longest time to access because access must be synchronized across the thread blocks operating on the device. Thus, in some embodiments, the processing of each cell image is coded such that it primarily utilizes registers and shared memory and only utilizes device memory as necessary to move data in and out of a thread block.

[0043] The embodiments of the present disclosure may be implemented with any combination of hardware and software. For example, aside from parallel processing architecture presented in FIG. **9**, standard computing platforms (e.g., servers, desktop computer, etc.) may be specially configured to perform the techniques discussed herein. In addition, the embodiments of the present disclosure may be included in an article of manufacture (e.g., one or more computer program products) having, for example, computer-readable, non-transitory media. The media may have embodied therein computer readable program code for providing and facilitating the mechanisms of the embodiments of the present disclosure. The article of manufacture can be included as part of a computer system or sold separately.

[0044] While various aspects and embodiments have been disclosed herein, other aspects and embodiments will be apparent to those skilled in the art. The various aspects and embodiments disclosed herein are for purposes of illustration and are not intended to be limiting, with the true scope and spirit being indicated by the following claims.

[0045] An executable application, as used herein, comprises code or machine readable instructions for conditioning the processor to implement predetermined functions, such as those of an operating system, a context data acquisition system or other information processing system, for example, in response to user command or input. An executable procedure is a segment of code or machine readable instruction, sub-routine, or other distinct section of code or portion of an executable application for performing one or more particular processes. These processes may include receiving input data and/or parameters, performing operations on received input data and/or performing functions in response to received input parameters, and providing resulting output data and/or parameters.

[0046] A graphical user interface (GUI), as used herein, comprises one or more display images, generated by a display processor and enabling user interaction with a processor or other device and associated data acquisition and processing functions. The GUI also includes an executable procedure or executable application. The executable procedure or executable application conditions the display processor to generate signals representing the GUI display images. These signals are supplied to a display device which displays the image for viewing by the user. The processor, under control of an executable procedure or executable application, manipulates the GUI display images in response to signals received from the input devices. In this way, the user may interact with the display image using the input devices, enabling user interaction with the processor or other device.

[0047] As used herein, the term "module" can refer to either or both of: (i) a software component that causes an electronic device to accept various inputs and generate certain outputs; or (ii) an electronic input/output interface, such as a panel, frame, textbox, window or other portion of a GUI.

[0048] The functions and process steps herein may be performed automatically or wholly or partially in response to user command An activity (including a step) performed automatically is performed in response to one or more executable instructions or device operation without user direct initiation of the activity.

[0049] The system and processes of the figures are not exclusive. Other systems, processes and menus may be derived in accordance with the principles of the invention to accomplish the same objectives. Although this invention has been described with reference to particular embodiments, it is to be understood that the embodiments and variations shown and described herein are for illustration purposes only. Modifications to the current design may be implemented by those skilled in the art, without departing from the scope of the invention. As described herein, the various systems, subsystems, agents, managers and processes can be implemented using hardware components, software components, and/or combinations thereof. No claim element herein is to be construed under the provisions of 35 U.S.C. 112(1) unless the element is expressly recited using the phrase "means for."

1. A computer-implemented method for detecting out of focus microscopy images, the method comprising:

acquiring a plurality of microscopy images depicting cells;

extracting one or more sets of pixels from the plurality of microscopy images, wherein each set of pixels corresponds to an independent cell;

assigning one of a plurality of image quality labels to each set of pixels indicating the degree to which the independent cell is in focus;

training a classifier to classify the set of pixels into the plurality of image quality labels, wherein the classifier is configured according to a multi-layer architecture and the training results in determination of a plurality of weights for connecting layers in the multi-layer architecture;

creating a deployment of the classifier based on the multi-layer architecture, the plurality of weights, and the plurality of image quality labels.

2. The method of claim **1**, wherein the classifier is a convolutional neural network.

3. The method of claim **1**, wherein the microscopy images are synthetic images generated by:

using a deep convolutional general adversarial network (DCGAN) to generate the synthetic images at a plurality of different foci based on a training set of images.

4. The method of claim **1**, wherein the one or more sets of pixels are extracted from the plurality of microscopy images using a process comprising:

averaging the plurality of microscopy images to yield an average image;

subtracting the average image from the plurality of microscopy images to yield a plurality of transformed microscopy images;

applying adaptive thresholding to the plurality of transformed microscopy images to yield a plurality of thresholded microscopy images;

applying one or more exclusion criteria to the plurality of thresholded microscopy images to remove one or more pixels from the plurality of thresholded microscopy images corresponding to non-cell components;

following application of the exclusion criteria, applying connected components analysis to the plurality of