## C38 An Investigation of Distinctiveness of Skin Texture for Forensic Applications

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**Learning Overview:** After attending this presentation, attendees will better understand the distinctiveness of skin texture for criminal and victim identification based on digital images.

**Impact on the Forensic Science Community:** This presentation will impact the forensic science community by serving as a key aspect of personal identification, as it can provide a new way to support the identification of suspects and victims whose faces and tattoos are not in the images (e.g., child sexual abuse or terrorist images).

Skin texture suggested for personal identification a decade ago has been neglected by the biometric community for a long time because of a low distinctiveness and unobvious features, similar to other soft biometrics and different from other hard skin biometrics, such as fingerprints and palm prints. However, in some cases, such as identifying terrorists, rioters, or pedophiles in images, where faces are masked or blurred and other traits such as tattoos or skin marks are not visible, skin texture may remain the only possible choice. Blood vessels, which are considered a hard biometric trait, have been suggested to tackle these problems. Nevertheless, successful visualization of blood vessels hidden in color images and consequently identification performance highly depends on image quality. Visualized blood vessels can be partially evident or not evident in low-resolution images, whereas skin texture, such as the forearm or thigh skin, are still visible in low-resolution images and may be useful clues for forensic applications.

A skin texture identification algorithm, which includes a positive sample generation scheme, dynamic and directional grids, large feature set generation scheme, and a classification using partial least squares regression is proposed to explore the distinguishing trait of low-resolution skin texture. The proposed algorithm is fully automatic and does not require any manual or time-consuming human supervision. To evaluate the algorithm, the image databases were collected in a laboratory environment and the internet to simulate more realistic scenarios. The databases contain more than 6,300 inner forearm and thigh skin images, which have a large pose, viewpoint, and illumination variations.

In the experiments, the proposed algorithm and the state-of-the-art texture recognition methods were evaluated. Moreover, the traits of skin texture and blood vessels, extracted from color and infrared image, were compared. First, the experimental results revealed that the proposed algorithm achieves significantly higher performance than the state-of-the-art texture recognition methods. Second, the comparison between skin texture and blood vessel distinctiveness demonstrated a superior performance of skin texture, revealing its potential usage in forensic applications.

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**Skin Texture, Criminal and Victim Identification, Biometrics**