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Detection of Digital Image Forgeries By Color Classification Based On Illumination

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Abstract: **For many years the usage of photography is done for space-time events, used as evidence in crime scenes. Photography is developed to such a extend that people rely on the phrase that says One picture says thousand words. However every development has pros and cons, hence much powerful editing software for images has been developed thus making the modification and forgery easy and not acted upon. Therefore image composition is increased. Hence forgery of images or splicing is increased which is type of splicing where a fake object or image is added in an original image. After the insertion of the fake object it is hard to determine the original image. Thus the question arises regarding these photographs used in evidence or for any personal usage. To tackle this kind of misuse we propose forgery detection that helps to find fake images based on the illuminated inconsistencies which are subtle in the images of the photographs. This is a machine learning based approach. This technique is available for only the images containing the faces of two or more human only. We incorporate the information from physics and statistical-based illumination. We do estimation in the regions of faces only. Then we extract texture and the edge based features. These estimations are then sent to the machine learning approach and the automatic decision is made.**

Keywords: **Forensic of image, machine learning, spliced image detection, constancy in color, illuminated color.**

I. INTRODUCTION

In this today's society photography is vital because it emphasizes on the information through the visual capture of the things as they really are. These images to sway the opinion of public through moving object's emotional representation. People have emotional response to the images. People believe in whatever they see rather than what they hear or read. The Data protection Act (DPA) is embarked upon all the images containing personal data and individuals however there is some illegal ambiguity in this. This leads to the forgery of the images. Forgery of an image means inserting a fake object or image into the original image which is hard to recognize. The edited region is simply impossible to recognize. People have been doing image manipulation since the beginning and these forgeries have been put to many uses. Such as Journalists who want to make up their own stories ,dramatic scenes prepared by photo journalist repetition of images in scientific paper by scientists or politicians who give their public opinion by falsely creating political images or events. Thus to maintain the integrity and authenticity of the image we propose a detection technique[1].The more emphasis is on that kind of images on which the detection method will be used. The images must strictly contain two or more faces of human being only. We propose the methods based on the illumination of the color of each face in the image There are two categories in this either consistent or inconsistent .When the illuminant estimates' are found, the texture and edge based features are then provided to machine-leaning approach for the making of the decision

II. RELATED WORK

There are two methods for forgery detection which are either geometry-based or color-based. The detection of inconsistencies in light source positions between specific positions in the scene is done by geometry-based methods.

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The inconsistencies which are seen in interactions mostly between color of the object and the light color. Hence the color based methods is described to be more accurate and used [2]. A method which is available computes a low-dimensional descriptor in the image plane for the lighting environment (i.e in 2D). The estimation is done about the illumination direction from the intensity along manually object which are annotated boundaries of color that is homogenous. This approach was later extended to exploiting the (3D approach).Hence it would be misleading to rely on the visual assessment as human visual system is not that accurate to judge illuminations in the pictures. We propose a forgery detection method that exploits subtle inconsistencies in the color of the illumination of images. The automatic detection of highly specular regions is avoided. We make an important step towards minimizing user interaction for illuminant-based tampering decision-making. The algorithms used are most accurate and yield good results. The classification of illumination on color is done on all the faces in the images.

