm.

The concept of getting information on the go is most important in the modern day intelligent systems. More research is needed in order to improve the prevailing issues with regard to digital imaging and information extraction.

In this paper, it's been observed that all users need is to give an input to smart phone through an external camera module and obtain the information about image. A hybrid algorithm is hence designed to efficiently and quickly compare and recognize an image and return the information to the user.

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