

RESEARCH ARTICLE

STUDY OF SECURITY FEATURES PRESENT IN NEPALI PASSPORT

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ARTICLE DETAILS

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ABSTRACT

Security features present on Nepali passport are examined with the help of Video Spectral Comparator. Mainly examination is carried out with application ultra-violet light, normal light, oblique light and transmitted light. We obtain different types of security features including fluorescence, ghost image, binding thread, optical fiber, punched number, barcode, micro-printing, watermark, emboss etc. The main aim of this work is to provide information about security features present in Nepali passport so that concern agencies as well as general public to distinguish between genuine and fake passport.

KEYWORDS

Security feature, Counterfeit, Light source, Non-destructive

1. INTRODUCTION

Passport is a very important travel document issued by government by which people can travel from one country to another. Many legal documents like paper currency, passport, bank cheque etc. are prepared with special security features. With development of technology and advancement in printing machines, now days many counterfeit and fake documents are prepared. So, it is very necessary to study security features present on passport since many fraud cases on passport are being increased daily.

Generally we can find three types of passport: ordinary passport, official passport and diplomatic passport. Some works had been done to study security features present in Indian passport. A studied about security features of Indian passport Video Spectral Comparator (VSC) and reported major security features as gothic/punched number, letter screen image (LSI), barcode, micro printing, binding thread, optical fiber, fluorescent ink, water mark, dicitus etc (Gupta et al., 2016). Also study about forgery in Indian passport and examination of security features present on it (Gupta et al., 2017).

But we became unable to find any work to examine security features present in Nepali passport. So, we decided to do this work. We have tried to reveal most of security features of Nepali passport as much as possible by using Video Spectral Comparator (VSC-6000 and VSC-8000).

2. WORKING PRINCIPLE

Electromagnetic waves are categorized according to their frequency ' f '. Electromagnetic waves with shorter wavelength and higher frequencies include ultraviolet light, X-rays and gamma rays. Electromagnetic waves with longer wavelength and lower frequencies include infrared light, microwaves and radio waves. Visible light makes just a small part of the full electromagnetic spectrum and light interacts with matter through many phenomenon like reflection, refraction, diffraction, absorption, emission, scattering, fluorescence, phosphorescence etc (White, 1934). In this work, security features are studied by using ultra-violet, normal, oblique and transmitted light.

Ultra-violet rays shows fluorescence effect when it falls on fluorescent materials. Fluorescence is photon emission processes which occur during molecular relaxation from electronic excited states. Fluorescence is short-lived with luminescence ending almost immediately. It takes place from singlet excited states (Bose et al., 2018). The lifetime of fluorophore in the absence of non-radiative processes is called the intrinsic or natural life time and is given by (Lakowicz, 1999)

$$\tau_n = 1/\Gamma \quad (1)$$

In this equation, ' τ_n ' is natural life time and ' Γ ' is emissive rate of fluorophore. In case of normal, oblique and transmitted light, we do not obtain any special effect but they help to visualize hidden security features more clearly.

3. MATERIALS AND METHOD

We have used Nepali passport issued by Government of Nepali as our study material which consists of 32 pages in total. Security features of every pages of passport are studied by using Video Spectral Comparator. Examination is done with the application of ultra-violet rays, normal light, oblique light and transmitted light.

3.1 Video Spectral Comparator (VSC)

Video Spectral Comparator (VSC) is very useful tool in document examination which allows an examiner to analyze ink, reveal alteration in document, visualize hidden security features in currency passport etc., determine chronological of crossing strokes enhance handwriting on charred documents etc. (Giri et al., 2021; Gupta et al., 2016, Gupta et al., 2017; Giri et al., 2022). that uses different light sources for examination of document. At first power of VSC is switched on and appropriate setting is done before working. The position of document to be checked is adjusted by viewing on the monitor. After placing the passport, different suitable light is passed. Once the required result is obtained, the image is saved.

4. RESULTS AND DISCUSSION

A careful and systematic examination is required to find security features of any document and those security features provide protection against

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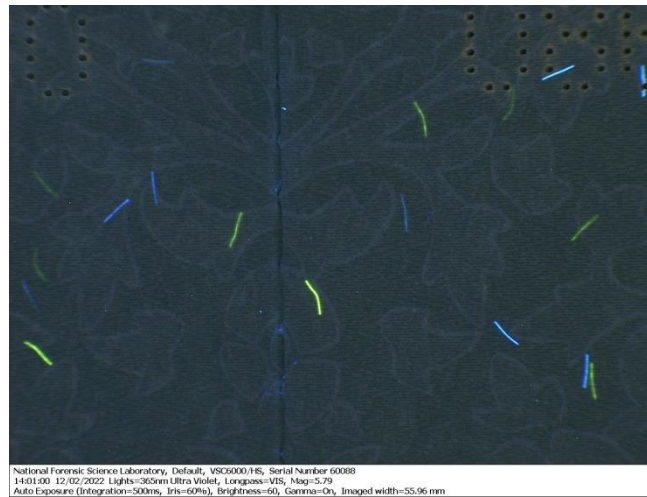