III. OVERVIEW AND DETAILS IN ALGORITHMS

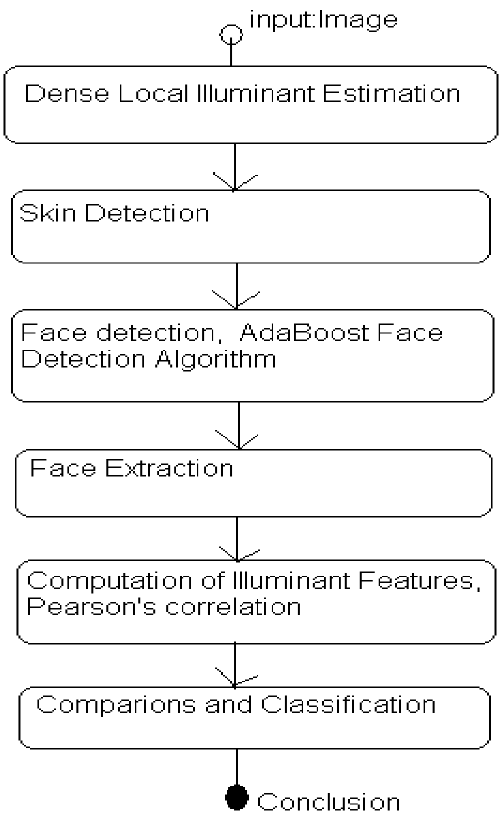

Fig. 1 Architectural workflow Design of the proposed system

ALGORITHMS

1. The AdaBoost Algorithm

This is a fast face detection algorithm, which was proposed by Yoav Freund Robert and E.Schapire in 1995 and it is a milestone in the progress of the face detection field [3]. The basic idea is that it constructs a strong classifier as linear combination of simple weak classifiers. The AdaBoost algorithm is one kind of self-adaptation iterative algorithm. It selects the most important features from a big feature candidate set and makes a weak classifier for every selected one. Then the multi weak learners are combined to a strong one. In this algorithm, every training sample is assigned a weight representing the probability to be selected into the training set by some classifier. If it is not classified correctly, its weight will be raised[3].

(1) Given (xI'YI),(x2,yJ, ... (xn,Yn) X; E X is the training sample set and y; E Y classifies the category symbol. And y={O,I} , y=O stands for negative examples(non-face) and y = 1 stands for positive examples (face). n is the total number of training samples. w,,; is assumed to be the error weights of the i th samples in the t th cycle.

(2) Weight initialization

When y;=O, then wl, ,=I/(2m) when y;=1 , then WI" = 1/(2/). Where m and I are the number of non-face example and face example respectively.

(3) For t = l,oo.,T :

1) Normalized the weight: w,,; = W,,! (□ w,,; J ;

2) For each feature ,j, trains its weak classifier h/x,J,p,O) to determine the threshold OJ and the offset Pj , so it could obtain the minimum value of the c function

3) After the weak classifiers are determined in step 2)select the weak classifier h, which has the minimum error rate

4) Set the update threshold of the weight for this training:

HW, = □ W', j In , then update the sample weight:

Where p,=&,/(I-&,), z, is factor to make j I.w"j=l, =1

HW, is the update threshold of the weight for this training:

(4) The final strong classifier is: C(x)

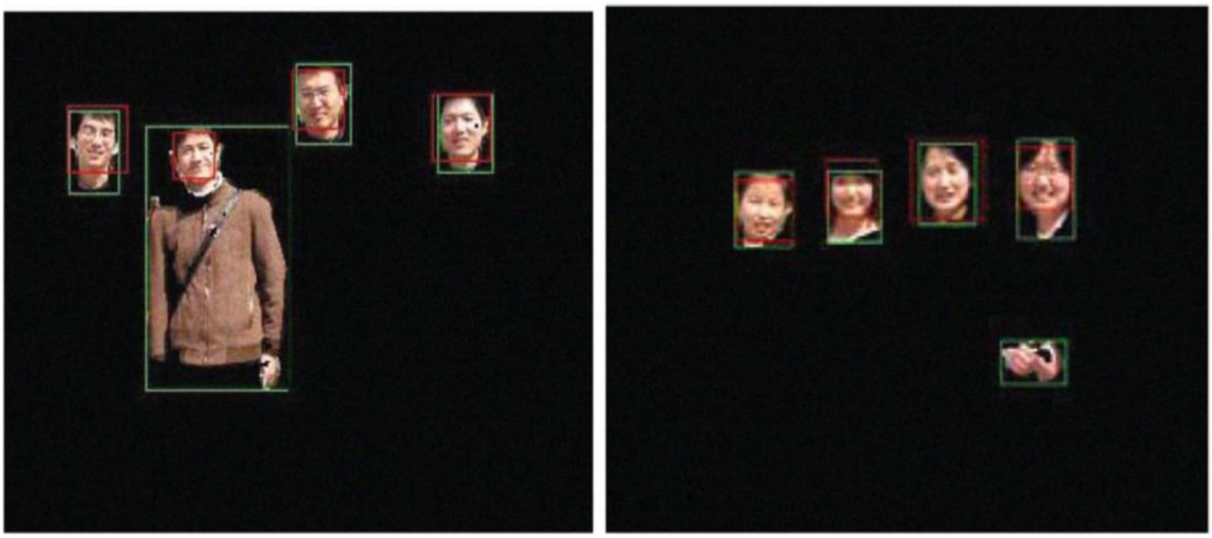

Fig. 2. Image for skin detection

In order to get the ideal detection results, the number of training set should not be reduced, so we could only reduce the Number of feature.

