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DESCRIPTION RU2239860C1

A METHOD FOR CREATING A HOLOGRAM CONTAINING NON-VISUALIZED PHYSIOLOGICALLY SIGNIFICANT INFORMATION

[0001]

The invention relates to the field of optics and is intended to create a hologram containing non-visualized physiologically significant information that can be used in medicine.

[0002]

A known method of creating a hologram includes dividing a laser beam into a reference and

an object branch using a beam-splitting cube so that the difference in the geometric path length between the reference and object branches does not exceed the coherence length of the laser radiation source, directing the reference branch of the beam reflected from a mirror surface to a lens expander that forms an unmodulated spherical wave front, illuminating a photographic plate with the resulting light beam at an angle of 25° - 50° ; directing the object branch of the beam reflected from another mirror surface to a lens expander that forms a spherical wave front, illuminating with the resulting light beam an object located in such a way that the light beam reflected from its surface falls normally with a deviation of no more than 35° on the same side of the photographic plate; obtaining a transmission hologram by developing, fixing and drying with bleaching a photographic plate, obtaining a reflection hologram by recording a hologram from a photographic plate containing a transmission hologram and used as the object of the hologram, onto a second photographic plate that does not contain a hologram, wherein the second photographic plate is placed in the plane of focus of the copied real holographic image, illuminated from the opposite side by an unmodulated spherical wave front obtained on the basis of the reference branch of a laser beam at an angle of 45° , processed according to the method indicated above without bleaching (1).

[0003]

The disadvantage of the known method is that it does not allow the introduction of non-visualized physiologically significant information into the hologram.

[0004]

The problem that the invention is aimed at solving is the creation of a hologram containing non-visualized physiologically significant information.

[0005]

To solve the stated problem, when recording a hologram, a carrier of non-visualized physiologically significant information is used as a hologram object, which is in a state of active or passive information transmission, and/or as a light beam diffuser located at the exit point of the lens expander of the spherical wave front obtained on the basis of the object branch of the laser beam.

[0006]

Description of the essence of the invention

[0007]

The method for creating a hologram containing non-visualized physiologically significant information includes dividing a laser beam 1 using a beam-splitting cube 2 (Fig. 1a) into a reference 3 and an object 4 branch, so that the difference in the geometric path length between the reference and object branches does not exceed the coherence length of the laser radiation source, directing the laser beam reflected from the mirror surface 5 of the reference branch 3 to a lens expander 6, which forms an unmodulated spherical wave front, illuminating a photographic plate 7 at an angle of 25° - 50° ; directing the beam of the laser reflected from the mirror surface 8 of the object branch 4 to the lens expander 9, which forms a spherical wave front, illuminating with it through the light beam diffuser 10, which contains non-visualized physiologically significant information recorded on it, the object 11, located in such a way that the light beam reflected from its surface falls along the normal with a deviation of no more than 35° on the same side of the photographic plate 7.

As a result of the interference of two light waves - reference 3 and object 4 - a diffraction pattern is formed on the photographic plate 7 in the form of hidden energy centers on the photosensitive layer.

Standard chemical processing of the photographic plate is carried out, including development, fixation and drying with bleaching (2).

To record a hologram, photographic plates containing silver halide crystals measuring 0.005–0.09 μm are used.

After the specified processing, the photographic plate contains a translucent hologram.

To obtain a reflection hologram, the hologram is copied from the photographic plate 7, containing a transmission hologram and used as the object of the hologram 11, onto a second photographic plate 8, which does not contain a hologram, wherein the second photographic plate 8 is placed in the plane of focus of the copied real holographic image 12, illuminated from the opposite side by an unmodulated spherical wave front obtained on the basis of the reference branch 3 of the laser beam 1 at an angle of 45° (Fig. 1b), and chemical processing of the photographic plate is carried out according to the method indicated above without bleaching.

[0008]

To introduce non-visualized physiologically significant information into a transmission hologram, in addition to the light beam diffuser 10 containing non-visualized physiologically significant information, an object 11 may be used that contains non-visualized physiologically significant information and/or is in a state of activating functional reserves that facilitates the active transmission of non-visualized physiologically significant information.

[0009]

The holographic image 12 is reproduced and presented for recognition in the following form.

[0010]

Option 1.

Photographic plate 7 with a translucent hologram is illuminated from above at an angle of 25° - 50° by a directed stream of polychromatic light from the side opposite the test subject 13 (Fig. 2a).

