the bands are often irregular or imperfectly formed. Bands can appear curved, crooked, or sometimes faint. These problems are well known in the field and present analysis challenges.

[0006] Another problem with conventional gel imaging devices is that they fail to utilize their light sensors efficiently by imaging large portions of background which contains irrelevant information.

[0007] Therefore, there is a need in the art to create a system, method, and apparatus to image electrophoresis gels with varying attributes and to acquire the highest quality images possible to increase image resolution and therefore data precision and accuracy. Such a system will maximize the use of a detector's pixel sensors by increasing the footprint an object, or electrophoresis gel, consumes in the detector's field of view.

SUMMARY

[0007a] An aspect of the disclosure provides a system for maximizing a field of view for an image capturing device. The system includes an alignment unit including a surface configured to support an object to be imaged; a camera configured to capture an image of the object in a first position within a field of view; and a processor including instructions to calculate a rotational angle by virtually aligning an edge of the object with an edge of the field of view and calculating a zoom factor to position the edge of the object along the edge of the field of view; wherein the surface is configured to change position using a motor.

[0007b] Another aspect of the disclosure provides a system for maximizing a field of view for an image capturing device. The system includes an imaging device and a computing device. The imaging device includes an alignment unit including a rotatable surface configured to hold an object, and a camera configured to capture an image of the object in a first position within a field of view. The computing device includes a processor including instructions to calculate a rotational angle by virtually aligning an edge of the object with an edge of the field of view and instructions to calculate a zoom factor to position the edge of the object along the edge of the field of view; wherein the rotational surface is configured to change position using a motor said change in position comprising rotation by the rotational angle.

[0007c] Another aspect of the disclosure provides a method for maximizing a field of view for image capture. The method includes capturing an image of an object on a surface of the above defined alignment unit in a first position within a field of view; calculating a rotational angle by virtually aligning an edge of the object with an edge of the field of view; calculating a zoom factor to position the edge of the object along the edge of the field of view; repositioning the object into a second position relative to the field of view based on the rotational angle and the zoom factor; and imaging the object in the second position to create a

second image; wherein the image is captured by a camera and the rotational angle and zoom factor are calculated by a processor with instructions to calculate the rotational angle and zoom factor; and wherein the repositioning the object comprises changing the position of the surface using a motor the repositioning comprising rotation by the rotational angle.

[0007d] Another aspect of the disclosure provides a method for increasing a field of view for capturing images. The method includes capturing an image of an object that is an electrophoresis gel on a surface of the above defined alignment unit in a first position within a field of view to generate a first image; calculating a rotational angle on a processor with instructions by virtually aligning an edge of the object with an edge of the field of view; and rotating the object relative to the field of view based on the calculated rotational angle, wherein the rotating comprises changing the position of the surface using a motor with a drive shaft that is connected to the surface housing through a drive linkage; capturing an image of the object in a second position within the field of view to generate a second image; providing machine executable instructions from a memory to a processor to calculate a zoom factor to position the edge of the object along the edge of the field of view; increasing the size of the object within the field of view based on the zoom factor; and capturing an image of the object in a third position to generate a third image.

[0008] Optical systems, methods and apparatuses are disclosed herein for maximizing field of view of an object with an image capturing device or system. In such systems, methods and apparatuses, an image of an object in a first position is captured within a field of view. A rotational angle to align an edge of the object with an edge of the field of view is then calculated, and a zoom factor to position the edge of the object along the edge of the field of view is also calculated.

[0009] In certain embodiments, the optical systems for maximizing field of view of an object with an image capturing device or system include a camera to capture the image of the object and a processor with instructions to calculate the rotational angle and the zoom factor. Embodiments may include a surface configured to rotate based on the calculated rotational angle and for the zoom of the image capturing device or system to be adjusted based on the calculated zoom factor. The adjusted zoom can be achieved mechanically in certain embodiments.

[0010] In certain embodiments, the image capturing device or system is configured to image the object in a second position within the field view. In certain embodiments, the second position may be optimized for the image of the object to be captured using a larger portion of the field of the view than the first image and for the second image of the object to be in an improved rotational alignment than the first image.

CLAIMS

1. A system for maximizing a field of view for an image capturing device, the system comprising:

an alignment unit comprising a surface configured to support an object to be imaged;

a camera configured to capture an image of the object in a first position within a field of view;

a processor including instructions to calculate a rotational angle by virtually aligning an edge of the object with an edge of the field of view and calculating a zoom factor to position the edge of the object along the edge of the field of view;

wherein the surface is configured to change position using a motor.

