Task Number: 2017-02

Article Title: Contactless Visualization of Latent Fingerprints on Nonporous Curved Surfaces of Circular Cross Section

Origin: Journal of Forensic Sciences

Date Published: July 2016

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Article's Subject Matter:

The article describes a relatively simple photographic technique used to record the visualization of friction ridge detail on the cross sectional plane of a curved non-porous surface. The materials utilized in the technique involve a simple plane mirror, a high intensity white light source and a Digital Single Lens Reflex (DSLR) camera as the recording imaging system. The intention of the method is to provide a contactless and less intrusive means of visualizing and recording friction ridge detail on curved surfaces. Furthermore, other traditional photographic processes such as specular lighting techniques have a propensity to produce glare band artifacts which obfuscates ridge detail. The method is based on general theories of optical reflection associated to specular and diffused light specifically calibrated for curved surfaces rather than planar surfaces. The validation of the study was conducted using Spectral Image Validation and Verification (SIVV) system which uses a combination of the friction ridges, furrows and the signal to noise ratio as the represented peak strength to determine the presence of visible friction ridge detail.

Key Points in Article:

- Proposes a photographic technique to capture digital images of friction ridge detail on curved surfaces
- Provides a repeatable system of gathering friction ridge detail from curved surfaces without altering the evidence or introducing artifacts
- Describes previous research that unsuccessfully attempted to record friction ridge detail on expended cartridges using Reflected Ultra Violet Imaging System and other research that focused on recording friction ridge detail on planar surfaces
- Illustrates and explains the theoretical framework of optical reflectance and the different light characteristics between specular (background surface) and diffused (fingerprint residue) light

- Materials in the experiment include a High-intensity white light from a Forensic Alternative Light Source Kit FAL (Sirchie®, Yongsville, USA), a 5cm x 5cm ground glass diffuser (Edmund Optics, Singapore), a plane mirror (flat section of aluminum sheet sprayed with a thin layer of K-Line) and a Canon EOS 60D digital SLR camera with a Canon EFS 60mm *f*/2.8 Macro lens mounted on a tripod

- Set up involved depositing a natural fingermark by pressing the finger on the substrate with light pressure on a plastic cylinder, a red pen cap and a fired bullet casing. A ground glass diffuser was positioned in front of the light source to spread the light evenly across the plane mirror. The plane mirror (aluminum sheet) was sprayed with K-Line in order to improve the quality of the diffused light.

- Validation of the experiment was performed using Spectral Image Validation and Verification (SIVV). The SIVV was used to analyze the captured images to confirm the presence of level one friction ridge detail

- The proposed contactless photograph technique was able to reveal and capture level one friction ridge detail on curved surfaces using different light sources and a plane mirrors

Fallacies and or Issues:

- The experiment is limited to only a small sample of various curved surfaces and does not take into account other potentially exacerbating conditions such as the reflectiveness of the substrate and diffraction of light from curved surfaces

Conclusions:

Curved surfaces often present challenging photography conditions. The proposed contactless visualization of fingerprint on curved surfaces as presented in this article provides another potential photographic technique that may assist in the procurement of fingerprint impressions on challenging surfaces.