F28 Infrared and Ultraviolet Photography for Individual Identification Using Minor Skin Imperfections

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After attending this presentation, attendees will better understand the use of "smart chips" incorporated into United States passports for rapid and better biometric identification of individuals at the borders. In addition, attendees will learn whether or not digital Ultraviolet (UV) and Infrared (IR) photography can result in enhancing subtle facial details not yet being utilized for identification.

This presentation will impact the forensic science community by suggesting methods of increasing border security measures, as there are presently important decisions being made regarding immigration into this country.

The United States requires biometric passports for visitors, especially those from politically sensitive areas, which require fingerprints, photographs, and pertinent identification information.

This study hypothesized that detailed facial information can be captured by using UV and IR photography and incorporated into digital photographs. Experiments were conducted with a digital and a modified UV/IR camera.

Photographs were taken of subjects under different lighting conditions with the goal of distinguishing facial characteristics. Sunlight, studio lighting, UV penlight, and black light sources were all utilized. In addition, subject characteristics ranged in age, skin type, and use of makeup. In addition to a Digital Single-Lens Reflex (DSLR) camera to take color photographs, five different filters (one UV and four IR) were utilized with the UV/IR camera. Black light IR and UV images were converted into black-and-white photographs. Sunlight experiments were conducted outside on a cloudless June day, at approximately 2:00 p.m. The camera settings were ISO 100, f/13, and shutter speed of 1/350. A white background was used with the UV penlight at a distance of 4ft from the subject's face and the camera manually set for ISO 2000, f/4, and shutter speed of 1/30. Black light photography was conducted in a dark room with the camera settings of f3.5, ISO 400, and shutter speed of 1/25. The studio lighting was conducted with a Calumet® 950-watt light at 1/8 power with an umbrella and white background. Camera settings were f/11, ISO 160, and 1/80 shutter speed. A female subject used mud and silicone-based makeup to see if the UV and IR lighting would show any differences between texture of natural skin and the use of makeup. Black light images revealed skin damage on the subject's face that could have potential identification value. The post-production images were adjusted in Adobe® Photoshop® and brightness compensated for the density of the filter to create the black-and-white photographs. The results were shown to passport photographers, police, and other individuals to see if they detected any differences in skin tone, skin detail, and any special facial characteristics that can be seen in one image compared to another to aid in facial mapping for identification.

Photographers chose the regular color image as showing the best facial details, images taken with a UV filter were second best, and the use of IR filters did not show any improvements in image detail. Laypeople also chose color images as having the most detail and the use of a UV filter, second best. They were also in agreement with the value of using studio lighting. Therefore, photography in conjunction with facial mapping will play a significant role in maintaining passport security and aid in human identification. Using studio lighting for passport photographs will improve their quality and value for screening at points of entry. Incorporating biometric data (fingerprints, iris scans) in a passport chip would further strengthen passport security measures and enhance methods for human identification.

Forensic Photography, Biometrics, Passport Images

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