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RESEARCH ARTICLE

Detection of Digital Image Splicing by using Illumination of Color Classification

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Abstract*— Now a days, photographs are considered as very important part in various fields like digital forensics, medical imaging, digital forensics, scientific publications, in the courts as an evidence, etc. From last few years, photographers are also able to create composites of analog pictures. This process requires lots of time and expert knowledge is also required. Today, large number of image modification softwares and corresponding graphics are available. So, modifications of digital image become easy. Hence, we can hardly trust on photographs as evidence. In this paper, we are going to describe a technique for exposing fake images by the method of splicing or compositing the image. Here we used Adaboost algorithm for finding the face area and non-face area. This algorithm divides the whole image into number of parts and Pearson's correlation is for comparing difference between background and foreground color. This technology is very much easy for finding the fake image.

***Keywords*— Illuminant color, image forensics, machine learning, spliced image detection, color constancy.**

I. INTRODUCTION

As the use of images have been increasing very much day by day in our surrounding. It is also the more powerful channel now-a-days. Photographs are used as evidences in many crime cases. The example of importance of digital image printed in a newspaper is commonly accepted as certification of trustfulness of news. Also thousands of digital images have been circulated through various media like internet, television, newspaper, etc.

At the same time, due to large number of editing software tools makes very easy to change the contents of images or to create a new image. If, before taking appropriate action upon a doubtful image, it is necessary to detect that the image has been altered or not.

Image composition is one of the most common image modification techniques to create forgery images. Image

splicing and composition is a simple process that crops and pastes regions from same or separate sources. Splicing image produced by sticking together images using digital tools such as Adobe Photoshop.

This paper aims that to describe the facts about an image. An effective AdaBoost technique is used to detect face and non-face region. Also few days ago, large numbers of manipulated or edited images are circulating on social media, for example images of Shivaji Maharaj were manipulated in wrong manner. So we need technology which will help us in these types of crimes.

The important contributions of this paper are summarized as follows:

1) Creating illuminant maps of images.
2) Introducing an integrated approach of feature extraction.
3) Minimizing human interaction in tampering decision making.
4) Semi – automated Forgery detection.

Here, we proposed effective forgery detection method. For forgeries, detection is based on illumination inconsistencies in the color of illumination of images. This technique is able to detect images containing two or more people and no expert interaction for tampering decision. The basic goal of face detection is to detect human faces in images or videos. In different situations, face appearance may vary between two or more persons identification. It depends on lightening conditions. Hence, an AdaBoost algorithm is used to get fast detection, due to its real time and it also has higher detecting rate. Another basic idea of detecting fake image is by calculating luminance in face region and background luminance for face identification and background identification.

AdaBoost algorithm is used along with Pearson correlation. Hence, it will get coefficients which decide the fake and non-fake image.

