CLAIMS

1. A method comprising:

performing a first imaging cycle of a patterned sample comprising a plurality of spots;

dividing a first set of imaging data generated during the first imaging cycle into a first plurality of imaging data subsets, each of the first plurality of imaging data subsets corresponding to a respective region of the patterned sample, each of the respective regions of the patterned sample comprising a plurality of spots;

calculating a set of image distortion correction coefficients for each of the first plurality of imaging data subsets;

performing a second imaging cycle of the patterned sample to generate a second set of imaging data; and

dividing the second set of imaging data generated during the second imaging cycle into a second plurality of imaging data subsets, each of the second plurality of imaging data subsets corresponding to the same respective region of the patterned sample as one of the first plurality of imaging data subsets; and

for each of the second plurality of imaging data subsets, applying the distortion correction coefficients calculated for the one of the first plurality of imaging data subsets corresponding to the same respective region of the patterned sample.

2. The method of claim 1, wherein each of the plurality of spots of the patterned sample comprise fluorescently tagged nucleic acids, wherein the first imaging cycle is a first sequencing cycle, and wherein the second imaging cycle is a second sequencing cycle.

3. The method of claim 1, wherein the first set of imaging data and the second the set of imaging data each respectively comprises imaging data of a first color channel and imaging data of a second color channel, and wherein calculating a set of image distortion correction coefficients for each of the first plurality of imaging data subsets comprises determining a set of distortion correction coefficients for each color channel of each imaging data subset.

4. The method of claim 1, wherein calculating a set of image distortion correction coefficients for each of the first plurality of imaging data subsets, comprises:

estimating an affine transform of the imaging data subset;

sharpening the imaging data subset; and

iteratively searching for an optimal set of distortion correction coefficients for the imaging data subset.

5. The method of claim 4, wherein iteratively searching for an optimal set of distortion correction coefficients for the imaging data subset comprises:

applying the estimated affine transform during each iteration of the search.

6. The method of claim 4, wherein the first set of imaging data and the second set of imaging data are divided using at least the position of fiducials on the sample, and wherein the affine transform for each of the first plurality of imaging data subsets is estimated using the fiducials.

7. The method of claim 6, further comprising:

after applying the set of optical distortion correction coefficients to each of the plurality of spot locations, extracting a signal intensity for each of the plurality of spot locations.

8. A method for correcting for optical distortion in an image of a patterned sample comprising a plurality of spots, comprising:

estimating an affine transform of the image;

sharpening the image; and

iteratively searching for an optimal set of distortion correction coefficients for the sharpened image, wherein iteratively searching for the optimal set of distortion correction coefficients for the sharpened image comprises calculating a mean chastity for a plurality of spot locations in the image using at least signal intensities extracted from each of the plurality of spot locations, and wherein the estimated affine transform is applied during each iteration of the search.

9. The method of claim 8, wherein the image comprises a first image dataset corresponding to a first color channel and a second image dataset corresponding to a second color channel, and wherein the operations of estimating the affine transform and sharpening the image are applied to each of the first image dataset and the second image dataset.

10. The method of claim 8, wherein iteratively searching for an optimal set of distortion correction coefficients for the sharpened image comprises:

generating a set of optical distortion correction coefficients for the image;

applying the estimated affine transform to the plurality of spot locations in the image; and

after applying the estimated affine transform, applying the set of optical distortion correction coefficients to each of the plurality of spot locations.

11. The method of claim 8, further comprising:

normalizing the extracted signal intensities; and

calculating a mean chastity for the plurality of spot locations using at least the normalized signal intensities.

12. The method of claim 11, wherein calculating a mean chastity for the plurality of spot locations using at least the normalized signal intensities comprises:

for each of the plurality of spot locations determining a chastity using at least a distance from a point corresponding to the spot location's normalized signal intensity to a Gaussian centroid.

13. The method of claim 8, wherein iteratively searching for an optimal set of distortion correction coefficients for the sharpened image comprises subsampling a plurality of spots in the image, wherein if a spot in a row of the sharpened image is subsampled, then all spots in the row of the sharpened image are subsampled.

14. A non-transitory computer readable medium having instructions stored thereon that, when executed by one or more processors, causes a system to:

estimate an affine transform of an image, wherein the image is an image of a patterned sample comprising a plurality of spots;

sharpen the image; and

iteratively search for an optimal set of distortion correction coefficients for the sharpened image, wherein iteratively searching for the optimal set of distortion correction coefficients for the sharpened image comprises calculating a mean chastity for a plurality of spot locations in the image using at least

signal intensities extracted from each of the plurality of spot locations, and wherein the estimated affine transform is applied during each iteration of the search.

15. The non-transitory computer readable medium of claim 14, wherein the image comprises a first image dataset corresponding to a first color channel and a second image dataset corresponding to a second color channel, and wherein the operations of estimating the affine transform and sharpening the image are applied to each of the first image dataset and the second image dataset.

16. The non-transitory computer readable medium of claim 14, wherein iteratively searching for an optimal set of distortion correction coefficients for the sharpened image comprises:

generating a set of optical distortion correction coefficients for the image;

applying the estimated affine transform to the plurality of spot locations in the image; and

after applying the estimated affine transform, applying the set of optical distortion correction coefficients to each of the plurality of spot locations.

17. The non-transitory computer readable medium of claim 16, wherein the instructions, when executed by the one or more processors, further cause the system to:

apply the set of optical distortion correction coefficients to each of the plurality of spot locations; and

extract a signal intensity for each of the plurality of spot locations.

18. The non-transitory computer readable medium of claim 17, wherein the instructions, when executed by the one or more processors, further cause the system to:

normalize the extracted signal intensities; and

calculate a mean chastity for the plurality of spot locations using at least the normalized signal intensities.

19. The non-transitory computer readable medium of claim 18, wherein calculating a mean chastity for the plurality of spot locations using at least the normalized signal intensities comprises:

for each of the plurality of spot locations determining a chastity using at least a distance from a point corresponding to the spot location's normalized signal intensity to a Gaussian centroid.

20. The non-transitory computer readable medium of claim 18, wherein each of the plurality of spots of the patterned sample comprises fluorescently tagged nucleic acids.