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An Approach towards Face Counting System using Image Processing Techniques

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***Abstract*— In this modern time, face recognition has gathered much attention and its research has enormously expanded among researchers, since it has many potential applications in computer vision, communication and automatic access control system etc. Especially, human detection is an important part of crowd analysis as the primary goal for automatic human face detection. However, face detection is not very simple as faces of human varies from person to person. They varies in different aspects such as pose variation (front, profile face etc), image orientation, illuminating condition, and facial expression and so on. Therefore, an approach is put forward to evaluate the number of people present in a group image of human. The results found are encouraging.**

***Keywords*— Face counting system, MatLab, Morphological operation, Face Detection, Spatial transform.**

I. INTRODUCTION

The primitive goal is to build a system that will aggregate the count of people available in a group. The approach made here is based on morphological operations followed by some other pre-processing image transformation to aggregate the number of human via their faces or heads available in a group. The input is a simple coloured (JPEG) image of human group and output is the approximation of human available in that image. The system will help find the approximate number of human in an instant time that in other way may be used for crowd analysis, face detection, mob surveillance and traffic management.

II. REVIEW OF LITERATURE

Many legitimate methods were introduced to detect facial appearance. For example, the feature invariant approaches are used for feature detection of eyes, mouth, ears, nose, etc [1,2]. The template-matching methods are used for face localization and detection by computing the correlation of an input image to a standard face patterns [3,4].

The appearance-based methods are used for face detection with Eigen face and neural network [5,6]. Last, but not the least, putting this method in practical use is still a great challenge. Therefore, input images those are considered are standardized to make the detection algorithm simpler .Firstly, all the faces are vertical and have frontal view; second, they are under almost the same illuminate condition. This paper presents a fruitful way to evaluate number of people/human through face detection technique which is mainly based on the Vision Tool functions and binary object counting functions.

Digital visual information is scattered in all aspects of our present world. Demand for detailed images has increased the demand for development of robust and efficient object recognition techniques. Detection of a single object is quite simple and less complex. But, detection of multiple objects in an image is rather a complex method. Though, there are techniques those can detect different objects effectively. There are some works that discusses number of ways to recognize and detect multiple objects [7].

Image segmentation is disassociation of an image/plane into finite number of segments or sub areas in context of some desired application to ease the process of analyzing the image. Recognition of a provided object in an image is the task of searching the same with some procedure. Some of the well-known Edge detection methods such as Sobel, Prewitt, Roberts, Canny, and Laplacian of Guassian (LoG) are used for segmenting the image. Moreover, Expectation-Maximization (EM) algorithm, OSTU and Genetic algorithms are used to demonstrate the synergy between the segmented images and object recognition [8-13].

III. WHAT IS FACE COUNTING?

Face counting is the approximation of total number of faces which corresponds to the number of people present in an image. Therefore, counting the total number of faces/regions present in an image as an only individual or in a group at an instant of time will help provide to approximate the number of

people present in an image. Hence, Counting of face means counting of the people since each face represents a people.

Therefore, face count provides a scalar number of the people present in the group which helps in many ways for Crowd Management and Analysis over a place. Figure 1 shows the simple form of face counting process.

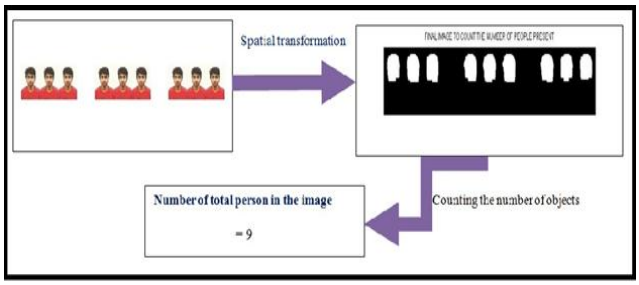

Figure 1: Face Counting Process

IV. FACE COUNTING SYSTEMS

Like the black box view, a system overview diagram also provides the legitimate glimpse of our proposed system but a bit more thoroughly. It helps to understand the behavior of the processes and transforms that occurs within the system. The actual procedures or steps that are involved are also made cleared by the diagram, those are highlighted in Figure 1.

