

## EXAMINATION OF DIFFERENT DENOMINATION BY USING ANALYTICAL TECHNIQUES

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### ABSTRACT

The highly develop technology can be use by Counterfeiters to improve their skills to produce efficacious banknote. This technique is use to solve problems related counterfeit. In this study, different analytical methods like Raman Spectroscopy or FTIR was discovered for study the components of banknote. Without the Preparation of sample different types of original banknote is scrutiny. Different areas were selected to study the front and back of the original banknote. In this study, original banknote observes and a result was calculated. These analytical techniques provide fast and potent analysis using handled equipment. This is very advantageous or convenient method for the investigation. Main goal this research is to create absolute method for forensic branch.

**Keywords:** Analytical Techniques, Different Denomination, Component, Counterfeit, Forensic Analysis.

### I. INTRODUCTION

1. Every country includes various types of security features in their banknote. These security feature obviate counterfeit. At the time of manufacturing this security feature is added in banknote. In this paper security features of Indian Rupees (₹), Australian Dollar (\$), British Pound (£), Euro (€), American Dollar (\$) and Renminbi (¥) were examined. The cardinal bank varies from country to country, they are responsible for issuing currency of a particular country. by adding technical security features to banknote, it will secure or stop the counterfeit of currency. There are two types of security features one which can be seen by naked eyes and other requires use of unique equipment or techniques.
2. For recognition of currency note there is need of automatic system which is excited many scientists and researchers to develop reliable method. Fake cash is unsecure to a country and that are delivered without the government's Authorization. In November 2016 500rupee banknote making it invalid.
3. Recognize immediately and accurately paper currency are designed. This currency is used in various areas such as banks, shops and different types of market that mean currency is used rural to urban area.
4. The counterfeit currency printing and scanning technology have made but counterfeit with new denominations notes have been seized at India- Bangladesh border because they were printed on official Bangladesh stamp paper and number of fake Indian currency note increased from 104743 in 2006-2007 to 632926 in 2015-2016 a 500% increased ten years.
5. And the original 2000-rupee banknote's unique security features, such as OVI print, UV fluorescent print and micro letter are not possible for counterfeiters to duplicate its originality.

### II. METHODOLOGY

#### Methods

#### Various light and filter

Study on security features of ₹500 Indians currency note conducted by the reserve Bank of India and analyzing them using various light and magnification range and filter. [6]

#### Negatively correlated neural network

There is different type of old and noisy notes which are not easily recognizable for the machine, therefore a system develop using ENN that identify accurately and easily. In this process note are converted image which indicates gray scale and then given image is compressed, this compressed image used for recognition. [7]

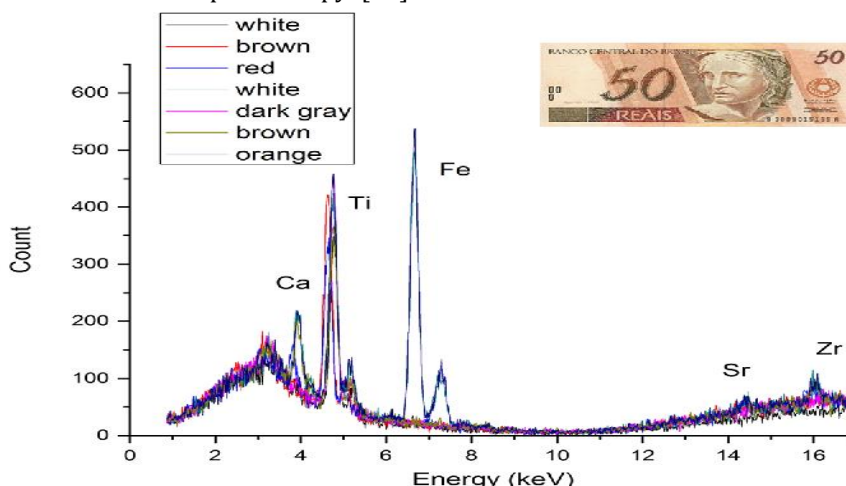
### Raman spectroscopy

[8]For recognition of euro banknote Raman micro spectroscopy is use and analysis real and fake 10&20 notes were used, In the detection different ink are provided color of each banknote and with the help of Raman micro spectroscopy disclose itself difference between them, and for the examination of Indian currency ₹500 Raman spectroscopy was collected by using highly sensitivity camera and at 532nm there is emission line of He Ne leaser spectra. [9]