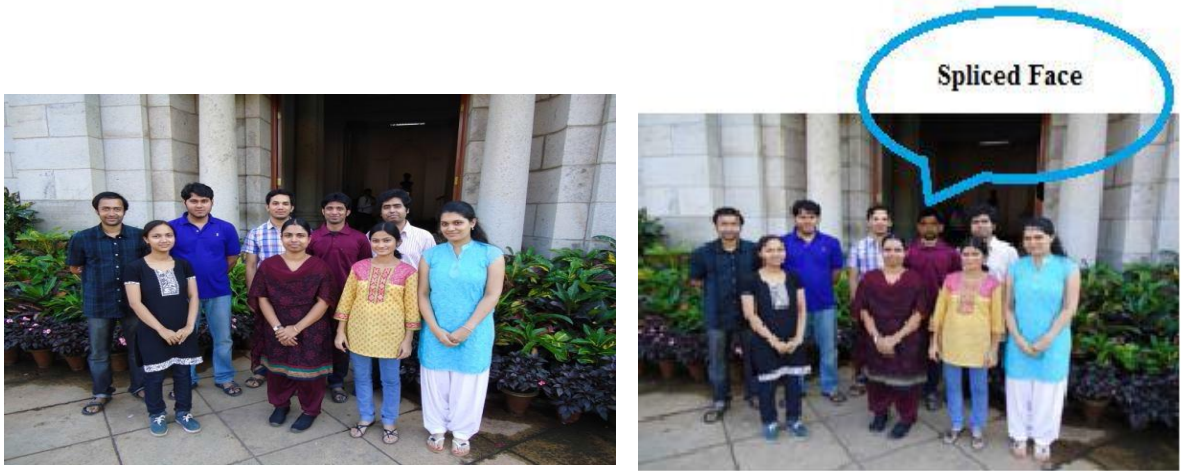

Fig:- (a) original image (b) spliced image

II. RELATED WORK

In the 'Scene illumination as an indicator of image manipulation' C. Riess and E. Angelopoulou , stated that, the development of a physics-based method for the recovery of the illuminant color for different objects in the scene. The illumination map is based on the distance measure on the estimated results. The demonstration of the feasibility of employing an illuminant map is done in forensic analysis. In "Exposing digital forgeries in complex lighting environments" H. Farid and M. J. Bravo stated that, the past few years has seen a considerable rise in the availability and sophistication of digital imaging technologies (cameras, scanners, software) and their use in manipulating digital images. From the tabloid magazines to the fashion industry and from the main-stream media outlets to the political campaigns and photo hoaxes that land in our emails in-boxes, doctored photographs are appearing with an expanding frequency and sophistication. As a result, our trust in the photographs is now being diminished. The field of "Digital Forensics" has emerged over the past few years to combat these problems. Many techniques have been developed to detect the various types of digital tampering.

In "Exposing Digital Forgeries through specular highlights on the eye", H. Farid and M. J. Bravo stated that, 'when producing a digital composite of two persons, it is hard to perfectly match the lighting conditions under which each person was originally photographed.' In several conditions, the light source in the scene gives rise to a specular highlight on the eyes. This shows that, how the directions to a light source can be obtained from this. After that the difference in lighting across an image are used to reveal traces of digital tampering.

"A Novel Digital Image Forgery Detection Method using SVM Classifier" states that, as the use of images have been increasing nowadays in our lives, the inspiration to create forged images also increases

simultaneously. With the introduction of digital technology, digital image has now taken the place of an original analog photograph. The forgeries in digital images have become simple and indiscoverable. Here, in this paper, we are going to detect an extremely common form of image forgery called as image splicing by using enhanced face extraction techniques and universal classifier. We use the forgery detection method that makes the use of delicate inconsistencies in the color of the illumination of images. Our approach is to use fully automatic methods that need minimum user interactions. To achieve this, we obtain the information from illuminant estimators on image regions of similar material. Human faces can be extracted from illuminant maps. Edge based and gradient based algorithms are used for feature extraction from the extracted faces. Then we can combine these complementary points (texture and edge-based) using machine learning late fusion SVM classifier that helps us to classify forged image.

The "Forgery Detection in Digital Images by Illumination Color Classification Using Adaboost Classifier" explained that, the photographs have been used for document space-time events and they have served as evidence in courts many times. Image modifications are made easily by powerful digital image editing softwares directly and this is the main reason of the lacking trust on photographs. Fake image detection method is used to expose inconsistencies in the color of the illumination of images. This is a machine-learning based approach that needs less user interactions. After that, the extracted features paired using the same descriptors which are then classified by Adaboost Classifier. Generally, a photograph states truth. So, the trusts on digital images are diminished due to the ease of manipulation. Images provide an effective and a natural communication media for humans, as humans always needs no special training to understand the image content. By verifying the credibility of digital images and performing image forensics can protect the truthfulness and reliability of digital images.

III. OVERVIEW OF THE SYSTEM

1] Dense Local Illuminant Estimation (IE):- The input image is segmented into homogeneous regions. Per illuminant estimator, a new image is created where each region is colored with the extracted illuminant color. This resulting intermediate representation is called illuminant map (IM).

2] Face Extraction:- This is the only step that may require human interaction. An operator sets a bounding box around each face (e.g., by clicking on two corners of the bounding box) in the image that should be investigated. Alternatively, an automated face detector can be employed. We then crop every bounding box out of each illuminant map, so that only the illuminant estimates of the face regions remain.

