



Science and Technology

TRANSPORTATION SECURITY & EXPLOSIVES CHARACTERIZATION

FACIAL HUE DETECTION SYSTEM

METHOD AND SYSTEM FOR ESTABLISHING DETECTION METRICS AND CALIBRATING FACIAL IMAGING EQUIPMENT.

Traditional methods for scanning and analyzing various skin tones can affect biometric system performance. Lighting conditions around the biometric camera can also impact how a biometric system perceives skin tone, further exasperating performance issues. As reliance on biometric data increases, detection technologies need to be accurate and fair, designed with as little bias as possible, and consistent across people with different skin tones.

Researchers at the Department of Homeland Security's Science and Technology Directorate invented the Facial Hue Detection System (FHDS) to address these challenges and provide an accurate method for facial skin tone standardization and measurements. FHDS analyzes facial images and creates an accurate skin tone swatch. Biometric processing systems then use the swatch to calibrate biometric cameras and produce color-corrected images that accurately capture skin tone.

KEY BENEFITS

- + Increases skin tone measurement accuracy
- + Improves set-up time of biometric capture systems
- + Enables fair and equitable systems for all skin tones

STAGE OF DEVELOPMENT

Prototype

PARTNERSHIP SOUGHT

License

INVENTORS

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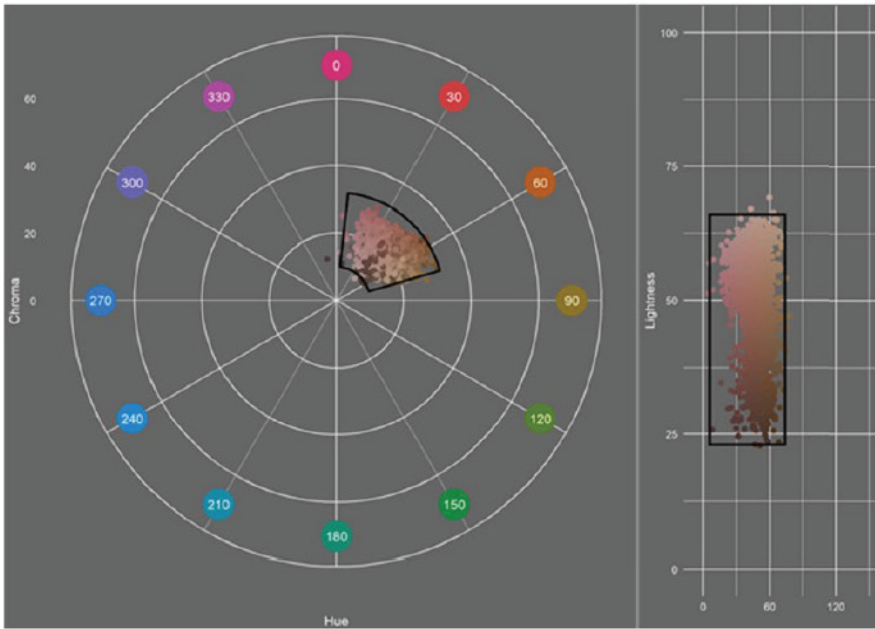
DHS COMPONENT

Science & Technology Directorate

THE TECHNOLOGY

FHDS consists of a process flow and system for biometric system skin tone calibration. The process measures skin tone across a facial data set and expresses the facial hues detected in image pixels along hue, chromaticity, and lightness (HCL) coordinates. The system removes outlier skin pixels with light reflection adjustments to calculate a normal range of hue, chromaticity, and luminance values. The values create a set of accurate skin tones that correspond to the tones observed in the image.

These coordinates provide an optimized quantification of facial image pixels and a spectrally printed calibration patch. FHDS uses the calibration patch to adjust camera settings such as the focus, white balance, sensitivity, and shutter speed to accurately reproduce human skin tones regardless of the lighting available when additional images are captured.



A range of HCL for various skin tones plotted on a polar graph.

APPLICATIONS

The technology has several potential end users:

- + Border checkpoints
- + Event or venue security
- + Transportation security
- + Testing or registration centers

PATENT INFORMATION

US Patent number 12,067,750



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TECHNOLOGY SOLUTION

FOR MORE INFORMATION ABOUT THE DHS TECHNOLOGY TRANSFER & COMMERCIALIZATION BRANCH:

<https://www.dhs.gov/science-and-technology/technology-transfer-program>