The face counting system proposed here takes an RGB color image which consists of multiple faces conceptualized as group of individuals. Through the series of transformation the images is converted into desired form involving clipping and superimposing image by another binary image of all zeros in a way such that the half portion of the image is clipped off i.e, the body portion are made invisible keeping face portion as it is. Some other morphological operations over the image are applied such that the face portion remains clear. The count of human are evaluated from those clear face portions.

V. ALGORITHM

INPUT: *A digital image(JPEG format) having any number of faces aligned horizontally.*

OUTPUT: *A positive integer corresponding to number of faces.*

Step1: Take a standard RGB color group image as input as IMG.

Step2: Convert IMG to gray scale image as IGRAY

Step3: Adjust the contrast of IGRAY to make the objects clear in IMGRAY.

Step4: Convert IGRAY to binary image say IBIN using a threshold value.

Step5: Calculate height (H) and width (W) of IBIN.

Step6: Convert all pixel to '1' starting from [(H/2), 1] to [H, W], so that only the face portion retains, while clipping off the other portions.

Step7: Complement the whole image IBIN, so that become white and considerably be counted.

Step8: Found image is dilated and eroded several times, and the unwanted small portions are discarded.

Step9: Finally the objects are counted from the found image.

VI. RESULT AND DISCUSSION

The system was tested with different group image samples in MatLab image processing platform. The results found are encouraging and shown in Table 1 , figure 13.

Applying the proposed algorithm over a standard RGB image which is taken in JPEG format followed by some other Morphological operations those are carried out to approximate the number of faces. These are shown in the diagrams figure 2 through 11. Considering the image in figure 11, which is the final transformed image, counting is performed to find out the total number of objects, which are the faces representing the individuals inside the image.

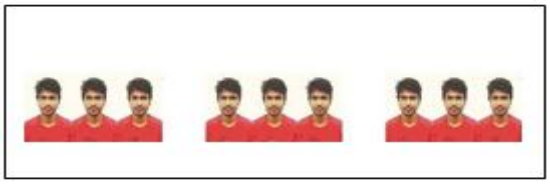

Figure 2: A standard RGB colour image

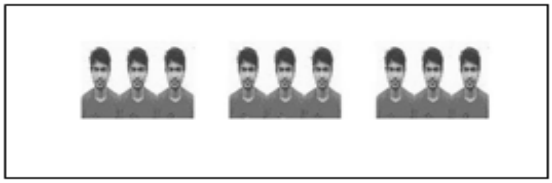

Figure 3: Image from RGB to GRAY

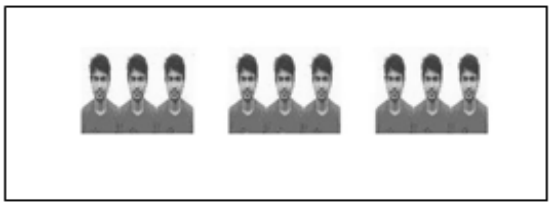

Figure 4: Image adjustment for the appropriate contrast

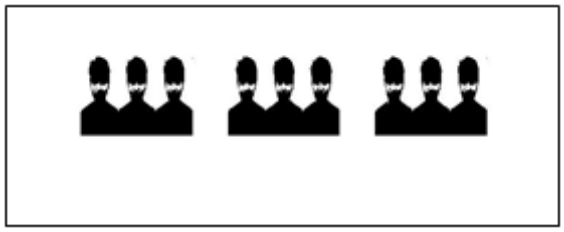

Figure 5: Converted the image into binary using threshold.

