



Digital Image Processing for Forensic Analysis of Fabricated Documents

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ABSTRACT: Digital Image processing is the most advanced techniques used by forger for fabrication of documents, however there is always two sides of a coin, the image processing tools where used for fabrication of documents also open avenues for detection of tampering in any digital documents, the technique of digital image processing discussed in this paper is the role of Matlab in detection of fabrication or any tampering of digital image which is used as fabricated document. The paper provide a simple method to evaluate fabricated documents in order to assist forensic document expert

KEYWORDS: Image Processing, Fabricated Documents, Forensic Document Examination

I. INTRODUCTION

Fabricated document is frequently found in criminal and civil cases. Fabricated documents are found on the contested wills, financial paper work and professional business documentation. It may be necessary to determine whether or not the document is in fact genuine and if not if the entire document has been forged or altered in anyway. In some instances it may also be possible to link a forged document to a suspected author. The forger uses latest advances and uses them to perfect his art as like computer scan documents are copied from one document to another to make them genuine.

Mostly acquisition and manipulation tools use the JPEG standard for image compression. As a result, one of the standard approaches is to use the blocking fingerprints introduced by JPEG compression, as reliable indicators of possible image tampering. Not only do these inconsistencies help to determine possible forgery, but they can also be used to light into what method of forgery was used. Many passive schemes have been developed based on these fingerprints to detect Resampling, Copy-paste, Luminance-level, Double Compression JPEG and Wavelet Transformation Coefficient [1].

This study is based on analysis of document like PAN (Permanent Account Number) Card, Driving License, which are being frequently fabricated for using as an ID proof for various wrongful gain. This study entitled is intended to help the forensic document expert to apply the method for detection and examination of fabricated document through digital image processing techniques.

II. METHODOLOGY

A. Image acquisition

The samples of suspected fabricated driving license & PAN cards were digitized using high resolution scanner at 600 dpi using HP 2400 series Scanner and their data set has been prepared for its use in the study .

B. Image segmentation

The image thus observed was preprocessed with Matlab using Otsu method [2] the image is segmented by thresh holding the image to minimize the intra class variance of the black & white pixels. Multidimensional arrays are converted to 2-D arrays using reshape.

```
A= imread ('originalimage.jpg');  
% Reads the image named original image  
& loads it to Command window
```



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Gray image = gray thresh (A); % Threshold the Image

GI=im2bw (A, Grayimage);
% Binarized the Image

Imshow (GI)
% Display the binarized image at the command window

C. Detection of Red Green Blue (RGB) Values

By using the image information command in matlab the basic information about its array size has been observed and then their detailed RGB pixel value was observed by using the imtool command
Imtool (GI) % image tool opens and displays the pixel wise values of the opened image

D. Detection of Tampering through Image Processing

The suspected document in form of a digital image was compared with the standard and pixel to pixel matching was performed. It was assumed that if there is any alteration in the two images it will show variation in their pixel RGB component. The entire analysis was done using Matlab as per the algorithm given below

A = imread ('standard.jpg'); %reads the standard image and loads it to the working window

Figure, imshow (A); %display the image of standard document on the figure window

PIA= impixelinfo; % creates a pixel information tool in the current figure

B=imread ('suspected.jpg'); %reads the suspected image and loads it to the working window

Figure1, imshow (B); %display the image of suspected image on another figure window

PIB= impixelinfo; % Creates a pixel information tool in the current figure

C= A-B; % Subtracts the RGB value of Suspected image from standard image

D=B-A; % subtracts the RGB value of Standard image from suspected image.

Plot(C); %Plots the RGB Value Spectra for the standard image

Plot (D); %Plots the RGB Value Spectra for the suspected image

III. RESULTS

The scanned documents were thoroughly examined for its pixel details and on examination by Matlab Programming and the on the basis of variation in RGB content the fabrication were confirmed.

