Claims

~~What is claimed is:~~

1. A system, comprising:

a light emitter to emit light;

an optical element to diffract light emitted by the light emitter to project a plurality of fringes on a plane of a sample comprising patterned features; and

an image sensor to collect light emitted by the features of the sample, the image sensor comprising a plurality of pixels, wherein the sample is to be aligned over the image sensor such that a plurality of the patterned features is aligned over each of a respective one of the plurality of pixels along a first axis, wherein the projected plurality of fringes is shaped to illuminate one of the features of each of the respective pluralities of the patterned features.

2. The system of claim 1, wherein the projected plurality of fringes has a fringe width that is at least about the same or greater than a dimension of the regularly patterned features, and wherein the fringe width is less than the pitch of each of the plurality of pixels.

3. The system of claim 2, wherein the image sensor is an active pixel image sensor.

4. The system of claim 3, wherein the image sensor is a complementary metal-oxide-semiconductor (CMOS) image sensor.

5. The system of claim 3, further comprising: a second optical element to diffract light emitted by the light emitter to project a second plurality of fringes on the plane of the sample, wherein the second plurality of fringes is orthogonally oriented relative to the first plurality of fringes.

6. The system of claim 5, wherein the sample is to be aligned over the image sensor such that a second plurality of the patterned features is positioned over a respective one of each of the plurality of pixels, wherein each of the second plurality of the patterned features are aligned along a second axis orthogonal to the first axis, wherein the projected second plurality of fringes is shaped to illuminate one of each of the second plurality of the patterned features.

7. The structured illumination imaging system of claim 6, wherein the optical elements to diffract light comprise a horizontal transmissive diffraction grating to project the first plurality of fringes and a vertical transmissive diffraction grating to project the second plurality of fringes.

8. The system of claim 6, wherein four patterned features are positioned over a respective one of the plurality of pixels, wherein the four patterned features are arranged in a square grid over the pixel.

9. The system of claim 6, wherein three patterned features are positioned over a respective one of the plurality of pixels, wherein the three patterned features are arranged in an L-shape over the pixel.

10. The system of claim 3, wherein each of the plurality of pixels is a rectangular pixel, wherein the features of the sample are aligned over each rectangular pixel in a linear array.

11. The system of claim 3, wherein each of the plurality of pixels is a square pixel, wherein each of the pluralities of features comprises two features having an aspect ratio of about 2:1.

12. The system of claim 3, wherein each of the plurality of pixels is a square pixel, wherein each of the pluralities of features comprises three features having an aspect ratio of about 3:1.

13. The system of claim 3, wherein the sample is formed over the image sensor.

14. The system of claim 13, wherein each of the features is a reaction recess comprising a reaction site formed over a light guide of one of the plurality of pixels.

15. The structured illumination imaging system of claim 3, wherein the image sensor comprises first and second alignment rows or columns of pixels, wherein the first and second alignment rows or columns are to spatially align the plurality of fringes with the sample and image sensor.

16. The system of claim 15, wherein only one feature of the sample is positioned over each of the plurality of pixels of the first and second alignment rows or columns.

17. A method, comprising:

projecting a first plurality of fringes on a plane of a sample comprising patterned features, wherein the sample is aligned over an image sensor such that a first plurality of the patterned features is positioned over a respective one of the plurality of pixels, wherein each of the pluralities of the patterned features are aligned along a first axis over the pixel;

illuminating, with the first plurality of fringes, a first feature of each of the first pluralities of the patterned features;

capturing a first image of the first feature of each of the first pluralities of the patterned features;

phase shifting the first plurality of fringes to illuminate a second feature of each of the first pluralities of the patterned features; and

capturing a second image of the second feature of each of the first pluralities of the patterned features.

18. The method of claim 17, wherein the projected plurality of fringes has a fringe width that is at least about the same or greater than a dimension of the regularly patterned features, and wherein the fringe width is less than the pitch of each of the plurality of pixels.

19. The method of claim 18, wherein the sample is formed over the image sensor, wherein the image sensor is an active pixel sensor.

20. The method of claim 19, wherein the first plurality of fringes is positioned to illuminate only one feature over each of the plurality of pixels during the steps of capturing the first image and the second image.

21. The method of claim 18, further comprising:

projecting a second plurality of fringes on the plane of the sample, wherein the second plurality of fringes is orthogonally oriented relative to the first plurality of fringes, wherein the sample is aligned over the image sensor such that a second plurality of the patterned features is positioned over a respective one of the plurality of pixels, wherein each of the second plurality of the patterned features is aligned along a second axis orthogonal to the first axis;

illuminating, with the second plurality of fringes, a third feature of each of the second pluralities of the patterned features;

capturing a third image of the third feature of each of the second pluralities of the patterned features;

phase shifting the second plurality of fringes to illuminate a fourth feature of each of the second pluralities of the patterned features; and

capturing a fourth image of the second feature of each of the second pluralities of the patterned features.

22. A biosensor, comprising:

a device base, the device base comprising:

a sensor array comprising a plurality of pixels; and

a reaction array of reaction recesses having corresponding reaction sites, wherein the reaction array is patterned over the sensor array such that a plurality of the reaction recesses is patterned over a respective one of the plurality of pixels; and

an optical assembly to project a plurality of fringes on a plane of the reaction array, wherein the projected plurality of fringes is shaped to illuminate one of the reaction recesses patterned over each of the plurality of pixels.

23. The biosensor of claim 22, wherein the projected plurality of fringes has a fringe width that is at least about the same or greater than a dimension of the reaction recesses, wherein the fringe width is less than a pitch of each of the plurality of pixels, and wherein the fringe width is at least about the same as the pitch of each of the plurality of pixels.

24. The biosensor of claim 23, further comprising: one or more optical elements to phase shift the plurality of fringes by a fraction of the pitch of each of the plurality of pixels.