CLAIMS

1. A data collection apparatus, comprising:

a first linear stage;

a sample carriage attached to the first linear stage, wherein the first linear stage is operable to move the sample carriage along a first axis;

a second linear stage;

a probe carriage attached to the second linear stage, wherein the second linear stage is operable to move the probe carriage along a second axis;

a third linear stage attached to the probe carriage, wherein, in use, the third linear stage is operable to receive a detachable characterisation probe and to move the characterisation probe along a third axis;

a camera attached to the probe carriage, wherein, in use, the camera is configured to capture an image of one or more samples on the sample carriage; and

a non-transitory computer-readable memory storing computer program instructions executable by one or more computer processors to perform operations for data collection, the operations comprising:

capturing an image of the one or more samples using the camera;

performing image recognition on the captured image of the one or more samples to identify different sample types and spatially index sample arrays, wherein performing image recognition comprises performing image thresholding on the captured image to binarize the captured image, performing edge detection on the binarized image to identify sample boundaries, and performing blob detection on the binarized image to locate sample positions; and

performing measurements to characterise the one or more samples using the characterisation probe.

2. The data collection apparatus according to claim 1, wherein each of the first, second and third linear stages is driven by a microstepper motor.

3. The data collection apparatus according to claim 2, wherein each of the first, second and third linear stages further comprises a plurality of linear bearings coupled to the microstepper motor by a pulley system.

4. The data collection apparatus according to any one of the preceding claims, further comprising first and second optical endstops operable to determine real-time positions of the sample carriage and the probe carriage along the first and second axes, respectively.

5. The data collection apparatus according to any one of the preceding claims, wherein the characterisation probe is one of an electrical probe and an electrochemical probe.

6. The data collection apparatus according to claim 5, wherein the electrical probe is one of a four-point probe and a Hall-effect probe.

7. The data collection apparatus according to claim 5, wherein the electrochemical probe is one of an ion-selective electrode and a magnetic probe.

8. The data collection apparatus according to any one of claims 1 to 7, wherein the operation of performing image recognition on the captured image further comprises:

performing image registration on the captured image by detecting a sample substrate.

9. The data collection apparatus according to any one of claims 1 to 8, wherein the operation of performing image recognition on the captured image further comprises:

labelling the located sample positions.

10. A computer-implemented data collection method using the data collection apparatus of any one of the preceding claims, comprising executing on one or more processors the steps of:

capturing an image of the one or more samples using the camera;

performing image recognition on the captured image of the one or more samples to identify different sample types and spatially index sample arrays; and

performing measurements to characterise the one or more samples using the characterisation probe,

wherein the step of performing image recognition on the captured image comprises performing image thresholding on the captured image to binarize the captured image, performing edge detection on the binarized image to identify sample boundaries, and performing blob detection on the binarized image to locate sample positions for subsequent measurements.

11. The computer-implemented data collection method according to claim 10, wherein the step of performing image recognition on the captured image further comprises:

performing image registration on the captured image by detecting a sample substrate.

12. The computer-implemented data collection method according to claim 10 or claim 11, wherein the step of performing image recognition on the captured image further comprises:

labelling the located sample positions.