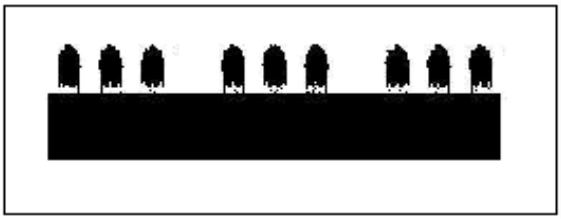

Figure 6: Clipped off portion of the image

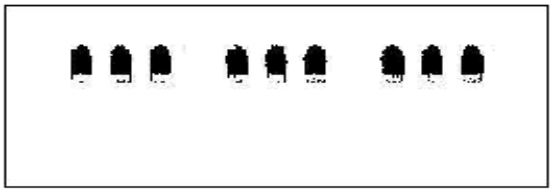

Figure7: Inverted clipped off image

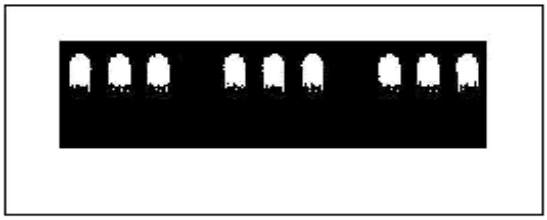

Figure 8: Complemented form of the entire image

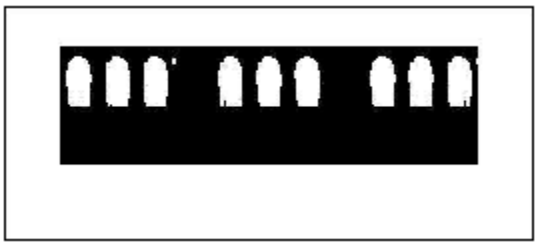

Figure 9: Dilated form of binary image

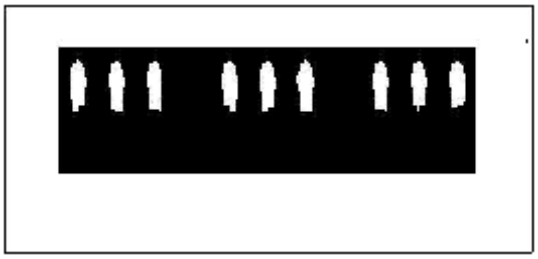

Figure 10: An Eroded image

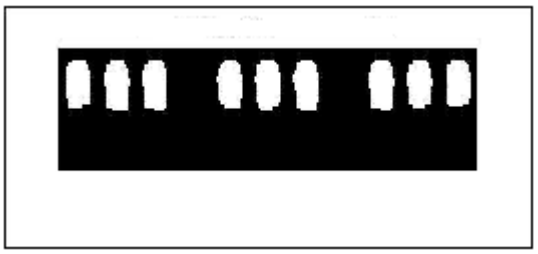

Figure 11: Re-dilated form of the image

SAMPLES	NUMBER OF PERSON PRESENT	NUMBER OF PERSON DETECTED
Picture Sample1	1	1
Picture Sample2	2	2
Picture Sample3	6	6
Picture Sample4	9	9
Picture Sample5	13	10
Picture Sample6	15	12
Picture Sample7	21	17
Picture Sample8	32	29
Picture Sample9	40	37
Picture Sample10	45	43
SUM	184	166
	ACCURACY	
	90.22%	

Table 1: Result of the system with different image samples

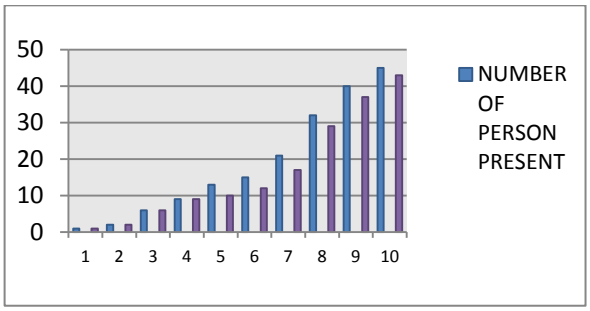

Figure 12: Chart showing results of the system with different group images.

Again, on retaking a more general image consisting of multiple objects (here faces) very close to one another and applying the above algorithm we get:

