Claims

1. An optical sensor apparatus (110) for determining at least one characteristic of a surface of an object (180) positioned within a measurement range, the sensor apparatus (110) comprising:

an illumination assembly (120) comprising two or more light sources (121, 121-k) that are disposed at different positions with respect to an optical axis and a focal plane of a light-collecting optical assembly and arranged to emit light towards the measurement range through the light-collecting optical assembly (122), wherein the emitted light from each of the two or more light sources covers the same predefined range of wavelengths and wherein the two or more light sources are arranged to form respective two or more light emitting area patterns of predefined spatial shape;

a first optical assembly (140) arranged to longitudinally disperse the light emitted from the illumination assembly (120) such that light across the predefined range of wavelengths from each of the two or more light emitting area patterns is focused at a respective range of focus distances that constitute corresponding two or more sub-ranges of candidate distances within the measurement range at respective two or more measurement positions distributed at different distances from an optical axis (A) of the first optical assembly (140);

a beam splitter (130) arranged to transmit the light emitted from the illumination assembly (120) towards the first optical assembly (140) and to fold the light reflected from the surface of the object (180) and received through the first optical assembly (140);

a second optical assembly (150) arranged to receive the folded light across the predefined range of wavelengths, laterally disperse the received light across the predefined range of wavelengths and to focus the laterally dispersed light across the predefined range of wavelengths at a predefined distance;

a light sensor assembly (160) having a sensor plane arranged at the predefined distance to receive the laterally dispersed light across the predefined range of wavelengths such that the light originating from the two or more light emitting area patterns is received at respective two or more corresponding sub-ranges of positions along an axis (y') on the sensor plane; and

a detector assembly (170) arranged to determine the at least one characteristic of said surface of said object (180) based on respective intensities of the laterally dispersed light received across said two or more sub-ranges of positions along said axis (y') on the sensor plane.

2. An optical sensor apparatus (110) according to claim 1, wherein the detector assembly (170) is arranged to determine one or more of the following based on one or more local intensity maxima of the laterally dispersed light across said two or more sub-ranges of positions along said axis (y') on the sensor plane:

a distance to the surface of said object (180),

an optical characteristic of the surface of the object (180).

3. An optical sensor apparatus (110) according to claim 2, wherein the detector assembly (170) is arranged to determine the distance to the surface of the object (180) in one or more of said two or more measurement positions based on those two or more candidate distances that respectively correspond to those two or more wavelengths that correspond to respective positions of the two or more local intensity maxima of the laterally dispersed light within respective ones of said two or more sub-ranges of positions along said axis (y') on the sensor plane.

4. An optical sensor apparatus (110) according to claim 2 or 3, wherein the detector assembly (170) is arranged to:

identify respective positions of the two or more local intensity maxima across said two or more sub-ranges of positions along said axis (y') on the sensor plane and to carry out the following for each of the identified positions:

identify the respective sub-range of positions along said axis (y') within which the respective identified position resides;

select from respective predefined mappings between a sub-range of positions along said axis (y') and a corresponding sub-range of candidate distances the one that pertains to the respective identified sub-range of positions; and

apply the selected predefined mapping to identify that one of the candidate distances that corresponds to a relative position of the respective identified position within the identified sub-range of positions, thereby determining the distance to the surface of the object (180).

5. An optical sensor apparatus (110) according to any of claims 2 to 4, wherein the detector assembly (170) is arranged to determine reflectivity of the surface of the object (180) based on respective magnitudes of one or more local intensity maxima of the laterally dispersed light across said two or more sub-ranges of positions along said axis (y') on the sensor plane.

6. An optical sensor apparatus (110) according to any of claims 1 to 5, wherein at least one of the following applies:

the predefined range of wavelengths spans over a band having a width in a range from 10 to 50 nanometers, and

the predefined range of wavelengths lies between 420 and 480 nanometers.

7. An optical sensor apparatus (110) according to any of claims 1 to 6, wherein said predefined spatial shape of the two or more light emitting area patterns comprises a point or a line.

8. An optical sensor apparatus (110) according to any of claims 1 to 7, wherein at least one of the following applies:

the light emitted from the two or more light sources (121, 121-k) originates from two or more light emitting diodes, and

said two or more light sources (121, 121-k) are provided via projecting light through a pinhole array or a slit array.

9. An optical sensor apparatus (110) according to any of claims 1 to 8, wherein the first optical assembly (140) comprises a focusing lens assembly (141) arranged to provide a predefined amount of longitudinal chromatic dispersion.

10. An optical sensor apparatus (110) according to any of claims 1 to 9, wherein the second optical assembly (150) comprises:

a dispersive optical component (151) arranged to receive the folded light across the predefined range of wavelengths from the beam splitter (130) and provide a predefined amount of lateral chromatic dispersion to the folded light across the predefined range of wavelengths; and

a focusing optical assembly (152) arranged to focus the laterally dispersed light across the predefined range of wavelengths at the predefined distance.

11. An optical sensor apparatus (110) according to any of claims 1 to 10, wherein the second optical assembly (150) is arranged to receive the folded light substantially in its entirety and provide the folded light

received therein substantially in its entirety as the laterally dispersed light for reception at the sensor plane of the sensor assembly (160).

12. An optical sensor apparatus (110) according to any of claims 1 to 11, wherein the light sensor assembly (160) comprises an image sensor.

13. An optical measurement apparatus for determining surface characteristics of an object (180) positioned within a measurement range, the measurement apparatus comprising:

an optical sensor apparatus (110) according to any of claims 1 to 12 arranged to determine at least one characteristic of a surface of said object (180); and

a mechanism for changing relative positions of the sensor apparatus (110) and the object (180),

wherein the measurement apparatus is arranged to

move the object (180) with respect to the sensor apparatus (110) to a plurality of positions according to a predefined movement pattern,

operate the sensor apparatus (110) to determine said at least one characteristic of the surface of the object (180) at said plurality of positions, and

determine said surface characteristics of said object (180) based on the respective at least one characteristic of the surface of said object (180) determined at said plurality of positions.

14. A measurement apparatus according to claim 13, wherein said surface characteristics include a shape of the surface of said object (180) and wherein the sensor apparatus (110) is arranged to determine a distance to the surface of said object (180) based on respective positions of one or more local intensity maxima of the laterally

dispersed light across said two or more sub-ranges of positions along said axis (y') on the sensor plane.

15. A measurement apparatus according to claim 13, wherein said surface characteristics include a reflectivity of the surface of said object (180) and wherein the sensor apparatus (110) is arranged to determine a reflectivity of the surface of said object (180) based on respective magnitudes of one or more local intensity maxima of the laterally dispersed light across said two or more sub-ranges of positions along said axis (y') on the sensor plane.