CLAIMS

1. A method for sequencing comprising:

performing a first imaging cycle on a substrate to which one or more samples are bound, the first imaging cycle comprising:

contacting the one or more samples with a first detectable element; and

imaging a portion of the substrate with an imaging system to detect one or more optical signals using, at least in part, the first detectable element;

deconvolving the one or more optical signals for each imaged portion of the substrate of the first imaging cycle using, at least in part, one or more correction coefficients for each imaged portion of the substrate; and

sequencing the one or more samples attached the substrate using a plurality of detectable labels using the one or more correction coefficients.

2. The method of claim 1, wherein one or more samples are one or more nucleic acid sequences.

3. The method of claim 1, wherein the first detectable element is a fluorescently tagged nucleic acid.

4. The method of claim 1, wherein deconvolving the one or more optical signals uses, at least in part, a theoretical distance of a first element to an actual image distance of the first element.

5. The method of claim 4, wherein the first element is a fiducial.

6. The method of claim 1 further comprising extracting an optical signal intensity for a spot location of a sample of the one or more samples on the substrate.

7. The method of claim 6, wherein the spot location is less than 5 pixels in size.

8. The method of claim 6, wherein the spot location is between 1 pixel and 5 pixels in size.

9. The method of claim 1, wherein the one or more correction coefficients are calculated using an estimated affine transform.

10. The method of claim 9, wherein the estimated affine transform is estimated using, at least in part, a theoretical distance of a fiducial to an actual image distance of the fiducial.

~~11. The method of claim 1, wherein the one or more correction coefficients are iteratively determined.~~

~~12. The method of claim 1, wherein performing the first imaging cycle on the substrate to which the one or more samples are bound further comprises:~~

~~contacting the one or more samples with a second detectable element; and~~

~~imaging the portion of the substrate with the imaging system to detect one or more optical signals using, at least in part, the second detectable element.~~

~~13. The method of claim 12, wherein the first detectable element is a first fluorescently tagged nucleic acid, wherein the second detectable element is a second fluorescently tagged nucleic acid, wherein the first fluorescently tagged nucleic acid and the second fluorescently tagged nucleic acid are different.~~

~~14. The method of claim 13, wherein the first fluorescently tagged nucleic acid emits light for a first color channel and the second fluorescently tagged nucleic acid emits light for a second color channel.~~

~~15. A system for sequencing comprising:~~

~~an imaging system to image one or more portions of a substrate; and~~

~~a processing system to:~~

~~initiate a first imaging cycle for the imaging system to detect one or more optical signals emitted from a detectable element of one or more samples bound to a portion of the substrate; and~~

~~deconvolve the one or more optical signals for the imaged portion of the substrate of the first imaging cycle using, at least in part, one or more correction coefficients for the imaged portion of the substrate.~~

~~16. The system of claim 15, wherein the one or more samples are one or more nucleic acid sequences.~~

~~17. The system of claim 15, wherein the detectable element is a fluorescently tagged nucleic acid.~~

~~18. The system of claim 15, wherein deconvolving the one or more optical signals uses, at least in part, a theoretical distance of a first element to an actual image distance of the first element.~~

~~19. The system of claim 18, wherein the first element is a fiducial.~~

~~20. The system of claim 15, wherein the processing system is to extract an optical signal intensity for a spot location of a sample of the one or more samples on the substrate, wherein the spot location is less than 5 pixels in size.~~

CLAIMS

1. A system for sequencing comprising:

an imaging system to image one or more portions of a substrate having a sample associated with a surface of the substrate; and

a processing system configured to:

initiate a first imaging cycle for the imaging system to image a portion of the substrate with the imaging system to detect one or more optical signals using, at least in part, a first fluorescently labeled nucleotide associated with the sample;

subdividing an image of the portion of the substrate into a plurality of tiles, each of the plurality of tiles comprising a plurality of imaging spots and a predetermined number of fiducials;

calculating a set of image distortion correction coefficients for each of the plurality of tiles using at least a fiducial of the predetermined number of fiducials;

initiate a second imaging cycle for the imaging system to image the portion of the substrate with the imaging system to detect one or more optical signals using, at least in part, a second fluorescently labeled nucleotide associated with the sample; and

applying the set of image distortion correction coefficients calculated for each of the plurality of tiles corresponding to each of the plurality of tiles of an image from the second imaging cycle.