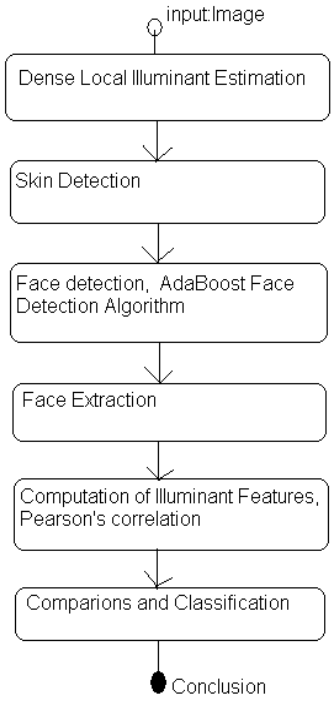

Fig:- Architectural workflow Design of the proposed system.

3] Computation of Illuminant Features:- For all face regions, texture-based and gradient-based features are computed on the IM values. Each one of them encodes complementary information for classification.

4] Paired Face Features:- Goal is to assess whether a pair of faces in an image is consistently illuminated. For an image with faces, we construct joint feature vectors, consisting of all possible pairs of faces.

5] Classification:- Using a machine learning approach to automatically classify the feature vectors. Consider an image as a forgery if at least one pair of faces in the image is classified as inconsistently illuminated.

IV. PROPOSED SYSTEM ARCHITECTURE

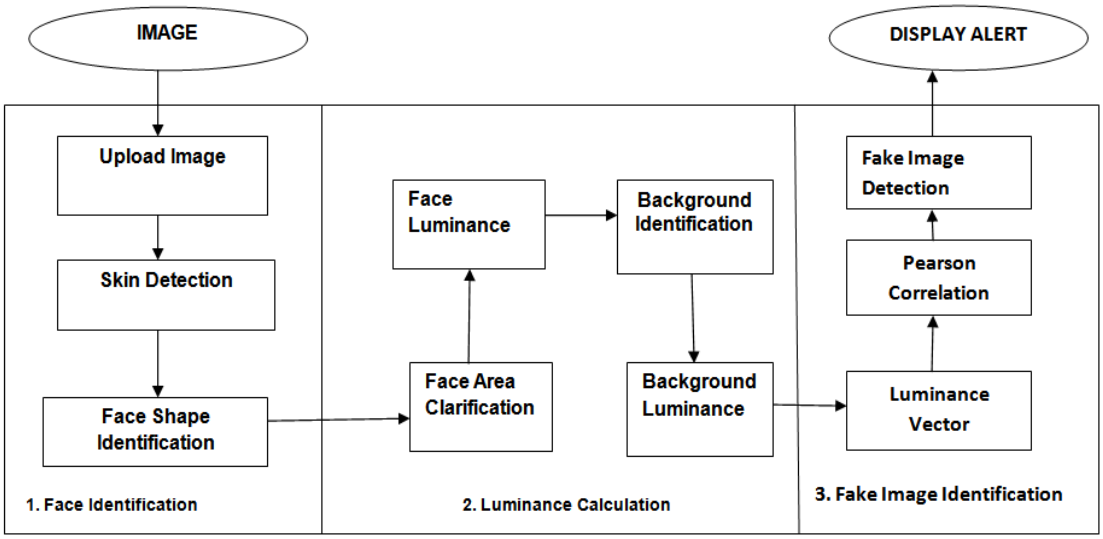

Fig:-Proposed System Architecture

An illumination of each pair of face in the image is classified as consistent .The three main components of proposed model are as:-

1] Face identification:-

The common thing about an image is that it may contain only face, or also any other objects with the face or the whole body may be present in image, hence the first step in algorithm is face identification.

In this an image is given to the system is given to the system which consist of other objects rather than a face, so it is necessary to identify the area, so it is necessary to identify the face area. Adaboost algorithm is used to upload the image into the system to identify the face area for skin detection. Adaboost algorithm is one of the fast face detection algorithm and it was proposed by Yoav Freund Robert and E. Schapier in 1995.In this algorithm the basic idea is to construct a strong classifier as the linear combination in simple weak classifier as the linear combination in simple weak classifier Paul Violo and Michael Johns proposed Adaboost detection algorithm based on the integral image features in 2004. Here, the "is used to compute the value of rectangle feature and solve the speed problem of the face detection.

2] Luminance calculation:-

The luminance calculation is used to calculate the brightness of image.The term Luminance is related to the brightness .Here brightness of face and any impurities present in the image then those are removed .first of all the face area is get clarified by the system then the clarified image is send to next process i.e for the face brightness calculation .

