

CLAIMS

1. A computer implemented method for detecting deformation of a structure from multi-dimensional image data of a surface of the structure captured with an optical inspection device, the method comprising:

5 providing the multi-dimensional image data at a processor, the image data comprising a plurality of data-points measured using the optical inspection device, each data-point including:

a respective location on the surface that a respective data-point was captured; and

10 a respective feature value z for the respective data-point measured using the inspection device;

dividing, with the processor, the surface represented by the image data into multiple planes;

15 calculating, with the processor, approximate feature values Z for the planes, in which the approximate feature value for a respective plane is calculated based on the measured feature value of one or more of the data-points within the respective plane;

20 calculating, with the processor based on the feature value, an adjusted feature value V for the plurality of data-points, in which the adjusted feature value for a respective data-point is calculated based on the measured feature value z for the respective data-point and the calculated approximate feature value Z for a plane that the respective data-point is within;

generating, with the processor based on the adjusted feature values V , a processed multi-dimensional image of the surface in which the data set for the processed multi-dimensional image differs from the data set in the provided image data; and

25 outputting, with the processor using a graphical display, the processed multi-dimensional image of the surface, in which the processed multi-dimensional image depicts in a graphical representation the detected deformation of the surface within respective planes of the divided image data.

2. A method according to Claim 1, in which the step of calculating the adjusted feature values V for inclusion in the processed multi-dimensional image further comprises baseline

subtraction of the calculated approximate feature value Z , for a given plane and each of its respective data-points, from the measured feature value z for each respective data-point.

3. A method according to Claim 1, in which the surface is divided into triangle-shaped planes and in which the approximate feature value Z for the respective triangle plane is
5 calculated according to a triangular plane equation and based on measured data-points that correspond to respective vertices of the respective triangle plane.

4. A method according to Claim 1, in which the processed multi-dimensional image generated based on the adjusted feature values V depicts in a graphical representation changes in measured feature values z occurring within a given plane with greater emphasis relative to
10 changes in measured feature values z occurring over an area comprising multiple planes.

5. A method according to Claim 1, in which the dividing step is performed by applying a surface dividing model, and further comprising:

generating, with the processor, the surface dividing model specifying a number of the planes as a function of dimensions of the surface represented by the image data and a
15 size of features corresponding to deformation to be detected from the image data.

6. A method according to Claim 1, in which the step of providing comprises:

measuring, using the inspection device, the plurality of data-points using the optical inspection device; and

generating the multi-dimensional image data.

20 7. A method according to Claim 6, in which the feature value data is a measure of hue of diffracted radiation captured using the inspection device.

8. A method according to Claim 1, in which the surface represented by the image data is divided into multiple parallelogram-shaped planes.

9. A method according to Claim 8, in which the parallelogram-shaped planes are each
25 subdivided into two triangle planes, respectively.

10. A method according to Claim 9, in which each parallelogram plane is further divided along a diagonal line extending between two vertices thereof, such that the diagonal line defines a shared edge of two respective triangle planes.

11. A method according to Claim 1, in which the calculated approximate feature value Z for a respective plane is represented as one or more of a value, vector, and equation and is calculated from the measured feature value z of one or more data-points located within the respective plane.

5 12. A method according to Claim 11, in which the approximate feature value Z for the respective plane is calculated from the measured feature value z of data-points located at vertices of the respective plane.

13. A system for detecting deformation a structure from multi-dimensional image data of a surface of the structure captured with an optical inspection device, the system comprising:

10 a computer readable storage medium;

a communication interface;

a display;

one or more processors configured to access the storage medium and in operative communication with the communication interface and the display; and

15 software modules stored on the storage medium and executable by the processor, in which the software modules including:

a communication module that, when executed by the processor, configures the processor to, using the communication interface, receive the multi-dimensional image data

including a plurality of data-points measured using the optical inspection device, the

20 data-points comprising: a respective location on the surface that a respective data-point was captured, and a respective feature value z for the respective data-point measured using the inspection device;

a surface dividing module that, when executed by the processor, configures the processor to, divide the surface represented by the image data into multiple planes;

25 a feature detection module that, when executed by the processor, configures the processor to calculate a respective approximate feature value Z for each of the planes, in which the approximate feature value Z for a respective plane is calculated based on the measured feature value v of one or more of the data-points within the respective plane, and

in which the feature detection module further configures the processor to calculate an adjusted feature value V for each of the plurality of data-points, in which the adjusted feature value V for a respective data-point is calculated based on the measured feature value z for the respective data-point and the calculated approximate feature value Z for a plane that the respective data-point is within; and

an image generation module that, when executed by the processor, configures the processor to generate, based on the adjusted feature value V of each data-point, a processed multi-dimensional image of the surface in which the data set for the processed multi-dimensional image differs from the data set in the received image data, and further configures the processor to output the processed multi-dimensional image of the surface using the display, in which the processed multi-dimensional image depicts in a graphical representation the detected deformation of the surface within respective planes of the surface.

14. A system according to Claim 13, in which the planes are triangle shaped and in which the approximate feature value Z for the respective plane is calculated according to a triangular plane equation and based on measured data-points that correspond to respective vertices of the respective plane.

15. A system according to Claim 13, in which the adjusted feature values V inclusion in the processed multi-dimensional image further is calculated by baseline subtraction of the calculated approximate feature value Z , for a given plane, from the measured feature value z for each respective data-point in the given plane.

16. A system according to Claim 13, further comprising:

an optical inspection device configured to measure the plurality of data-points and generate the multi-dimensional image data.

17. A system according to Claim 13, in which the surface dividing module further configures the processor to generate the surface dividing model specifying a number of planes as a function of dimensions of the surface represented by the image data and a size of features corresponding to deformation to be detected from the image data.