2. The system of claim 1, wherein the surface is configured to rotate based on the rotational angle and a zoom is adjusted based on the zoom factor.

3. The system of claim 2, wherein the camera is configured to image the object in a second position within the field of view.

4. The system of claim 3, wherein the image from the second position is an optimized image and the optimized image is captured using a larger portion of the field of view than the image of the object in the first position.

5. The system of claim 2, wherein the zoom is achieved mechanically.

6. The system of claim 1, further comprising a display, wherein the processor is configured to create a virtual image based on the calculated rotational angle and present the virtual image on the display.

7. The system of claim 6, wherein the virtual image is configured to be virtually rotated by an end user.

8. The system of claim 7, wherein the camera is configured to image the object in a second position within the field of view.

9. The system of claim 1 further comprising a display, wherein the processor is configured to create a virtual image based on the calculated zoom factor and present the virtual image on the display.

10. The system of claim 9, wherein the virtual image is configured to virtually zoomed by an end user.

11. The system of claim 10, wherein the object is imaged in a second position within the field of view.

12. A system for maximizing a field of view for an image capturing device, the system comprising:

an imaging device comprising:

an alignment unit comprising a rotatable surface configured to hold an object to be imaged;

a camera configured to capture an image of the object in a first position within a field of view; and

a computing device comprising:

a processor including instructions to calculate a rotational angle by virtually aligning an edge of the object with an edge of the field of view and instructions to calculate a zoom factor to position the edge of the object along the edge of the field of view; wherein the rotational surface is configured to change position using a motor said change in position comprising rotation by the rotational angle.

13. A method for maximizing a field of view for image capture, the method comprising:

capturing an image of an object on a surface of an alignment unit as defined in claim 1, in a first position within a field of view;

calculating a rotational angle by virtually aligning an edge of the object with an edge of the field of view;

calculating a zoom factor to position the edge of the object along the edge of the field of view;

repositioning the object into a second position relative to the field of view based on the rotational angle and the zoom factor; and

imaging the object in the second position to create a second image,

wherein the image is captured by a camera and the rotational angle and zoom factor are calculated by a processor with instructions to calculate the rotational angle and zoom factor; and

wherein the repositioning the object comprises changing the position of the surface using a motor the repositioning comprising rotation by the rotational angle.

14. The method of claim 13, wherein the object in the second image covers a larger portion of the field of view than in the first image.

15. The method of claim 13, further comprising the step of creating a virtual representation of a virtually zoomed and rotated image.

16. The method of claim 15, wherein the virtually zoomed and rotated image is configured to be manipulated by an end user.

17. The method of claim 13, wherein the object is an electrophoresis gel.

18. The method of claim 13, wherein the repositioning step uses a moveable surface.

19. The method of claim 13, wherein the repositioning step uses a mechanical zoom.

20. A method for increasing a field of view for capturing images, the method comprising:

capturing an image of an object that is an electrophoresis gel on a surface of an alignment unit as defined in claim 1, in a first position within a field of view to generate a first image;

calculating a rotational angle on a processor with instructions by virtually aligning an edge of the object with an edge of the field of view; and

rotating the object relative to the field of view based on the calculated rotational angle, wherein the rotating comprises changing the position of the surface using a motor with a drive shaft that is connected to the surface housing through a drive linkage;

capturing an image of the object in a second position within the field of view to generate a second image;

providing machine executable instructions from a memory to a processor to calculate a zoom factor to position the edge of the object along the edge of the field of view;

increasing the size of the object within the field of view based on the zoom factor; and

capturing an image of the object in a third position to generate a third image.

21. The method of claim 20 further comprising the step of creating a virtual image, wherein the virtual image can be manipulated by an end user.

22. The method of claim 21, wherein the virtual image is configured to rotate.

23. The method of claim 22, wherein the virtual image is configured to zoom.

24. The method of claim 20, wherein the object in the third image covers a larger portion of the field of view than in the first image.

25. The method of claim 20, wherein rotating the object comprises rotating a surface holding the object.

26. The method of claim 20, wherein increasing the size of the object within the field of view comprises adjusting a mechanical zoom to achieve the zoom factor.

27. The system of any of claims 1 to 6, or method of any of claims 7 to 14, wherein calculating the zoom factor further comprises determining where a field of view border is located relative to an object border, wherein when any point of the object border is calculated to contact or be adjacent to the field of view border an optimized zoom factor has been determined.