Sample 1



(a)



(b)



(c)

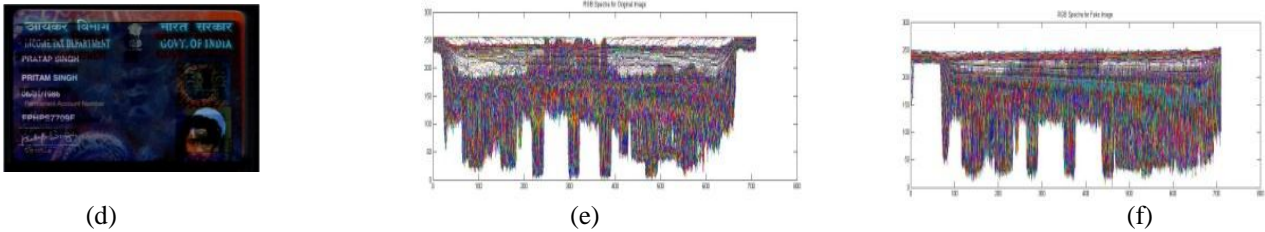


Fig.1(a) Original Document Image (b) Tampered Document Image (c) Image observed by subtraction (Original – Suspected) (d) Image observed by subtraction (Suspected- original) (e)RGB Spectra for original image (f)RGB Spectra for suspected image.

Table 1: RGB value at suspected area of original and fabricated document

Row-Column	Original sample	Suspected sample
134, 620	63, 59, 74	54, 56, 71
140, 650	178, 152, 115	51,45, 71
146,647	185, 156, 114	114, 114, 116

Sample-2

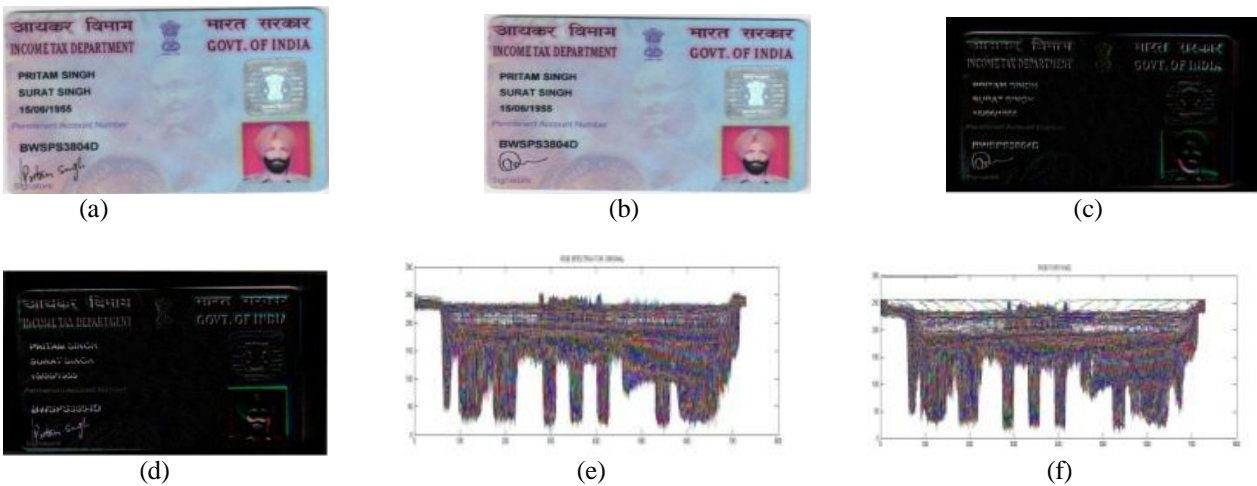


Fig.2 (a) Original Document Image(b) Tampered Document Image(c)Image observed subtraction (original- suspected). (d)Image observed by subtraction (suspected- original) (e)RGB Spectra for original image (f)RGB Spectra for suspected image.

Table 2: RGB value at suspected area of original and fabricated document.

Row-Column	Original sample	Suspected sample
150, 661	134, 115, 117	177, 148, 176
180, 634	166, 148, 160	176, 157, 176
160, 634	109, 94,99	181, 160, 179