### Portals x-ray and portals RS

Methodology for banknote delineation employ in portal x-ray and Raman spectroscopy for identify genuine and Counterfeit. In pXRF quantification of the metal in ink and paper are analyzed and two pigments from ink are identify in form of bands in Raman spectroscopy. [10]



### Partial least squares discriminate

PLSDA is administered classification method that are used for identify the category of sample set. PLSDA are Raman spectroscopy technique are developed for complementary method to classify forensic inspection. [11]

### FTIR spectroscopy

[12]Sample in the FTIR spectra is recorded in ATR mode, it determines the composition of organic binder material and also detect pigment. Some characteristics absorption bands in mid-range and but some regions do not absorb and some region have absorption that have peaks at low wave number end and feature are not enough [13]

### FT-Raman spectroscopy application

Use of FT-Raman spectroscopy for microbiological analysis of textiles, examine Escherichia coli bacteria on cotton. it identifies detergent traces, and examine microorganism influence. This method bears by chemometrics and use as application in the fabric industry [14]

Raman Spectroscopy is important technique for forensic examination of paint and inks evidence. It provides high discrimination between samples, performs non-destructive microscopical in situ analyses, requires minimal sample preparation, and can be easily stored for database purposes. This review article provides a comprehensive overview of Raman spectroscopy's applications in characterization, differentiation, comparison, and identification of trace evidence and questioned documents [15]

**Spectral analysis by using VSC-5000**

In India counterfeit of currency is a major issue therefore security features in bank note is important. In section 28 of Indian penal code define "counterfeit" punishment for the mentioned offences is stated in Section 489(A),(B),(C)and (E) specified imprisonment for 10 years along with fine.

In this paper Video Spectral Comparator (model 5000) and Stereomicroscope have been used for studying exclusive Significant features address in the new currency note of ₹500

Under different range of light in combination with various filters available in VSC-5000. And UV light for studying characteristics security features by complete non- distractive technique. [17]

**Under different light source**

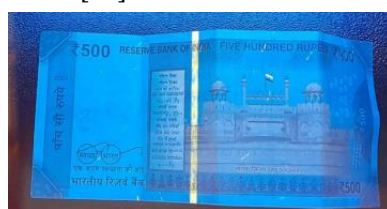
Different types of banknote are forged, but there are various features present inside the note which can be examined under different types of light source such as visible light, transmitted light, oblique light, reflected light and ultraviolet light.

**Light source-**

1. Visible light - it's wavelength range from 400-700nm. It usually lies between ultraviolet light and infrared light. In this range human beings can only see object in this range.
2. Transmitted light - Object are absorbed or scattered without deflecting the light
3. Oblique light - Details of an Object are shown when light source is placed at a low angle such as 45 degree.
4. Reflected light - Object are observed when light bounce back from a smooth surface at the same angle from which light is striking the surface.
5. Ultraviolet Visible light -its wavelength range from 100-400nm and light originates beyond violet visible light.

There are various type of security features are present such as see through registrar, latent image, Denominations Numeral, Mahatma Gandhi's portrait in scripted thread, promise clause of RBI, watermark Blank windows, Number panel, Ashoka pillar, Identification Mark, Bleed Lines, Omron Features, year of printing, Swachh Bharat logo etc.

Therefore by using these various type of light source several features which can be easily seen and possible to distinguish between the fake and real notes. [18]



It is the back side of 500 Rupee note under Ultraviolet light source which is showing different security features [19]

**Using Image processing**

Problem of counterfeit money is not new because this problem was found around 600BC in Greek city of Lydia. In this method image processing technique is use for detection of counterfeit Indian currency and for this examination new notes of 500-rupee and 2000-rupee note is considered.

There are some steps or algorithm for detection of Indian currency note as follows:

1. Acquisition of currency note using digital camera- with the help of digital camera image of notes is captured and it will use for acquire its features.
2. Pre-process the captured image- captured image is resize by using imresize function, after resize image there is important step there be chance of noise and such noise degrades the further processing task, and median filter is used to remove such noise.
3. Convert the image to grayscale- it is important to convert RGB color into grayscale image as it is carries only intensity information and it is easy to process.

4. Perform edge detection- It is a method used to finding boundaries of object within image can detect easily strong or weak edges of output.
5. Perform segmentation on the image and extract features-In this method image is classified into the sub region that is more useful and easier to analyze. [20]

### III. CONCLUSION

This study based on different analytical techniques in forensic examination of different denomination and these techniques are non-destructive and helpful in government agency. This review paper differentiating between genuine and fake currency

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