

CLAIMS

We claim:

1. An imaging system, comprising;
a sample stage comprising a surface to support a sample to be scanned by the imaging system;
an optical stage having an objective lens, the optical stage being positionable relative to the sample stage;
an actuator physically coupled to at least one of the sample stage and the optical stage to move the sample stage relative to the optical stage;
a servo circuit to control the actuator;
a first set of control parameters to control the servo circuit;
a second set of control parameters to control the servo circuit; and
a servo control circuit to apply the first set of control parameters to the servo circuit when the imaging system is operating in a first mode of operation and to apply the second set of control parameters to the servo circuit when the imaging system is operating in a second mode of operation.
2. The imaging system of claim 1, wherein the servo control circuit comprises a mode detection circuit to detect the mode of operation of the imaging system and a parameter selection circuit to apply the set of control parameters corresponding to the detected mode of operation.
3. The imaging system of claim 1, wherein the imaging system is a sequencer and the first mode of operation is a focus model generation mode, and the second mode of operation is a sequencing mode.

4. The imaging system of claim 1, wherein the servo control circuit further detects the mode of operation of the imaging system and selects the set of control parameters to apply for the detected mode of operation.
5. The imaging system of claim 4, wherein the servo control circuit applies the first or second set of control parameters that are identified as being the set of control parameters for the detected mode of operation.
6. The imaging system of claim 4, wherein at least one of the first and second sets of control parameters is optimized to account for structural characteristics of the imaging system.
7. The imaging system of claim 6, wherein optimizing at least one of the first and second sets of control parameters comprises operating the imaging system, scanning through a range of values of a control parameter of a set of the first and second sets of control parameters, measuring stability of the servo circuit during the scanning and selecting a value of the control parameter.
8. The imaging system of claim 6, wherein optimizing at least one of the first and second sets of control parameters comprises operating the imaging system, scanning through a range of values of a plurality of control parameters of a set of the first and second sets of control parameters, measuring stability of the servo circuit during the scanning and identifying optimal settings for the plurality of control parameters.
9. The imaging system of claim 1, wherein the imaging system further comprises focus tracking circuitry electrically coupled to the optical stage; and wherein the servo control circuit is further to enable feedback from the focus tracking circuitry to the servo circuit when the imaging

system is operating in a scanning mode of operation and to disable feedback from the focus tracking circuitry to the servo circuit when the imaging system is operating in focus model generation mode of operation.

10. The imaging system of claim 1, wherein the control parameters include servo loop gains and filter values.

11. The imaging system of claim 1, wherein the actuator is physically coupled to the sample stage to move the sample stage to adjust a distance between the sample stage and the optical stage.

12. The imaging system of claim 1, further comprising a plurality of actuators physically coupled to the sample stage to adjust a tilt of the sample stage.

13. The imaging system of claim 1, wherein the actuator is physically coupled to the optical stage to move the optical stage to adjust a distance between the sample stage and the optical stage.

14. The imaging system of claim 13, wherein the actuator comprises at least one of a piezoelectric device, a voice coil, and a drive motor.

15. The imaging system of claim 1, wherein the sample is contained in a flow cell or on a slide.

16. In an imaging system, a method of servo control, comprising:
- during operation of the imaging system, a mode detection circuit determining that the imaging system is operating in a first mode of operation;
 - a servo control circuit determining a first set of control parameters selected for the first mode of operation;
 - the servo control circuit applying the determined first set of control parameters to a servo circuit of the imaging system, wherein the servo circuit controls operation of an actuator physically coupled to at least one of a sample stage and an optical stage of the imaging system to move the sample stage relative to the optical stage; and
 - upon the mode detection circuit determining during operation of the imaging system that the imaging system has switched to operating in a second mode of operation, the servo control circuit determining a second set of control parameters selected for the second mode of operation and applying the determined second set of control parameters to a servo circuit.
17. The method of claim 16, wherein the servo control circuit comprises a mode detection circuit detecting the mode of operation of the imaging system and a parameter selection circuit applying the set of control parameters corresponding to the detected mode of operation.
18. The method of claim 16, further comprising the servo control circuit detecting the mode of operation of the imaging system and selecting the set of control parameters to apply for the detected mode of operation.
19. The method of claim 18, further comprising the servo control circuit applying the first or second set of control parameters that are identified as being the set of control parameters for the detected mode of operation.

20. The method of claim 16, further comprising optimizing at least one of the first and second sets of control parameters to account for structural characteristics of the imaging system.
21. The method of claim 20, wherein optimizing at least one of the first and second sets of control parameters comprises operating the imaging system, scanning through a range of values of a control parameter of a set of the first and second sets of control parameters, measuring stability of the servo circuit during the scanning and selecting a value of the control parameter.
22. The method of claim 20, wherein optimizing at least one of the first and second sets of control parameters comprises operating the imaging system, scanning through a range of values of a plurality of control parameters of a set of the first and second sets of control parameters, measuring stability of the servo circuit during the scanning and identifying optimal settings for the plurality of control parameters.
23. The method of claim 16, wherein the servo control circuit further enables feedback from focus tracking circuitry to the servo circuit when the imaging system is operating in a scanning mode of operation and to disable feedback from the focus tracking circuitry to the servo circuit when the imaging system is operating in focus model generation mode of operation.
24. The method of claim 16, wherein the control parameters include servo loop gains and filter values.
25. The method of claim 16, further comprising the actuator moving the sample stage to adjust a distance between the sample stage and the optical stage.

26. The method of claim 25, wherein the actuator comprises at least one of a piezoelectric device, a voice coil, and a drive motor.

27. The method of claim 16, wherein the imaging system is a sequencer and the first mode of operation is a focus model generation mode, and the second mode of operation is a sequencing mode.

28. An imaging system, comprising;

a sample stage comprising a surface to support a sample to be scanned by the imaging system;

an optical stage having an objective lens, the optical stage being positionable relative to the sample stage;

focus tracking circuitry coupled to the optical stage;

an actuator physically coupled to at least one of the sample stage and the optical stage to move the sample stage relative to the optical stage based on information from the focus tracking circuitry;

a servo circuit to control the actuator; and

a servo control circuit to enable feedback from the focus tracking circuitry to the servo circuit when the imaging system is operating in a scanning mode of operation and to disable feedback from the focus tracking circuitry to the servo circuit when the imaging system is operating in focus model generation mode of operation.

29. In an imaging system, a method of servo control, comprising:
- during operation of the imaging system, a mode detection circuit determining whether the imaging system is operating in a scanning mode of operation or a focus model generation mode of operation;
 - a servo circuit controlling movement of an optical stage relative to a sample stage in the imaging system; and
 - a servo control circuit enabling feedback from focus tracking circuitry to the servo circuit when the imaging system is operating in a scanning mode of operation and disabling feedback from the focus tracking circuitry to the servo circuit when the imaging system is operating in focus model generation mode of operation.