3] Fake image identification:-

Lastly the fake image identified by Luminance vector and person's co-relation algorithm.

V. ALGORITHM DETAILS

There are two algorithms are used in our system:-

1) ADABoost Algorithm.

2) Pearson Corelation Algorithm.

Components of AdaBoost algorithm are:-

1. Skin color detection:-

The most significant feature of people is human skin .One of the study shows that the people of different race, age, gender have different skin color, but the difference mainly concentrates on the brightness .If the brightness is removed from the color space then the different face skin color distribution as the character clustering. The two aspects contents of skin color segmentation are, color space and skin color model.

2. Light compensation:-

Here, color image considering that skin color information is often affected by factors like photo source color. The color deviation of image gathers equipment, we use "reference white" approach to solve the problem .For this all picture element's brightness are arranged from high to low; then take the top 5% of the picture pixels. If these pixels are adequate, then we will take their brightness as the "reference white" ,i.e adjust their color's R,G,B components to the maximum of 255. The other pixel color values of the entire image are handled in the same way.

3. Color segmentation:-

The color space widely used are : RGB, YCbCr, HSV, normalized RGB ,HIS, ets .the YCbCr space lightly affected by the Luminance change could handled luminance and chroma separately so that the skin color spots could form better cluster .The YCbCr space can be obtained directly from linear transformation of the RGB space with high effective calculations, but it is highly sensitive to red light and easily pruned to false detection while the normalized RGB space is able to reduce the impact of luminance changes .Hence , the combination of two space models can enhance the detection reliability. In the YCbCr color space ,Y is considered as Luminance while Cb and Cr are used to present chromaticities of blue and red respectively. Cb and Cr are two dimensional independent distributions and they can limit the distributions are the skin color. To convert RGB space into the YCbCr space the following formulae are used :

Y=0.299+0.587G+0.114B

Cb=0.5B-0.1687R-0.3313G+128

Cr=0.5R-0A187G-0.0813B+128

The YCbCr color space have Cb E[100,130] and Cr E[135,170]. The normalized RGB color space have rE[0.36,0.51],gE[0.28,0.35] and r>g .The region that meets the two conditions will be considered as skin area and set into the white points while the other regions are set into the block that generate the binerization image. The flow of AdaBoost algorithm is as follows:-

The image which has to be checked for corrections are read by Adaboost algorithm. After reading the image 2 things to be done are skin detection for identifying face area, and geometric screening, the candidate face region is marked. The Adaboost classifier detects the face area and non face area.

4. Luminance calculation:

The term Luminance is related to the brightness .Here brightness of face and any impurities present in the image then those are removed .first of all the face area is get clarified by the system then the clarified image is send to next process i.e. for the face brightness calculation.

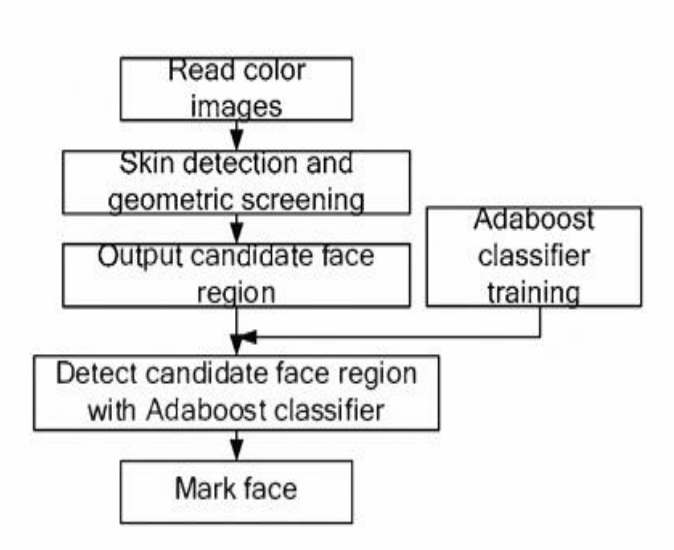

Fig:-Adaboost algorithm flow chart

VI. CONCLUSION

Here our system provides a new method to detect forged images of people using the illuminant colors. This method requires very less amount of human interactions and provides authenticity of an image. We expect that more improvements can be achieved when more advanced face detection algorithms become available. It can be implemented in different criminal and forensic departments further

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