Figure 7: Optical fibre present in passport when examined under UV light

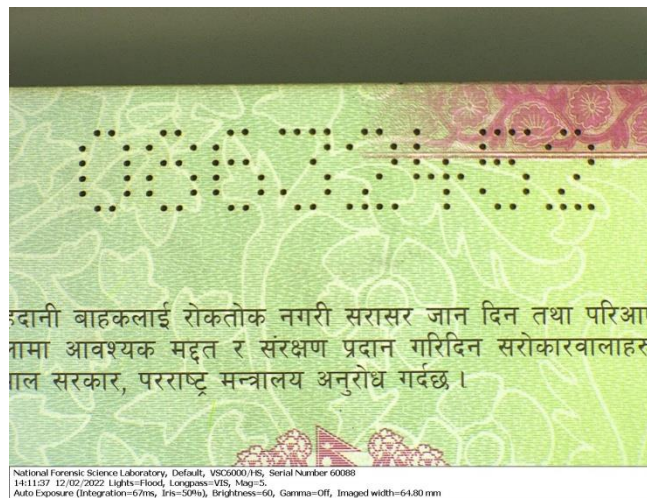


Figure 8: Punched number present in Nepali passport

4.2.2 Micro Printing

Micro lettering or micro text or micro printing refers to very minute inscription on passport which can be well observed under magnifying lens. We can find micro text in different parts of passport where 'GOVERNMENT OF NEPAL' or 'NEPALESE PASSPORT' or 'NEPAL' is written. Micro text is one of an anti-counterfeiting measure present in passport because methods of photocopy, image scanning etc. produce dotted or solid lines. Under high magnification only, it is observable whereas without magnification, letters or texts appear as a line. Passport shows high quality of micro text.

4.2.3 Barcode

Barcode is present on lower part of last page of passport which is machine readable and representation of data. It is observable by our naked eye and

is generally made from name and passport number of passport holder.

4.3 Examination Under Transmitted Light

Every page of passport is tested under transmitted light. In daily life, it can be done by holding a passport between light source and eye. Watermark is examined under transmitted light.

4.3.1 Water Mark

Three-dimensional figure of national bird Himalayan monal (Danphe) is found as watermark as shown in figure 11 in all pages of Nepali passport. Such water mark is produced by varying distribution of fibers in the particular space of passport. Generally, it is hard to observe water mark in normal light.



Figure 9: Micro-text present in Nepali passport under high magnification



Figure 10: Barcode present in Nepali passport

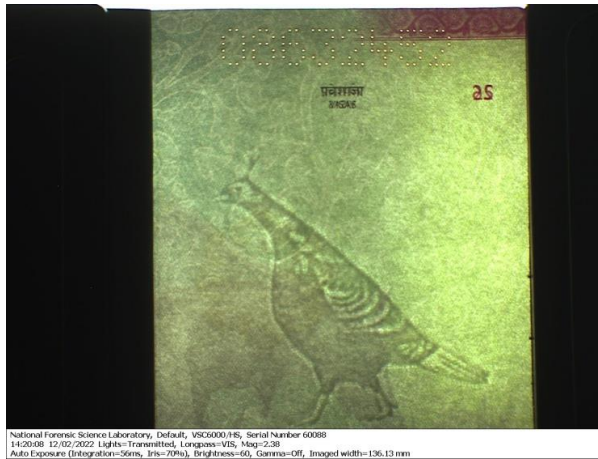


Figure 11: Water mark when examined under transmitted light



Figure 12: when viewed under normal light



Figure 13: Emboss when viewed under high magnification and oblique light

4.4 Examination Under Oblique Light

During this examination, we pass light at low angle. In case of Indian passport, very important feature Dicuts is reported under oblique light but we failed to find it in Nepali passport (Gupta et al., 2016). Very important feature emboss is found in back side of first cover page under oblique light examination.

4.4.1 Emboss

Embossing is the process of creating raised images using specific tool which can be felt by touching and by observing under oblique light. In Nepali passport, a circle carrying a flower like structure in its center is embossed as shown in figure 13. This is also one of the important security features present in many documents like academic certificate, passport, currency etc.

5. CONCLUSION

We examined all pages of passport under different light sources with the help of Video Spectral Comparator (VSC-6000 and VSC-8000). We find security features like florescence, ghost image, optical fiber, binding thread, punched number, barcode, micro-printing, watermark, emboss etc. after examination. From this study, we found Nepali passport having multiple security features.

REFERENCES

Bose, A., Thomas, I., Kavitha, G., Abram, E., 2018. Fluorescence spectroscopy and its application: A Review. *International Journal of*

Advances in Pharmaceutical Analysis, 8, Pp. 1-8. <https://doi.org/10.7439/ijapa>

Giri, R., Bhattarai, P., Chimouriya, S.P., Ghimire, B.R., 2021. Examination of Security Features in Nepali Currency of Denomination Rs. 500 and Rs. 1000 Using Video Spectral Comparator-6000. *Journal of Nepal Physical Society*, 7 (4), Pp. 36-42. <https://doi.org/10.3126/jnphysoc.v7i4.42929>

Giri, R., Chimouriya, S.P., Ghimire, B.R., 2022. Study of Chronological Order in Intersecting Printed and Pen Strokes with the Help of Chromaticity Diagram. *Acta Scientifica Malaysia (ASM)*, 6 (2), Pp. 38-42. <http://doi.org/10.26480/asm.02.2022.38.42>

Gupta, R.R., Ravi, N., 2017. Passport Forgery and Forensic Examination of Indian Passport. *Journal of Forensic Science and Criminal Investigation*, 5 (1), Pp. 1-5. <http://dx.doi.org/10.19080/JFSCI.2017.05.555658>

Gupta, S., Gupta, K., Singla, A., 2016. Advancement in Indian Passport- A Forensic Perspective. *International Research Journal of Engineering and Technology*, 3 (11), Pp. 585-591.

Lakowicz, J.R., 1999. *Principles of Fluorescence Spectroscopy*, Springer Science +Business Media, LLC, Second Edition.

White, H.E., 1934. *Introduction to Atomic Spectra*. Mc Graw-Hill Book Company.