Sample -3

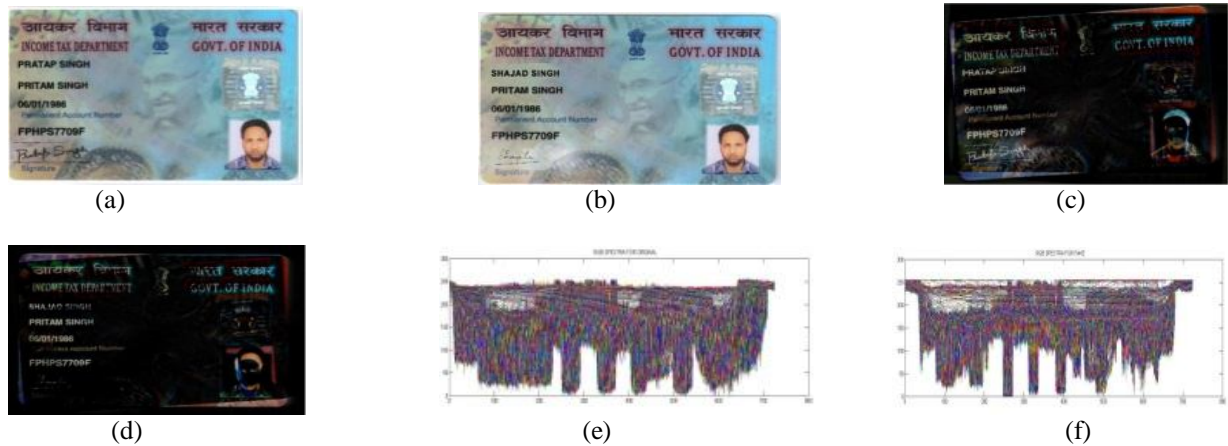


Fig.3(a) Original Document Image (b) Tampered Document Image (c) Image observed by subtraction (Original – Suspected) (d) Image observed by subtraction (Suspected- original) (e) RGB Spectra for original image (f) RGB Spectra for suspected image in MATLAB window.

Table 3 RGB value at suspected area of original and fabricated document.

Row-Column	Original sample	Suspected sample
100, 621	44, 3a8, 38	125, 126, 144
150, 643	158, 149, 134	200, 189, 171
130, 549	175, 177, 166	170, 161, 146

Sample-4

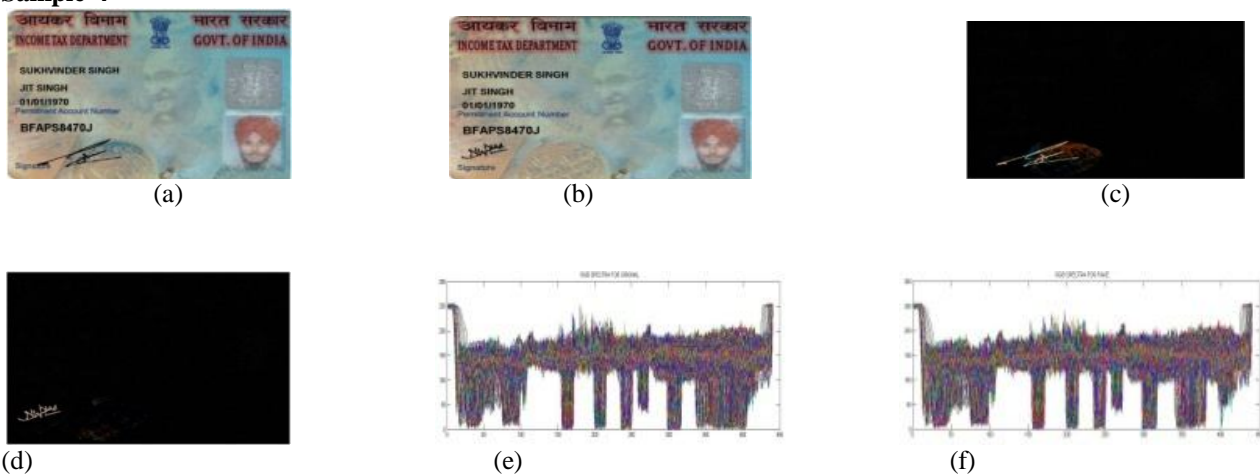


Fig.4 (a) Original Document Image (b) Tampered Document Image (c) Image observed by subtraction (Original – Suspected) (d) Image observed by subtraction (Suspected- original) (e) RGB Spectra for original image (f) RGB Spectra for suspected image in MATLAB window.

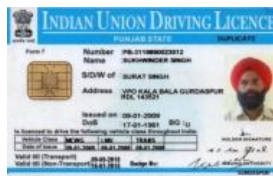
Table 4 RGB value at suspected area of original and fabricated document.

