WHAT IS CLAIMED IS:

1. A system for generating a three-dimensional height image of a reflective target comprising:

an illumination source configured to generate a patterned illumination on the target;

a camera configured to acquire an image of the patterned illumination on the target;

the illumination source and camera being aligned at equal and opposite angles relative to the target such that the camera acquires a specular image of the patterned illumination; and

a controller coupled to the illumination source and the camera configured to generate a height image of the target based on the acquired image, the generated height image being used by the controller to determine a plurality of x, y, z coordinates on the target and a surface gradient of the target relative to a focus plane of the system, and employ a height correction offset function that describes z coordinate error at each x, y, z, and surface gradient, to correct measurement error during sensor operation for x, y, z, and surface gradient.

2. The system of claim 1, wherein the illumination source comprises a telecentric lens assembly.

3. The system of either claim 1 or 2, wherein the camera comprises a telecentric lens assembly.

4. The system of any of claims 1-3, wherein the illumination source comprises a numerical aperture smaller than a numerical aperture of the camera.

5. The system of any of claims 1-4, wherein the illumination source comprises a numerical aperture larger than a numerical aperture of the camera.

6. The system of any of claims 1-5, wherein the height image is segmented by the controller based on surface reflectivity of the target.

7. A system for generating a three-dimensional height image of a reflective target, the system comprising:

an illumination source configured to generate a patterned illumination on the target;

a camera configured to acquire a first image of the patterned illumination on the target;

the illumination source and camera being aligned at equal and opposite angles relative to the target such that the camera acquires a specular image of the patterned illumination; and

a controller coupled to the illumination source and the camera configured to generate an estimated height image of the target based on the first image, the estimated height image being used by the controller to determine a plurality of estimated x, y and z coordinates on the target, and an estimated surface gradient of the target, relative to a focus plane of the system, the controller being configured to generate a corrected height image output of the target based on the estimated height image and a height correction offset function that describes z coordinate error at each x, y, z, and surface gradient.

8. The system of claim 7, wherein the illumination source comprises a telecentric lens assembly.

9. The system of either claim 7 or 8, wherein the camera comprises a telecentric lens assembly.

10. The system of any of claims 7-9, wherein the illumination source has a numerical aperture smaller than a numerical aperture of the camera.

11. The system of any of claims 7-10, wherein the illumination source has a numerical aperture larger than a numerical aperture of the camera.

12. The system of any of claims 7-11, wherein the height correction offset function comprises a least-squares fit.

13. The system of any of claims 7-12, wherein the estimated height image is segmented by the controller based on surface reflectivity of the target.

14. A method of generating three-dimensional height images of a reflective target, the method comprising:

placing a target to be imaged at a first orientation at which a position, height and slope of the target at the first orientation is known, the target having at least one specular surface;

projecting, with an illumination source placed at a first point of view, a first patterned illumination onto the target;

capturing, with a camera placed at a second point of view, a first image of the first patterned illumination, wherein the second point of view is positioned at an equal and opposite angle relative to the first point of view and target normal;

generating a first height image of the target based upon the first captured image;

determining a first position, a first height, and a first slope of the target based on the first height image;

calculating a first error based on a comparison of the determined first position, first height, and first slope from the first height image to the known position, the known height and the known slope of the target at the first orientation;

tilting the target to a second orientation at which a position, height, and slope of the target at the second orientation is known and wherein at least the slope and height of the target at the second orientation is different from the slope and height of the target at the first orientation;

projecting, with the illumination source, a second patterned illumination onto the target;

capturing, with the camera, a second image of the second patterned illumination;

generating a second height image of the target based upon the second captured image;

determining a second position, a second height, and a second slope of the target based on the second height image;

calculating a second error based on a comparison of the determined second position, second height, and second slope from the second height image to the known

position, the known height and the known slope of the target at the second orientation;

calculating a best fit function based on the first error and the second error;

storing the best fit function; and

using the best fit function to compensate subsequent height images.

15. The method of claim 14, wherein the illumination source comprises a numerical aperture smaller than a numerical aperture of the camera.

16. The method of either claim 14 or 15, wherein the illumination source comprises a numerical aperture larger than a numerical aperture of the camera.

17. The method of any of claims 14-16, wherein the illumination source comprises a telecentric lens assembly.

18. The method of any of claims 14-17, wherein the camera comprises a telecentric lens assembly.

19. A system for generating a three-dimensional height image of a reflective target, the system comprising:

a first, a second and a third operative illumination source and camera pair, the illumination sources configured to generate patterned illuminations on a target and the cameras being aligned at equal and opposite angles relative to target normal and their respective illumination source and configured to capture images of the patterned illuminations generated by their respective illumination source, wherein the illumination sources are aligned, relative to the target, at different azimuths, the azimuths separated by 120 degrees; and

a controller coupled to the first, second, and third operative illumination source and camera pairs, the controller being configured to generate a height image of the target based on acquired images of the patterned illuminations.