The subject 13 is placed at the point where the actual holographic image 12 is focused.

The subject cannot see the holographic image 12 in this position (Fig. 2a).

[0011]

Option 2.

Photographic plate 7 with a reflective hologram is illuminated from above at an angle of 25° - 50° by a directed stream of polychromatic light from the same side on which the subject is located (Fig. 2b).

Subject 13 can see holographic image 12 (Fig. 2b).

[0012]

Option 3.

The holographic image from the translucent hologram is reproduced in the focus of the digital video camera 14 (Fig. 3). To do this, photographic plate 7 is installed in mount 15 in front of digital camera 14 at a distance of 10 mm from the lens. Using a point source of polychromatic light 16, a white background (screen) 17, located at a distance of 30 cm from the lens, is illuminated with a directed light flux at an angle of 25-50°. The holographic image (white background with an introduced diffraction component), reconstructed using a stream of light reflected from the screen, is recorded on a digital video camera in BMP format (without compression). The diffraction background is recorded as the received information.

[0013]

Recognition of non-visualized physiologically significant information on a hologram.

[0014]

Recognition is carried out in one of the following ways

[0015]

Method 1.

The subject is alternately presented with a holographic image invisible to him, reproduced from a transmission hologram according to variant 1 (Fig. 2a), containing (experimental hologram) and not containing (control hologram) non-visualized physiologically significant information.

At the moment of presentation of holograms, physiologically significant biophysical parameters of a person are measured.

For example, electroencephalogram characteristics or finger glow parameters in video recording mode, obtained using computer gas discharge visualization, can be used as physiologically significant biophysical parameters. If there are significant differences in the body's reactions between the control and experimental holograms, a conclusion is made about the presence of non-visualized physiologically significant information in the hologram.

[0016]

Method 2.

The subject is presented with a holographic image (reproduction option 2) that is visible to him, obtained on the basis of reflection holograms, one of which contains (experimental), the other does not contain (control) non-visualized physiologically significant information (Fig. 2b). During the presentation of the holographic image, physiologically significant biophysical parameters of the body are determined in the subject, a comparative statistical analysis is carried out, and if there are differences in the body's reactions between the control and experimental holograms, a conclusion is made about the presence of non-visualized physiologically significant information in the hologram.

[0017]

Method 3.

The holographic image reproduced from the transmission hologram according to variant 3 is captured on a digital video camera, the contrast of the diffraction components is enhanced using computer programs, for example, PhotoShop, the graphic image of the hologram is converted into a digital matrix containing information about the color components and their

intensity, a comparative statistical analysis of the values of the elements of the numerical matrices of the holograms with and without the presence of non-visualized physiologically significant information (mean values, dispersions, Parsons correlation coefficient, covariance of the values of the digital matrices) is carried out. If significant differences are present, a conclusion is made about the presence of non-visualized physiologically significant information in the hologram.

[0018]

The following may be used as a carrier of non-visualized physiologically significant information in the claimed method:

[0019]

1) crystalline or liquid structures (glucose solution, crystalline silicon) carrying non-visualized physiologically significant information (recording of information on these media can, in particular, be carried out using the method and device described in Russian patent No. 2163491 (3));

[0020]

2) objects at the moment of phase transitions when the state of aggregation changes, for example, in the "ice-water" system;

[0021]

3) a biosystem as an object of a hologram, which is in a state of activation of functional reserves, facilitating the active transmission of non-visualized physiologically significant information.

[0022]

Theoretical justification for the possibility of recording non-visualized physiologically significant information, which is ultra-weak energy fields, on holographic media.

[0023]

When forming a topographic interference pattern, the distribution in the plane of photographic plate 7 depends on many factors.

It can be said with confidence that any even the smallest amplitude or phase effect on the object wave is reflected in a change in the structure of the interference pattern.

The sensitivity of holographic systems to any changes in the subject field is so enormous that the ratios between the main and additional modulations can exceed several orders of magnitude.

[0024]

Having assumed the presence of ultra-weak energy fields in biologically active objects, it is possible to assume the introduction of additional energy modulation into the subject branch

of the laser beam using one of the carriers of non-visualized physiologically significant information, used as a scatterer 10, which will affect the distribution of the interference pattern and, consequently, the structure of the hologram.

[0025]

List of drawing figures and other materials

[0026]

Fig.1a.

Scheme for obtaining a transmission hologram containing non-visualized physiologically significant information.

[0027]

Fig.1b.

