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# Quantifying optical properties of skin

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## OTHER INFORMATION

### KEYWORDS

Skin optical properties measurement, Non-invasive dermatological diagnostics, Monte Carlo simulation in dermatology, Spatial frequency domain imaging, Skin pigmentation correction, Melanin quantification in skin, Dermatological imaging techniques, Skin tone-adaptive optical analysis, Tissue chromophore concentration estimation, Iterative skin optical property modeling

### CATEGORIZED AS

- » Optics and Photonics
  - » All Optics and Photonics
- » Imaging

## BRIEF DESCRIPTION

The disclosed methods offer a robust approach to accurately quantify skin optical properties across different skin tones, facilitating improved diagnosis, monitoring, and treatment in dermatology.

## SUGGESTED USES

- Dermatology Diagnosis: Accurate quantification of skin optical properties can aid in the diagnosis of various dermatological conditions, including skin cancer, ulcers, and burns. The invention's ability to quantify tissue properties of skin lesions can be particularly valuable in this regard.
- Monitoring Skin Health: The invention enables non-invasive measurement of skin optical properties, allowing for the monitoring of changes in tissue properties over time. This can be useful for tracking the progression of skin conditions or assessing the efficacy of treatment regimens.
- Treatment Guidance: By providing accurate quantification of tissue properties, the invention can help guide treatment decisions in dermatology. Clinicians can use this information to tailor treatment plans based on individual skin characteristics and optimize therapeutic outcomes.
- Research and Development: The invention's ability to quantify skin optical properties across a wide range of skin tones makes it valuable for research purposes. It can be used to study the effects of various factors, such as age, ethnicity, and environmental exposure, on skin health and function.
- Cosmetic Industry: The invention may find applications in the cosmetic industry for assessing the efficacy of skincare products or cosmetic procedures. By quantifying changes in skin optical properties before and after treatment, the invention can provide objective measures of product performance.
- Medical Device Development: The invention's techniques and methodologies can be incorporated into medical devices for non-invasive assessment of skin health. This could lead to the development of novel diagnostic tools or monitoring devices for use in clinical settings.
- Overall, the invention has broad potential applications in dermatology, skincare, research, and medical device development, offering valuable insights into skin health and function across diverse populations.

## FEATURES/BENEFITS

- Accurate Quantification: The invention provides methods for accurately quantifying the optical properties of skin, including the concentration of major chromophores such as melanin, across a wide range of skin tones.
- Non-Invasive Measurement: The techniques employed by the invention are non-invasive, allowing for the measurement of skin optical properties in vivo without the need for tissue biopsy or invasive procedures.
- Iterative Approach: The invention utilizes an iterative, layered approach that adjusts parameters to improve the accuracy of measurements, particularly in individuals with darker skin tones where traditional techniques may be less effective.
- Layered Monte Carlo Model: By using a layered Monte Carlo model, the invention can simulate and analyze the propagation of light through multiple layers of skin, enabling more accurate quantification of tissue properties.
- Wide Range of Applications: The invention has diverse applications in dermatology, skincare, research, and medical device development, offering valuable insights into skin health and function.
- Improved Diagnosis: Accurate quantification of skin optical properties can improve the diagnosis of various dermatological conditions, including skin cancer, ulcers, and burns, leading to more effective treatment strategies.
- Personalized Treatment: By providing detailed information about individual skin characteristics, the invention can help clinicians tailor treatment plans to the specific needs of each patient, optimizing therapeutic outcomes.
- Monitoring and Follow-Up: The non-invasive nature of the invention allows for the monitoring of changes in skin health over time, enabling clinicians to track disease progression or treatment response and make timely adjustments as needed.
- Research Advancement: The invention's ability to quantify skin optical properties across diverse populations can advance research in dermatology and skincare, leading to a better understanding of skin health and the development of new therapeutic approaches.
- Product Development: In the cosmetic industry, the invention can be used to assess the efficacy of skincare products or cosmetic procedures, providing objective measures of product performance and guiding product development efforts.

» Medical

» **Medical**

» Devices

» Diagnostics

» Disease: Cancer

» Disease:  
Dermatology

» Imaging

» Other

» Research Tools

» Screening

» **Sensors &  
Instrumentation**

» Medical

» Other

» Scientific/Research

## RELATED CASES

2021-790-0

·Overall, the features and benefits of the invention make it a valuable tool for advancing our understanding of skin biology, improving clinical care, and driving innovation in dermatology and skincare.

## TECHNOLOGY DESCRIPTION

Accurate quantification of skin optical properties is crucial in dermatology for diagnosis, monitoring, and treatment. Non-invasive technologies are preferred for in vivo measurement of skin optical properties. However, existing techniques can be less accurate for individuals with higher levels of skin pigmentation due to the confounding effects of melanin in the epidermis.

The disclosure provides iterative, layered methods for accurately quantifying the optical properties of skin across various skin tones. It utilizes spatial frequency domain imaging with a layered Monte Carlo model to quantify epidermal melanin concentration. These methods are particularly effective for individuals with darker skin tones.

## STATE OF DEVELOPMENT

Prototype developed

## PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Published Application	20230277120	09/07/2023	2021-790

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