S P E C I F I C A T I O N

Mobile Image Quality Assurance in Mobile Document Image Processing Applications

BACKGROUND

RELATED APPLICATIONS

[0001]   The present application is related to U.S. Patent Application No. 12/346,071, titled "METHODS FOR MOBILE IMAGE CAPTURE AND PROCESSING OF DOCUMENTS" filed on December 30, 2008, U.S. Patent Application No. 12/346,091, titled "SYSTEMS FOR MOBILE IMAGE CAPTURE AND PROCESSING OF DOCUMENTS" filed on December 30, 2008, and U.S. Patent Application No. 12/717,080, titled "SYSTEMS FOR MOBILE IMAGE CAPTURE AND PROCESSING OF CHECKS" filed on March 3, 2010 which are hereby incorporated by reference in their entirety.

BACKGROUND

1.   Technical Field

[0002]   The embodiments described herein relate to processing images of documents captured using a mobile device, and more particularly to techniques for assuring the quality of document images captured by a mobile device to be used in processing the document.

2.   Related Art

[0003]   Banks and other businesses have become increasingly interested in electronic processing of check and other documents in order to expedite processing of these documents. Users can scan a copy of the document using a scanner or copier to create an electronic copy of the document that can be processed instead of routing a hardcopy of the document from one

place to another for processing. For example, some banks can process digital images of checks and extract check information from the image needed to process the check without requiring that the physical check by routed throughout the bank for processing.

[0004]   Mobile phones that incorporate cameras have also become ubiquitous. However, the quality of images captured varies greatly, and many factors can cause images captured using a mobile phone to be of poor quality. Therefore, images captured by mobile phones are often not of sufficiently high quality to be used for electronic processing of documents.

SUMMARY

[0005]   Systems and methods for assuring the quality of mobile document image captured using a mobile device, such as a mobile phone, are provided. These techniques can be implemented on a mobile device and can be used to perform various tests to assess the quality of images of documents captured using the mobile device. The tests can be selected based on the type of document that was imaged, the type of mobile application for which the image quality of the mobile image is being assessed, and/or other parameters such as the type of mobile device and/or the characteristics of the camera of the mobile device that was used to capture the image. In some embodiments, the image quality assurance techniques can be implemented on a remote server, such as a mobile phone carrier's server or a web server, and the mobile device routes the mobile image to be assessed and optional processing parameters to the remote server processing and the test results can be passed from the remote server to the mobile device.

[0006]   According to an embodiment, a mobile document image quality assurance system for assessing the quality of mobile document images captured by a mobile device is provided. The system includes a preprocessing module and a test execution module. The preprocessing module is configured to receive a mobile document image captured using a camera of a mobile

device and processing parameters for configuring the system for testing the mobile document image, extract a document subimage from the mobile document image, the document subimage, and select one or more mobile image quality assurance tests to be performed on the mobile image based at least in part on the processing parameters. The test execution module is configured to execute the one or more mobile image quality assurance tests on the document subimage to assess the quality of the mobile image, and reject the mobile document image if the image fails at least one mobile image quality test.

[0007] According to another embodiment, a computer-implemented method for assessing the quality of mobile document images captured by a mobile device is provided. The method includes receiving a mobile document image captured using a camera of a mobile device and processing parameters for configuring the system for testing the mobile document image, extracting a document subimage from the mobile document image, the document subimage, selecting one or more mobile image quality assurance tests to be performed on the mobile image based at least in part on the processing parameters, executing the one or more mobile image quality assurance tests on the document subimage to assess the quality of the mobile image, and rejecting the mobile document image if the image fails at least one mobile image quality test.

[0008] These and other features, aspects, and embodiments are described below in the section entitled "Detailed Description."

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] Features, aspects, and embodiments are described in conjunction with the attached drawings, in which:

[0010] Fig. 1 is a high level block diagram of a system for performing mobile image quality assurance according on images captured by a mobile device;

[0011]   Fig. 2 is a flow diagram of a process for performing mobile image quality assurance on an image captured by a mobile device according to an embodiment;

[0012]   Fig. 3 is a flow diagram of a process for performing mobile image quality assurance on an image of a check captured by a mobile device according to an embodiment;

[0013]   Fig.4A is an example of a mobile image captured by a mobile device according to an embodiment;

[0014]   Fig. 4B is an example of a snippet generated by a mobile document image processing engine from the mobile image illustrated in Fig. 4A;

[0015]   Fig. 5A is an example of a mobile image captured by a mobile device according to an embodiment;

[0016]   Fig. 5B is an example of a blurry mobile image of the document illustrated in Fig. 5A according to an embodiment;

[0017]   Fig. 6 is an example mobile image of a shadowed document according to an embodiment;

[0018]   Fig. 7 is an example of a mobile image having low contrast according to an embodiment;

[0019]   Fig. 8 is a method for testing the contrast of a mobile image according to an embodiment;

[0020]   Fig. 9A is an example of a mobile image of a document having significant plane skew according to an embodiment;

[0021]   Fig. 9B is an example of a mobile image of a document having view plane skew according to an embodiment;

[0022]   Fig. 10 is a method for testing the skew of a mobile image according to an embodiment;

[0023]   Fig. 11 is an example of a mobile image where the corner of the imaged document is cut off according to an embodiment;

[0024]   Fig. 12 is a method for testing whether one or more corners of a document in a mobile image have been cut off according to an embodiment;

[0025]   Fig. 13 is an example of a mobile image where the side of the imaged document is cut off according to an embodiment;

[0026]   Fig. 14 is a method for testing whether a side of a document in a mobile image have been cut off according to an embodiment;

[0027]   Fig. 15 is an example of a mobile image where the image of the document is warped according to an embodiment;

[0028]   Fig. 16 is an example method for testing whether a document in a mobile image is warped according to an embodiment;

[0029]   Fig. 17 is an example of an mobile image where document subimage captured in the mobile image is small compared to the overall size of the mobile document image according to an embodiment;

[0030]   Fig. 18 is a method for testing whether the size of the image captured in a mobile image is too small;

[0031]   Fig. 19 is a method for testing whether a MICR line of the document captured in a mobile image is of high enough quality according to an embodiment;

[0032]   Fig. 20 is a method for testing the aspect ratios of the front and back images of a check to test whether the images are of the same check according to an embodiment;

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