Finding Missing People Using Hybrid Algorithm

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Abstract-*Objective is to make an application that can be used to find the missed, abducted, rescued people. Here the admin will be given access to the database of such lost people which will be used to find them first and then locating them by using the details submitted by the user about the whereabouts. This application uses the process of image processing, thus reducing the ambiguity pertaining to other attributes such as name, sex, age etc. uploaded images will be compared with the images present in the database and an appropriate result will be displayed regarding the same after the completion of process. Thus enhancing the output by increasing the efficiency and time.*

I. INTRODUCTION

Concept of image processing is used for conversion of an image in digital form so that some enhancement operation can be performed on it in order to extract data or information from it. Here input is an image of any form while output can be a corresponding image. Output is not restricted to image only it can also be data or some characteristic. In this concept of image processing images are treated as two dimensional signals in which pre-defined manipulation techniques are performed to process it. It is now a strong area in the technical fields of Computer Sciences and Engineering.

It includes following steps:

- Input Stage: Image is obtained using different means.
- Processing the image so as to analyze or manipulate input image where it is processed.
- Output Stage: Image obtained after processing is displayed

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II. LITERATURE SURVEY

Image is processed using mathematical equation large number of images can be processed by converting them into signal form. These signals can be two dimension along the x and y axes while three dimensional also includes z axis. These signals are generally in digital form but it can also entertain analog or optical type of signals.

Most significant part of image processing is analysing.Analyzing results in achieving useful information from image. Images while processing are favored to be in digital form so as to apply digital manipulation techniques. The simplicity of the process can be such that it can be equivalent to reading encrypted tags on products to identify someone by merely looking at their face.

The next important step after analyzing is, matching. Image matching as name suggests is the process of matching images from information extracted from other images helps find an authenticated match. This process aims at determining the important constraints of image such as the key points. The process of matching can be performed using various algorithms. Here SIFT-NMI is used to serve the purpose of key point localization and matching them.

III. PROPOSED SYSTEM

Website is created using HTML, CCS where user is asked to fill the details regarding the lost person. This details includes name, address, contact no. , etc. and a clear picture of the person lost (recommended size 256*256). A successful message is displayed if all the information is submitted correctly.

All this information regarding the missing people is stored in a database connected to the website. This database is created and maintained using MySQL.

After a person is found the admin will acquire its picture. A simple interface is created for the admin using MATLAB where he will upload this new picture and initialize the SIFT-NMI algorithm. This picture will then be compared will all the pictures existing in the database one-by-one in a loop. This algorithm calculates a matching value; this value is compared with threshold value, if the matching value is greater than the threshold value then this picture is more likely to be the picture of the person lost. On finding this, the image in the database is displayed on the interface along with a message. If no image is found having matching value greater than threshold than an appropriate message is displayed for the same.

Let's discuss about 2 important face matching algorithms SIFT (Scale Invariant Feature Transform) and NMI (Normalized Mutual Information).

A. SIFT (Scale Invariant Feature Transform)

The SIFT is the first algorithm which is applied on the image. In the SIFT algorithm we find out the key points of the image by going through the following processes.

1) Scale Space Extreme Detection .In the initial step we calculate the extreme points in the scale space.

The scale space is defined using an equation which is represented as.$L(x, y, \theta)$[1]
It is calculated with the help of bilinear difference and Gaussian kernel.
$L(x,y,\theta)=G(x,y,\theta)*I(x,y)$
To detect, in the scale space, the stable critical points, we calculate the DoG(Difference of Gaussian) function. This helps in finding the extreme points.

2) Key Point Localization. To localize the key points we need to find the maxima and the minima of DoG in scale space.

Each point is compared to its 8 neighbors in the current image and 9 neighbors each in the scales above and below.

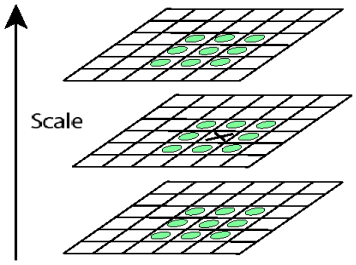


Figure 1. Key Point Localization

The Hessian matrix is used to eliminate the edges responses.[2]

$$\mathbf{H} = \begin{bmatrix} D_{xx} & D_{xy} \\ D_{xy} & D_{yy} \end{bmatrix}$$

$$\mathrm{Tr}(\mathbf{H}) = D_{xx} + D_{yy} = \alpha + \beta,$$

$$\mathrm{Det}(\mathbf{H}) = D_{xx}D_{yy} - (D_{xy})^2 = \alpha\beta.$$

$$\frac{\mathrm{Tr}(\mathbf{H})^2}{\mathrm{Det}(\mathbf{H})} = \frac{(\alpha+\beta)^2}{\alpha\beta} = \frac{(r\beta+\beta)^2}{r\beta^2} = \frac{(r+1)^2}{r}$$

Figure 2. Hessian Matrix Formula

3) Key Point Descriptors. After processing the output from the Hessian Matrix. We move forward towards describing the key points.

The key point locations are stored as the descriptors. The descriptors helps in finding out the pixels which are dominant in the image, those locations can be used to match with the other images for comparison.

Figure 3. Sample key point's location in an image

B. NMI (Normalized Mutual Information)

The final output of the SIFT algorithm is the input to the NMI. Each pixel can be seen as 2-Dimensional digital gray image, which can be seen as a particle in plane XOY. The gray value of particle f(i, j) is the quality of particle.[3]

The NMI algorithm is use to normalize the properties of the image which is to be compared.

