Claims

1. A structured illumination imaging system, comprising:

a light emitter to emit light;

a linear motion stage mounted with a first beam splitter and a second beam splitter, wherein the first beam splitter is to split light emitted by the light emitter to project a first plurality of fringes on a plane of a sample, wherein the second beam splitter is to split light emitted by the light emitter to project a second plurality of fringes on the plane of the sample; and

an image sensor to collect light emitted by the sample,

wherein the linear motion stage is a one-dimensional linear motion stage, wherein the linear motion stage is to translate along the one dimension to optically couple each of the first beam splitter and the second beam splitter to the light emitter, wherein the first beam splitter is adjacent to the second beam splitter along the one dimension.

2. The structured illumination imaging system of claim 1, wherein the first beam splitter comprises a first transmissive diffraction grating and wherein the second beam splitter comprises a second transmissive diffraction grating.

3. The structured illumination imaging system of claim 2, wherein the first diffraction grating and the second diffraction grating are angularly offset from the one dimension.

4. The structured illumination system of claim 3, wherein the first diffraction grating and the second diffraction grating are integrated into a single optical element mounted on the linear motion stage.

5. The structured illumination system of claim 4, wherein the single optical element comprises a first side patterned with the first diffraction grating and a second side, adjacent the first side, patterned with the second diffraction grating.

6. The structured illumination imaging system of claim 3, wherein the first diffraction grating and the second diffraction grating are angularly offset from the one dimension by about ±45 degrees.

7. The structured illumination imaging system of claim 6, wherein the first plurality of fringes are angularly offset from the second plurality of fringes on the sample plane by about 90 degrees.

8. The structured illumination system of claim 7, wherein the sample comprises a plurality of features regularly patterned in a rectangular array or hexagonal array.

9. The structured illumination system of claim 3, further comprising: one or more optical beam blockers for blocking zero orders of light emitted by each of the first and second diffraction gratings.

10. The structured illumination system of claim 3, further comprising: an objective lens to project each of the first plurality of fringes and the second plurality of fringes on the sample.

11. The structured illumination system of claim 10, further comprising: a projection lens in an optical path between the linear motion stage and the objective lens, wherein the projection lens is to project a Fourier transform of each of the first diffraction grating and the second diffraction into an entrance pupil of the objective.

12. The structured illumination system of claim 2, further comprising: an alignment pattern formed on a component mounted on the linear motion stage, wherein the alignment pattern is to split light emitted by the light emitter to project a pattern on the plane of the sample for imaging alignment.

13. The structured illumination system of claim 12, wherein the projected pattern comprises lines having a lower frequency than the projected first plurality of fringes and second plurality of fringes, wherein the alignment pattern is formed on a substrate comprising at least one of the first diffraction grating and the second diffraction grating.

14. A structured illumination imaging system, comprising:

a light emitter to emit light;

a linear motion stage mounted with a first beam splitter and a second beam splitter, wherein the first beam splitter is to split light emitted by the light emitter to project a first plurality of fringes on a plane of a sample, wherein the second beam splitter is to split light emitted by the light emitter to project a second plurality of fringes on the plane of the sample;

an image sensor to collect light emitted by the sample; and

an optical phase modulator to phase shift the first plurality of fringes and the second plurality of fringes that are projected on the plane of the sample, wherein the optical phase modulator is a separate component from the linear motion stage.

15. A method, comprising:

turning on a light emitter of a structured illumination imaging system, the structured illumination imaging system comprising a one-dimensional linear motion stage mounted with a

first diffraction grating and a second diffraction grating, wherein the linear motion stage is to translate along one dimension;

translating the linear motion stage along the one dimension to phase shift a first plurality of fringes projected by the first diffraction grating on a sample;

translating the linear motion stage to optically couple the second diffraction grating to the light emitter; and

after optically coupling the second diffraction grating to the light emitter, translating the linear motion stage along the one dimension to phase shift a second plurality of fringes projected by the second diffraction grating on the sample.

16. The method of claim 15, wherein the first diffraction grating and the second diffraction grating are transmissive diffraction gratings.

17. The method of claim 16, wherein the first diffraction grating and the second diffraction grating are angularly offset from the one dimension of translation.

18. The method of claim 17, wherein the first diffraction grating and the second diffraction grating are integrated into a single optical element mounted on the linear motion stage.

19. The method of claim 17, wherein the first diffraction grating and the second diffraction grating are angularly offset from the one dimension by about ±45 degrees.

20. The method of claim 17, wherein the method comprises:

translating the linear motion stage along the one dimension a plurality of times to phase shift, a plurality of times, the first plurality of fringes projected by the first diffraction grating on the sample; and

after optically coupling the second diffraction grating to the light emitter, translating the linear motion stage along the one dimension a plurality of times to phase shift, a plurality of times, the second plurality of fringes projected by the second diffraction grating on the sample.

21. The method of claim 20, further comprising:

capturing an image of the sample after each time that the linear motion stage is translated to phase shift the first plurality of fringes; and

capturing an image of the sample after each time that the linear motion stage is translated to phase shift the second plurality of fringes.

22. The method of claim 21, further comprising: using the captured images to computationally reconstruct an image having a higher resolution than each of the captured images.

23. The method of claim 20, wherein the linear motion stage is translated about the same distance along the one dimension each time the first plurality of fringes or the second plurality of fringes are phased shifted on the sample.

24. The method of claim 23, wherein the sample comprises a plurality of features regularly patterned in a rectangular array or hexagonal array.

25. The method of claim 20, wherein the linear motion is stage is translated between about 10 mm and about 15 mm when the second diffraction grating is optically coupled to the light emitter.