A. The Pearson Correlation

Correlation between sets of data is a measure of how well they are related. The most common measure of correlation in stats is the Pearson Correlation. The full name is the Pearson Product Moment Correlation or PPMC. It shows the linear relationship between two sets of data. Two letters are used to represent the Pearson correlation: Greek letter rho (ρ) for a population and the letter “r” for a sample.

$$r = \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{\sqrt{[n\Sigma x^2 - (\Sigma x)^2][n\Sigma y^2 - (\Sigma y)^2]}}$$

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The results will be between -1 and 1. You will very rarely see 0, -1 or 1. You'll get a number somewhere in between those values. The closer the value of r gets to zero, the greater the variation the data points are around the line of best fit. *High correlation:* .5 to 1.0 or -0.5 to 1.0*Medium correlation:* .3 to .5 or -0.3 to .5

Low correlation: .1 to .3 or -0.1 to -0.3

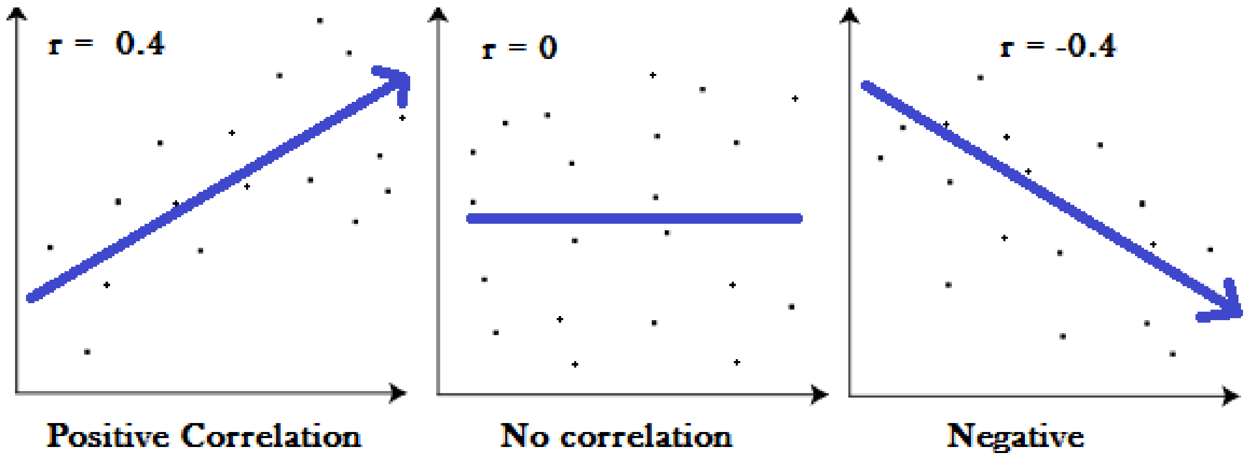

Fig.3 Graphs of different Pearson's results.

For Example:-

Subject	x	y	(x)(y)
1	18	15,000	270,000
2	25	29,000	725,000
3	57	68,000	3,876,000
4	45	52,000	2,340,000
5	26	32,000	832,000
6	64	80,000	5,120,000
7	37	41,000	1,517,000
8	40	45,000	1,800,000
9	24	26,000	624,000
10	33	33,000	1,089,000
Sum	369	421,000	18,193,000

$$r = \frac{18193000 - \frac{(369)(421000)}{10}}{\sqrt{(15629 - \frac{136161}{10})}\sqrt{(21289000000 - \frac{177241000000}{10})}}$$

$$r = \frac{18193000 - 15534900}{(44.865)(59706.78)} = 0.99$$

x(Age) and y(Yearly Income) have a strong positive relationship.

IV. CONCLUSION

The verification of integrity of the image as well as identifying the areas of tampering on images without need of any expert support or manual process or prior knowledge of the original image contents is now days becoming the challenging research problem. Thus to solve we have discussed different methods of detection for digital image forgery as well as illumination inconsistencies. There is no principal hindrance in applying it to other. This is problem-specific materials in the scene requires only a minimum amount of human interaction. This provides a crisp statement on the authenticity of the image. Also it gives significant advancement in the exploitation of illuminate color as a forensic cue new descriptor, classifier and combination method for taking advantage of illumination maps for forensic purposes.
Our results are encouraging, yielding an accuracy of over 86% correct classification. Good results are also achieved over internet images and under cross-database training/testing. Thus this machine-learning based illumination method will help to overcome the forgery of images in the future.

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