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POSSIBILITIES OF APPLICATION OF 3D-SCANNING IN DETERMINING OF DAMAGED AREAS OF SKIN

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The work is devoted to the use of spatial scanning in the diagnosis of skin diseases. It is proposed to use the 3D scanning method to determine the surface area of the affected area on the skin with generalized dermatitis. The principles of operation of modern equipment for 3D scanning are considered. The basic principles of 3D scanning are analyzed to obtain spatial models of the human body or its individual parts.

Introduction Today it is known that skin diagnostics by its visual state is carried out using conventional dermoscopy and, in some cases, luminescent, using surface visualization under illumination in the ultraviolet range [1, 2].

Dermatoscopy is a non-contact diagnostic method that can reliably determine the nature of skin formation. The peculiarity of this method is that it allows you to establish the degree of danger of any neoplasm at an early stage. Using dermatoscopy, a specialist is able to draw a conclusion about the degree of safety of a skin formation based on data on its shape and color. Today, thanks to dermatoscopy, it is possible to establish the fact of the presence of melanoma and other malignant neoplasms at an early stage.

In modern dermatology, luminescent diagnostics are also used [3, 4]. This method is widely used not only in the diagnosis of human skin, but also in veterinary medicine. In the process of their life, some microorganisms secrete substances that are capable of fluorescing under the influence of ultraviolet radiation. A luminescent study is carried out using devices the prototype of which is a Wood lamp emitting in the long-wave ultraviolet range (365 nm) onto the surface of the organ under study and recording the resulting optical image. With Wood's lamp, many skin lesions can be detected, such as fungal infections, lichen, or some bacterial infections. The device can detect the presence of certain amino acids and skin proteins, for example, hypomelanotic and depigmented spots give a bright glow, which is especially valuable in the diagnosis of vitiligo in people with fair skin. Also, this method allows rapid diagnostics of various skin conditions, such as fat, dryness or dehydration, to determine the type of skin. Wood's lamp is also widely used in chemical peels, since salicylic acid gives a green glow when exposed to ultraviolet light, and evaluate the uniformity of applying the peeling composition to the skin [3, 4]. In this case, the color characteristics of the image are evaluated [5, 6].

But with large areas of skin lesions, it is necessary to evaluate the exact surface area of pathologically altered skin integuments at an evidence level [7, 8]. Given that the surface shape of the body is quite complex and individual, this area is considered approximately, given the proportions of the surface of different organs. And it can be estimated conclusively with the help of 3D scanning, a method that allows you to get a spatial model of the surface of the studied region [9, 10]. The device creates a cloud of points connected by lines that form the geometry of the object from many intersecting planes. 3D scanning of objects helps to prepare the necessary model for prototyping [11, 12] and phantom objects [13, 14], which is useful, for example, for planning surgical operations [15-17].

The aim of the work is to study the possibilities of applying the three-dimensional scanning method to accurately determine the area of problem areas of the skin with generalized dermatitis.

The results of the study. The composition of devices for spatial scanning of surfaces includes several cameras and a projection unit. During scanning, the image resulting from cameras in different planes is combined and digitized. The result is an accurate 3D copy of the area corresponding to the original in configuration, size and proportion. When choosing a 3D scanner, it is important to take into account parameters such as the scanning area, the scanning duration of the working area, the accuracy of surface reproduction and resolution.

Experimental studies were carried out on 3D scanning devices - a desktop one with the ability to scan objects with linear dimensions up to 300 mm 3D Scanner Matter and Form MFS1V1, and 3D Scanner XYZprinting 3D handheld 3Dscanner 2.0. with the ability to manually scan the surfaces of individual parts and the entire human body. Considering the large volumes of processed data for stable scanning procedures, computing systems are subject to rather high requirements - microprocessors intel i5 / i7 no less than the 4th generation, RAM 16 MB and discrete graphics cards supporting the latest Open GL standards.

During the study, it was found that the accuracy of the scan depends on the specific device, on the parameters of illumination and surface characteristics. The error for 3D scanning of objects with a surface area of 100 cm2 or more is 1 mm. 3D scanning of large objects can be implemented by batch processing of photographs of the object from all sides.

To date, the area of affected skin areas has been estimated by approximately a few approximate techniques [7]. Most often, such approaches are used to determine surface area for burns. In these cases, the value of the area of the affected body surface is given a decisive role in the planning of subsequent treatment.

The methods for determining the area of the burn for a fairly long time have not changed. In adults, the rule of nines is applied when the anatomical areas of the body are a multiple of 9% and total 99%, and 1% is transferred to the genitals. In addition, it should be noted that in children, the area of the anatomical regions with respect to the total surface area of the body varies with age.

In addition, both in adults and in children, regardless of age, the palm rule is widely used, when the surface of the palm of the burned is taken as 1% of the total

body area. This method is used for local, scattered, mosaic lesions or in addition to the rule of nines.

Conclusion. When choosing a scanning method, it is worth paying attention to the parameters of the 3D scanner, namely the accuracy, resolution, working area and duration of scanning the working area. The use of spatial scanning allows you to get a computer model of the body surface, built on the basis of triangulation, and, knowing the scale factors, to estimate the area of the scanned area by the total area of the surface elements. The prospect of work is the development of segmentation algorithms for surface fragments corresponding to the affected areas.

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