[0041]

CLAIMS

What is claimed is:

1. A method of measuring a height of a location on an object, comprising:

projecting at least one line of radiation onto the object;

detecting at least one line of radiation reflected from the object including semi-transparent surface;

generating at least one two-dimensional height displacement map from the detected line of radiation, wherein the two-dimensional height displacement map comprises a plurality of spots; and

processing the intensity of each spot of the plurality of spots as a gray-scale using a two-dimensional image processing technique to calculate the height of the object at that point.

2. The method of claim 1, wherein the object is a three-dimensional object.

3. The method of claim 1, wherein the two-dimensional image processing technique further comprises at least one of an edge detection technique, a convolution technique, a blob analysis technique and a pattern matching technique.

4. An apparatus for measuring a height of a location on an object, comprising:

at least one illumination source configured to output at least one line of radiation onto the object;

at least one image capturing unit configured to detect at least one line of radiation reflected from the object; and

at least oneprocessing unit configured to generate a two-dimensional height displacement map from the detected line of radiation, wherein the two-dimensional height displacement map comprises a plurality of spots;

wherein all the processing unit processes the intensity of each spot of the plurality of spots as a gray-scale using a two-dimensional image processing technique to calculate the height of the object at that point.

5. The system of claim 4, wherein the object is a three-dimensional object.

6. The system of claim 4, wherein the illumination source is a line source.

7. The system of claim 4, wherein the two-dimensional image processing technique further comprises at least one of an edge detection technique, a blob analysis technique and a pattern matching technique.

[0041]

CLAIMS

What is claimed is:

1. A method of measuring a height of a location on an object, comprising:

projecting at least one line of radiation onto the object using at least one illumination source;

detecting at least one line of radiation reflected from the object including semi-transparent surface using at least one image capturing unit comprising at least one sensor and at least one camera; and

generating at least one two-dimensional height displacement map from the detected line of radiation, wherein the two-dimensional height displacement map comprises a plurality of spots using at least one processing unit; and

processing the intensity of each spot of the plurality of spots as a gray-scale using a two-dimensional image processing technique to calculate the height of the object at that point;

the height of the object is calculatedby following formula:

Object height = Height of sensor / (x cosine(90 degree - (laser angle + camera angle))) / cosine(laser angle),

wherein height of sensor signifies the height to the y-location of the pixel with maximum intensity on the sensor;

wherein x represents the x position on the two-dimensional height displacement map;

wherein laser angle is angle between the laser beam and a line drawn from the object tobe perpendicular to workstation;

wherein camera angle is angle between a reflected ray and a line drawn from the object to be perpendicular to workstation; and

wherein the reflected ray is at least one line of radiation reflected from the object.

2. The method of claim 1, wherein the object is a three-dimensional object.

3. The method of claim 1, wherein the two-dimensional image processing technique further comprises at least one of an edge detection technique, a convolution technique, a blob analysis technique and a pattern matching technique.

4. An apparatus for measuring a height of a location on an object, comprising:

at least one illumination source configured to output at least one line of radiation onto the object;

at least one image capturing unit comprising at least one sensor and at least one camera configured to detect at least one line of radiation reflected from the object; and

at least one processing unit configured to generate a two-dimensional height displacement map from the detected line of radiation, wherein the two-dimensional height displacement map comprises a plurality of spots;

wherein all the processing unit processes the intensity of each spot of the plurality of spots as a gray-scale using a two-dimensional image processing technique to calculate the height of the object at that point;

The height of the object is calculatedby following formula:

Object height = Height of sensor / (x cosine(90 degree - (laser angle + camera angle))) / cosine(laser angle),

wherein height of sensor signifies the height to the y-location of the pixel with maximum intensity on the sensor;

wherein x represents the x position on the two-dimensional height displacement map;

wherein laser angle is angle between the laser beam and a line drawn from the object tobe perpendicular to workstation;

wherein camera angle is angle between a reflected ray and a line drawn from the object to be perpendicular to workstation; and

wherein the reflected ray is at least one line of radiation reflected from the object.

5. The system of claim 4, wherein the object is a three-dimensional object.

6. The system of claim 4, wherein the illumination source is a line source.

7. The system of claim 4, wherein the two-dimensional image processing technique further comprises at least one of an edge detection technique, a blob analysis technique and a pattern matching technique.