Scheme for obtaining a reflective hologram containing non-visualized physiologically significant information.

[0028]

Fig.2a.

A scheme for reproducing a holographic image invisible to the test subject (option 1) from a translucent hologram for recognizing non-visualized physiologically significant information in it.

[0029]

Fig.2b.

Scheme for reproducing (option 2) a holographic image visible to the test subject from a reflection hologram for recognizing non-visualized physiologically significant information in it.

[0030]

Fig.3.

Scheme for reproducing (option 3) and recording a holographic image from a translucent hologram on a digital video camera.

[0031]

Fig.4.

Results of amplification using the computer program PhotoShop of a holographic image

captured on a digital video camera from a translucent hologram: 4a) - before processing the hologram using the specified program, 4b) - after processing.

[0032]

Fig.5.

Comparison of the control (without non-visualized physiologically significant information) and two experimental holograms containing, respectively, non-visualized physiologically significant information 1 and 2 based on the average values of the elements of the numerical matrices for the frequency ranges corresponding to the three primary colors (red, green, blue).

[0033]

Fig.6.

Comparison of the control (without non-visualized physiologically significant information) and two experimental holograms containing, respectively, non-visualized physiologically significant information 1 and 2 by the dispersion of the values of the elements of the numerical matrices for the frequency ranges corresponding to the three primary colors (red, green, blue).

[0034]

Fig.7.

Comparison of the control (without non-visualized physiologically significant information) and two experimental holograms containing respectively non-visualized physiologically significant information 1 and 2 by the Parsons correlation coefficient of the values of the elements of the numerical matrices for the frequency ranges corresponding to the three primary colors (red, green, blue).

[0035]

Fig.8.

Comparison of the control (without non-visualized physiologically significant information) and two experimental holograms containing, respectively, non-visualized physiologically significant information 1 and 2 by the covariance of the values of the elements of the numerical matrices for the frequency ranges corresponding to the three primary colors (red, green, blue).

[0036]

Fig.9.

Changes in the spectral density of the glow of the ring finger of the right hand (under conditions of using the method of computer gas-discharge visualization) in subjects (n=27) when presented with a control hologram and a hologram containing non-visualized physiologically significant information.

[0037]

Fig.10.

Changes in the activity of the alpha rhythm of the electroencephalogram when subjects (n=30) were presented with a control hologram and a hologram containing non-visualized physiologically significant information.

[0038]

Examples of specific implementation of the invention

[0039]

Example 1.

According to the claimed method, using the diagram shown in Fig. 1, two holograms were created using a glucose solution as a diffuser, into which non-visualized information was preliminarily introduced in the form of a frequency-modulated light flux in the range of 2.5-3.5 Hz (hologram 1) and 10 Hz (hologram 2), physiologically significant for the functioning of the brain and other human systems.

The introduction of information into the glucose solution was carried out using a frequency modulator of the light flux according to the description of the invention protected by Russian patent No. 2163491.

A white matte screen (sheet of paper, A4 format) was used as the object of the hologram.

A GREEN STAR pulsed laser with a power of 2 J and a pulse duration of 30 ns was used to record the hologram. The photographic plate used was FP-R photographic material - TU 6-43-00205133-33-94, silver halide plates, measuring 63 x 63 mm.

Development was carried out under standard conditions according to GOST 10691.0-84, developer - MAA-3 (2).

For bleaching, iron chloride FeCl_3 was used, and for drying, ethyl alcohol 50, 100% for 5 minutes.

[0040]

A transmission hologram that did not contain non-visualized physiologically significant information, i.e. obtained without the use of diffuser 10 (glucose solution), was used as a control.

[0041]

Each of the three transmission holograms was reproduced in the focus of a digital video camera 14 (Fig. 3).

For this purpose, photographic plate 7 with a translucent hologram was installed in mount 15 in front of digital camera 14 at a distance of 10 mm from the lens.

Using a point source 16 of polychromatic light from above at an angle of 45° , a white screen 17, located at a distance of 30 cm from the lens, was illuminated with a directed stream of light.

The topographic image reconstructed according to option 3 (white background with added diffraction component) was recorded on a digital video camera in BMP format (without compression).