2. The system of claim 1, wherein the imaging system is a line scanning system.

3. The system of claim 1, wherein the substrate comprises a rectilinear array of features.

4. The system of claim 1, wherein the substrate comprises a hexagonal array of features.

5. The system of claim 1, wherein the substrate comprises multiple planes of features, each of the multiple planes substantially perpendicular to a focusing direction of the imaging system.

6. The system of claim 1, wherein the substrate comprises an octagonal array of features.

7. The system of claim 1, wherein the first imaging cycle is a calibration imaging cycle.

8. The system of claim 7, wherein the calibration imaging cycle is performed at the beginning of a multi-cycle imaging run.

9. The system of claim 1, wherein imaging processing of the plurality of tiles is parallelized.

10. The system of claim 1, wherein the set of image distortion correction coefficients comprises a first set of distortion correction coefficients for a first color channel and a second set of distortion correction coefficients for a second color channel.

11. The system of claim 1, wherein the set of image distortion correction coefficients are calculated using an estimated affine transform.

12. The system of claim 11, wherein the estimated affine transform is estimated using, at least in part, a theoretical distance of a fiducial of the predetermined number of fiducials to an actual image distance of the fiducial.

13. The system of claim 1, wherein the set of image distortion correction coefficients correspond to a first surface, wherein a second set of image distortion correction coefficients correspond to a second surface, wherein the second surface is different from the first surface.

14. The system of claim 1, wherein the set of image distortion correction coefficients correspond to a first lane, wherein a second set of image distortion correction coefficients correspond to a second lane, wherein the second lane is different from the first lane.

15. A system for sequencing comprising:

an imaging system to image one or more portions of a substrate having a patterned array of features, each feature of the patterned array of features having a biological sample associated therewith; and

a processing system configured to:

initiate a first imaging cycle for the imaging system to image a portion of the substrate with the imaging system to detect one or more optical signals using, at least in part, a first fluorescently labeled nucleotide associated with the biological sample;

subdividing an image of the portion of the substrate into a plurality of tiles, each of the plurality of tiles comprising a plurality of imaging spots and a predetermined number of fiducials;

calculating a set of image distortion correction coefficients for each of the plurality of tiles using at least a fiducial of the predetermined number of fiducials, wherein the set of image distortion correction coefficients comprises a first set of

distortion correction coefficients for a first color channel and a second set of distortion correction coefficients for a second color channel;

initiate a second imaging cycle for the imaging system to image the portion of the substrate with the imaging system to detect one or more optical signals using, at least in part, a second fluorescently labeled nucleotide associated with the biological sample; and

applying the set of image distortion correction coefficients calculated for each of the plurality of tiles corresponding to each of the plurality of tiles of an image from the second imaging cycle.

16. The system of claim 15, wherein the biological sample comprises one or more nucleic acid sequences.

17. The system of claim 15, wherein the imaging system is a line scanning system.

18. The system of claim 15, wherein the first imaging cycle is a calibration imaging cycle.

19. The system of claim 18, wherein the calibration imaging cycle is performed at the beginning of a multi-cycle imaging run.

20. A system for sequencing comprising:

an imaging system to image one or more portions of a substrate having a patterned array of features, each feature of the patterned array of features having one or more nucleic acid sequences associated therewith; and

a processing system configured to:

initiate a calibration imaging cycle for the imaging system to image a portion of the substrate with the imaging system to detect one or more optical signals using, at least in part, a first fluorescently labeled nucleotide associated with the one or more nucleic acid sequences;

subdividing an image of the portion of the substrate into a plurality of tiles, each of the plurality of tiles comprising a plurality of imaging spots and a predetermined number of fiducials;

calculating a set of image distortion correction coefficients for each of the plurality of tiles using at least a fiducial of the predetermined number of fiducials;

initiate a second imaging cycle for the imaging system to image the portion of the substrate with the imaging system to detect one or more optical signals using, at least in part, a second fluorescently labeled nucleotide associated with the one or more nucleic acid sequences; and

applying the set of image distortion correction coefficients calculated for each of the plurality of tiles corresponding to each of the plurality of tiles of an image from the second imaging cycle.