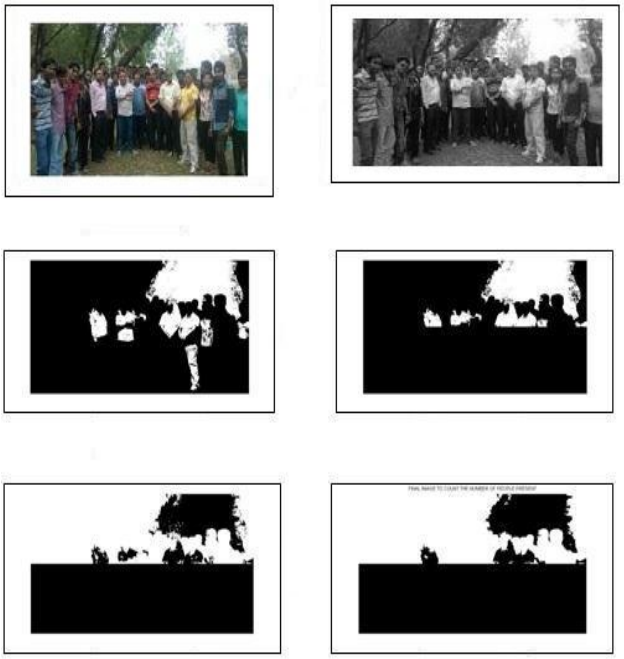

Figure 13: Analysis between different steps of processing

VII. CONCLUSION

A system to approximate number of individual present in an image is proposed here. From the entire discussion, we found objects inside the final image are very clear and are found to be segmented, which naturally provides correct information about the number of objects i.e. number individuals available inside an image. Therefore, the proposed method provided fruitful result as the people's faces in the group image was segmented and counted properly.

REFERENCES

[1].Craw I.,Tock D., and Bennett A., "Finding Face Features", Proc. Second European Conf. Computer Vision, pp. 92-96,1992.

[2].Lanitis A., Taylor C. J., T. F. Cootes, "An automatic face identification system using flexible appearance models," Image and Vision Computing, Vol.13(5), pp.393-401, 1995.

[3].Leung T.K., Burl M.C., Perona P., "Finding Faces in ed Scenes Using Random Labeled Graph Matching", Proc. Fifth IEEE Int'l Conf. Computer Vision, pp. 637-644, 1995.

[4].Moghaddam B., Pentland A., "Probabilistic visual learning for object representation", IEEE Transactions on Pattern Analysis and Machine Intelligence, vol. 19, no. 7, pp. 696-710, 1997 (on-line).

[5] Turk M., Pentland A., "Eigenfaces for recognition," Journal of Cognitive Neuroscience, Vol.3(1), pp. 71-86, 1991.

[6].Bernier O.,Collobert M.,Feraud R.,Lemaried V.,Viallet J.E., CoUobert D, "MULTRAK: A system for automatic multiperson localization and tracking in real-time", Proc, IEEE. Int'l Conf. Image Processing, pp. 136-140, 1998.

[7]. Khurana K., Awasthi R.," Techniques for Object Recognition in Images and Multi-Object Detection" in International Journal of Advanced Research in Computer Engineering & Technology(IJARCET) Vol. 2(4), pp. 118-126, 2013

[8]. Agarwal S., "Edge Detection in blurred images using Ant Colony Optimization Techniques", International Journal of Scientific Research in Computer Science and Engineering, Vol.1(2), PP.21-24, Apr 2013

[9].Campadeli P., Lanzarotti R., Lipory G.," Face Detection in Color Image of Generic Scanes", Italia, IEEE International Conference on Computational Intelegence for Homeland Security and Personal Safety,2004.

[10]. Sudi G. S., Gadgil A.A., "Improved Color Image Segmentation using Kindred Thresholding and Region Merging", International Journal of Computer Sciences and Engineering, Vol.1(3), pp.1-9, Nov -2013

[11]. Wasson V., Singh B., Wasson G, "A Parallel Optimized Approach for Prostate Boundary Segmentation from Ultrasound Images", International Journal of Scientific Research in Computer Sciences and Engineering, Vol.1(1), pp.14-19, Feb 2013

[12]. Kaur B. and Kaur P, "A Comparative Study on Image Segmentation Techniques", International Journal of Computer Sciences and Engineering, Vol.3(2), PP.50-56, Dec -2015

[13].Kokkinos I., Maragos P.,"Synergy between Object Recognition and image segmentation using Expectation and Maximization Algorithm", IEEE Trans. on Pattern Analysis and Machine Intelligence (PAMI), Vol. 31(8), pp. 1486-1501, 2009.

[14] Arora K. , Suri K., Arora D. and Pandey V., "Gesture Recognition Using Artificial Neural Network", International Journal of Computer Sciences and Engineering, Vol.2(4), pp. 185-189, Apr -2014