The contrast of diffraction components on a white background was enhanced by processing BMP files in PhotoShop 6.0. We received an increase in contrast by 75 units, an increase in

saturation by 75 units. As a result of processing, three holograms were obtained with clearly expressed differences in the color gamut (Fig. 4a, 4b). The translation of the graphic image into digital format (digital matrix) was carried out using the MathCad 2000 environment (functions READBMP, READRGB). Each of the matrix elements contained information about the intensity of the RGB color components of an individual pixel in the image. After converting the graphic image into digital format, a quantitative analysis of the digital matrices was carried out for the three obtained holograms using the statistical and comparative functions of the MathCad 2000 environment. Based on the obtained data, statistical diagrams of color components were constructed, allowing us to identify differences between the control hologram and holograms 1 and 2, which contain non-visualized physiologically significant information.

[0042]

Figures 5-8 show statistically significant differences between the control and two experimental holograms 1 and 2 in terms of the average values of all elements of the digital matrix (Fig. 5), the dispersion of the matrix elements (Fig. 6), the Parsons correlation coefficient (Fig. 7), and the covariance of the two compared matrices (Fig. 8).

[0043]

Example 2.

The recording of the transmission hologram was carried out according to the stated method.

The object of the hologram was crystalline silicon without information (control hologram) and crystalline silicon processed according to the method described in Russian Federation patent No. 2163491 (3) with a light flux with additional frequency modulation in the range of 2.5-3.5 Hz (hologram containing non-visualized physiologically significant information). This hologram object was considered as an object for passive transmission of information. Diffuser 10 was not used during recording. Each hologram was reproduced according to

option 1 (Fig. 2a) and presented to a group of subjects (n=27 people). At the moment of presentation of a hologram invisible to the subjects, the glow of the ring finger of their right hand was recorded in video recording mode (in this case 7 s - 175 frames) using the method of computer gas discharge visualization.

[0044]

Figure 9 shows the group dynamics of the spectral density of luminescence in 3 stages: background recording, presentation to subjects according to the scheme shown in Figure 2a, of a control hologram (without non-visualized physiologically significant information) and a hologram with the specified information.

Each test has its own spectral density distribution curve for the luminescence. As can be seen from the nature of the curves in Fig. 9, the spectral density of the glow decreases when a hologram without information is presented, since the photographic plate itself with an invisible hologram is a source of additional visual information for the subject. As can be seen in Fig. 9, presenting the subject with a photographic plate with an invisible hologram containing non-visualized physiologically significant information in the range of 2.5-3.5 Hz causes an even greater decrease in the spectral density of the glow, predominantly in this range.

[0045]

Example 3.

The recording of the reflection hologram was carried out according to the claimed method using the diagram shown in Fig. 1. The object of the hologram was a person in a normal state (control hologram) and in a state of activation of functional reserves, while a glucose solution, pre-processed in frequency modulations of a 10 Hz light flux (non-visualized physiologically significant information) according to the method described in Russian patent No. 216349, was used as a diffuser 10. Each hologram was reproduced using method 2 (Fig.

2b) and presented to a group of subjects (n=30 people). At the moment the hologram was presented to the subjects, their electroencephalogram was recorded.

[0046]

An electroencephalographic study showed that the presentation of a hologram was accompanied by characteristic changes in the electrical activity of the brain, which occurred mainly due to the alpha rhythm.

The subject's viewing of any hologram in comparison with the background recording of the electroencephalogram (without the presentation of the hologram) caused a decrease in the amplitude of the alpha rhythm, which is associated with an additional influx of information through the visual analyzer, relative to the state with open eyes, when the subject does not focus his attention on any object. The presentation of a control hologram according to the scheme shown in Fig. 2b was accompanied by a pronounced depression of the alpha rhythm (Fig. 10). Presentation of a hologram containing non-visualized physiologically significant information caused activation of the alpha rhythm. When a subject is presented with a hologram containing non-visualized physiologically significant information in a 10 Hz frequency modulation variant at the moment of concentration, significant differences ($p < 0.05$) appear in the frontal (F3, F4) and occipital (O1, O2) leads. Such activation of the alpha rhythm is expected when using a 10 Hz frequency cue, since the frequency range of the alpha rhythm is between 8 and 13 Hz.

[0047]

Thus, electrophysiological studies made it possible to identify changes in the subjects' bodies caused by non-visualized physiologically significant information recorded on a holographic medium (photographic plate).

The above methods can be used to identify both the presence of non-visualized physiologically significant information, caused by the state of activation of the functional

reserves of a person as an object of the hologram, and information introduced during the recording of the hologram with frequency marks of 2.5-3.5 Hz and 10 Hz.

[0048]

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[0049]

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