Row-Column	Original sample	Suspected sample
140, 377	34, 24, 22	155, 149, 139
154, 371	91, 87, 86	151, 166, 161
180, 379	0, 6, 4	162, 147, 124

Sample-5



(a)



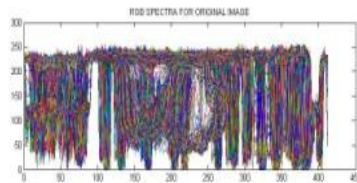
(b)



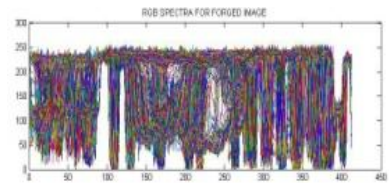
(c)



(d)



(e)



(f)

Fig.4(a) Original Document Image (b) Tampered Document Image (c)Image observed by subtraction(Original – Suspected) (d) Image observed by subtraction (Suspected- original) (e)RGB Spectra for original image (f)RGB Spectra for original image.

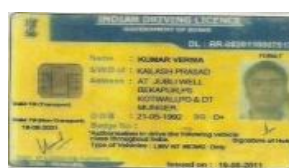
Table 5 RGB value at suspected area of original and fabricated document.

Row-Column	Original sample	Suspected sample
545, 303	4, 6, 0	162, 166, 169
553, 305	35, 41, 41	188, 189, 184
540, 308	233, 237, 238	241, 244, 249

Sample-6



(a)



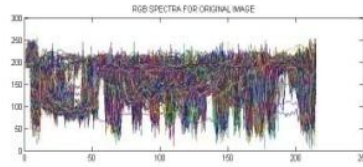
(b)



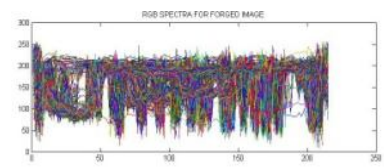
(c)



(d)



(e)



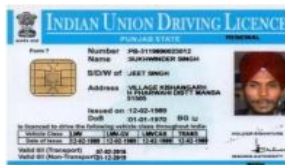
(f)

Fig.6 (a)Original Document Image (b)Tampered Document Image (c)Image observed by subtraction (Original – Suspected) (d)Image observed by subtraction(suspected- original) (e)RGB Spectra for original image (f)RGB Spectra for original image.

Table 6 RGB value at suspected area of original and fabricated document.

Row-Column	Original sample	Suspected sample
290, 165	99, 85, 0	232, 198, 65
303, 161	189, 169, 70	220, 205, 110
302, 163	176, 154, 55	218, 195, 102

Sample-7



(a)



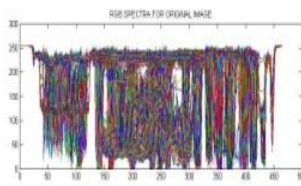
(b)



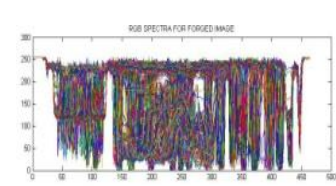
(c)



(d)



(e)



(f)

Fig. 7(a) Original Document Image (b)Tampered Document Image (c)Image observed by subtraction(Original – Suspected) (d)Image observed by subtraction (Suspected- original) (e)RGB Spectra for original image (f)RGB Spectra for suspected image showing variation.

Table 7 RGB value at suspected area of original and fabricated document.

Row-Column	Original Sample	Suspected sample
561, 339	205, 208, 217	171, 174, 167
565, 339	233, 236, 245	223, 224, 216
571, 342	170, 173, 182	221, 221, 221



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The RGB values at suspected areas of the digital images sample 1 to 7 and their corresponding spectra as reported in this paper clearly indicates the tampering in fabricated documents. The method employed in this paper is simple and very useful for detection of fabricated documents.

IV. CONCLUSION

Digital image processing is very useful in forensic document analysis as the cases of document forgery is very common at both national and international level. Today, forger becomes hitech in committing crimes and there is a need to detect the art of forgery using different scientific methods.

This paper deals with the study of different samples of driving licence & pan cards as they are the major documents which are fabricated by forgers for wrongful means. 7 samples were examined through Matlab for their pixel components and tampering was detected. The method described in this paper is simple and could be very beneficial for forensic document examiners.

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