To denote the gray value of the gray scale 2 dimensional image we use m[4].

The formula for calculating NMI is shown the figure4.

$$m = \sum_{i=1}^{M}\sum_{j=1}^{N} f(i,j)$$

$$\bar{i} = \frac{\sum_{i=1}^{M}\sum_{j=1}^{N} i \times f(i,j)}{\sum_{i=1}^{M}\sum_{j=1}^{N} f(i,j)}$$

$$\bar{j} = \frac{\sum_{i=1}^{M}\sum_{j=1}^{N} j \times f(i,j)}{\sum_{i=1}^{M}\sum_{j=1}^{N} f(i,j)}$$

$$J_{(i_0,j_0)} = \sum_{i=1}^{M}\sum_{j=1}^{N} ((i,j)-(i_0,j_0))^2 f(i,j)$$

$$= \sum_{i=1}^{M}\sum_{j=1}^{N} ((i-i_0)^2-(j-j_0)^2) f(i,j)$$

$$NMI = \frac{\sqrt{J_{(\bar{i},\bar{j})}}}{m}$$

$$\sqrt{\sum_{i=1}^{M}\sum_{j=1}^{N} ((i-\bar{i})^2+(j-\bar{j})^2) f(i,j)}$$

Figure 4. NMI Formulae

After calculating the NMI value we simply match the key point descriptor of the images. For a pair of image to get

matched a threshold valued is set. If the matching percentage is equal or greater than the threshold then it the image is authenticated.[4]

After we retrieved the image which matches, we can get the information about the personnel through the database, where we keep track of all the missing people

IV. METHODOLOGY

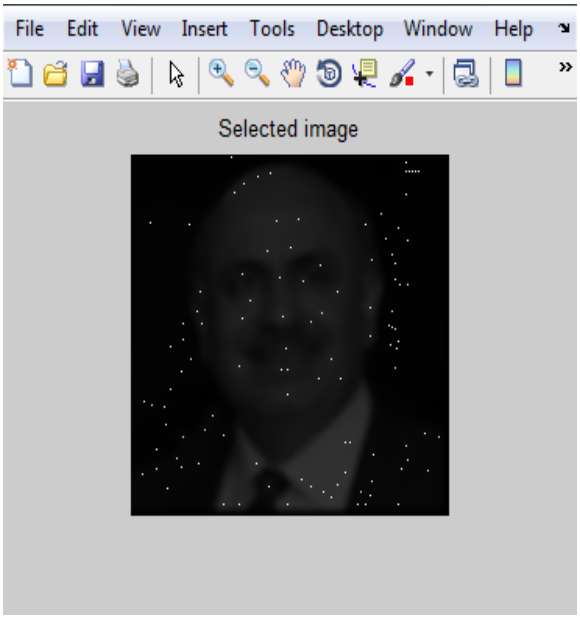


Figure 5. Key points on an image

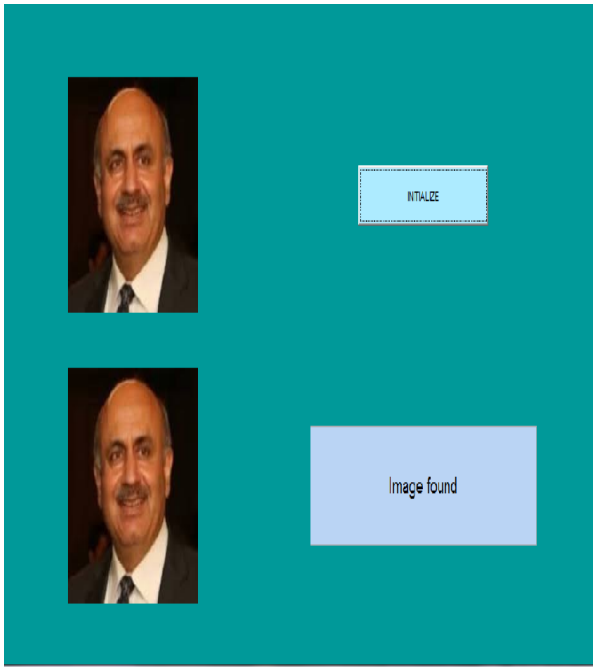
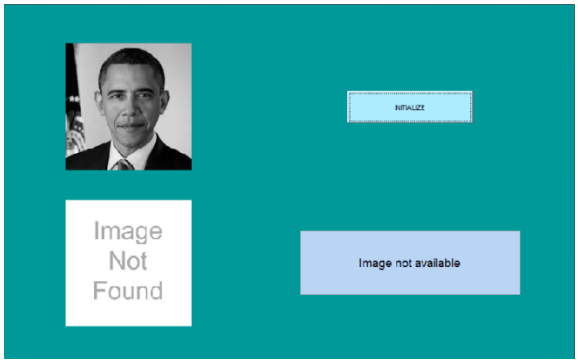


Figure 6. MATLAB GUI for match found



V. CONCLUSION

The system technically and progressively processes the input image and compares it to other images supplying a considerate output. The current system performs its primary goal with efficiency and can be implemented on an even larger scale. Further improvement can be enabled with help of advanced recourses. The system is evaluated on different level for authenticity. Based on the results of different types of images being used user friendliness and usability has been successfully defined within the constraints. However it was pointed out that the interface was unorganized at higher level.

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