Personal Devices for Prevention and Preliminary Diagnostic of Skin Cancer Based on Local Ultraviolet Reflectivity and Spectrum Analysis of Skin

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Every year, several million skin lesions are diagnosed as cancerous in the US. In many cases, this disease is correlated to an excessive exposure to harmful ultraviolet radiation. Application of sunscreen is a very effective way to shield from harmful radiation. Currently there are no conventional/affordable devices which provide quantified information on UV intensity and efficiency of sunscreen protection. Such devices would be most useful to visually impaired people, who cannot decide whether they need sunscreen protection at a particular time and which parts of their body are missing sunscreen. A compact and affordable device measuring the UV intensity and the efficiency of skin protection in real-time was built. It was used to study the sunscreen protection for different skin types, its degradation over time, and UV reflectivity properties of skin. Among the first symptoms of skin cancer is skin discoloration. While most people can regularly inspect their bodies for suspicious abnormalities, blind people cannot detect color changes on their skin. A device that analyzes the visible spectrum of local skin reflection and generates a warning for any suspicious abnormalities was designed and constructed. Even for subtle skin discoloration, the device proved to be sufficiently sensitive to detect cancerous areas. All results are represented in real-time in three independent ways: visual, acoustic, and haptic, making the device suitable for people with visual disabilities. An attempt was made to construct a third device that identifies cancerous lesions based on the differences of skin thermal conductivity. The set of affordable devices may aid sunscreen users to reduce harmful UV exposure and detect the first symptoms of skin cancer.