PATENT
APPLICATION

of

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On

SYSTEMS FOR MOBILE IMAGE CAPTURE AND PROCESSING OF CHECKS

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SYSTEMS FOR MOBILE IMAGE CAPTURE AND PROCESSING OF CHECKS

Related Application

[0001] This application claims the benefit of US, Provisional application(s) Serial Number 61/022,279 filed January 1, 2008, which is hereby incorporated herein by reference.

Field of the Invention

[0002] The present invention relates generally to automated document processing and more particularly, to systems and methods for document image processing that enhances an image for data extraction from images captured on a mobile device with camera capabilities.

Background of the Invention

[0003] In general, financial institutions have automated most check processing systems by printing financial information, such as account numbers and bank routing numbers, onto the checks. Before a check amount is deducted from a payer's account, the amount, account number, and other important information must be extracted from the check. This highly automated form of extraction is done by a check processing control system that captures information from the Magnetic Ink Character Recognition ("MICR") line. The MICR line consists of specially designed numerals that are printed on the bottom of a check using magnetic ink. The MICR data fields include the bank routing number, bank transit number, account number, check serial number, check amount, process code and extended process code.

[0004] Checks and other documents may be processed by banks and other financial institutions in large numbers. The documents that may be processed might include checks, deposit slips, payment slips, etc. In some cases the banks or other financial institutions may be required to use the actual physical documents. For example, checks might need to be transported between multiple banks or other financial institutions. This may slow down the processing of financial documents. In addition, other types of documents that are non-financial in nature may be processed by businesses and other institutions in large volumes.

Summary of the Invention

[0005] In order to facilitate processing of a document depicted in an image captured by a mobile device, embodiments of the systems and methods described herein provide image optimization and enhancement such that data can be extracted from the document. Some systems and methods described herein specifically involve a mobile communication device capturing an image of a document and then transmitting that image to a server for image optimization and enhancement.

[0006] The present invention relates to automated document processing and more particularly, to methods and systems for document image capture and processing using mobile devices. In accordance with various embodiments, methods and systems for document image capture on a mobile communication device are provided such that the image is optimized and enhanced for data extraction from the document as depicted. These methods and systems may comprise capturing an image of a document using a mobile communication device; transmitting the image to a server; and processing the image to create a bi-tonal image of the document for data extraction. For example, a mobile communication devices, such as a camera phone, would transmit the image of the document to the server, where the image is processed and results in a bi-tonal image of the document.

[0007] Some embodiments of the invention may allow the users to transmit images of the documents using a mobile communication device. Additionally, methods and systems are disclosed that allow the transmission of such information using a mobile communication device such as, for example, a mobile telephone handset with a camera (also known as a camera phone). Many people may benefit from these systems and methods because a large number of people currently carry and use handheld mobile communication devices.

[0008] In accordance with some embodiments of the invention, methods and systems for document capture on a mobile communication device further comprise requiring a user to login into an application. In this way access to the document capture system using a mobile communication device might be limited to authorized users. The methods and systems may further comprise selecting a type of document and entering an amount. Some systems may receive a status at the mobile communication device.

[0009] In other various embodiments, processing the image may comprise processing the image on the mobile communication device, processing the image on the server or processing the image on the mobile communication device and the server. Processing the image may comprise converting the image to gray-scale, detecting a quadrangle and correcting the image. In some embodiments, processing the image may comprise converting the image to a bi-tonal image.

[0010] In yet other embodiments, the methods and systems in accordance with the invention may comprise capturing an image of a document using the mobile communication device; automatically detecting the document within the captured image; geometrically correcting the image; binarizing the captured image; correcting the orientation of the captured image; correcting the size of the captured image; and outputting the modified captured image of the document.

[0011] In further embodiments, the automatic detection of the document may comprise determining a plurality of corners belonging to the document depicted within the captured image. In yet further embodiments, the automatic detection of the document may comprise converting the first image to a color "icon" image; reducing color within the color "icon" image, thereby resulting in a gray-scale "icon" image; and determining the plurality of corners belonging to the document depicted within the captured image.

[0012] In other embodiments, the geometric correction comprises reducing color within the captured image, resulting in a gray-scale image; building a projective transformation model that maps the document within the gray-scale image to a gray-scale document image; and applying the projective transformation model to the first image, resulting in the gray-scale document image. Further embodiments include a geometric correction further comprising correcting the orientation of the document within a gray-scale "icon" image if the document within the captured image is in landscape orientation; and building the projective transformation model from the gray-scale "icon" image.

[0013] In some embodiments, correcting the orientation of the captured image comprises correcting the orientation of the document within the third image if the document is in upside-down orientation. In some such embodiments, correcting the orientation of the captured image further comprises determining the orientation of the document within the third image using an MICR-line on the document.

[0014] In other embodiments, correcting the size of the fourth image comprises reading a relevant object of a known position on the document within the captured image; computing an average width of the relevant object; computing a scaling factor based on the average width of the relevant object; using the scaling factor to determine whether the captured image needs a size correction; applying a size correction to the captured image, resulting in a resized image; geometrically correcting the resized captured image, resulting in a corrected captured image; binarizing the corrected captured image, resulting in a binarized image; and outputting the binarized modified captured image.

[0015] In various embodiments, the captured image is a color image. In other embodiments, the outputted modified captured image is a bi-tonal image of the document. In yet further embodiments, the outputted modified captured image is a gray-scale image of the document.

[0016] In further embodiments, the mobile communication device is a camera phone. In yet further embodiments, the mobile communication device tranmists the image od the document to the server. In some of these embodiments, once the server receives the image, the image processed, resulting in a optimized and enhanced image.

[0017] In some embodiments of the invention, a computer program product is provided, comprising a computer useable medium having computer program code embodied therein for enabling a computing device to perform operations in accordance with some of the methods described herein.

[0018] Other features and advantages of the present invention should become apparent from the following description of the preferred embodiments, taken in conjunction with the accompanying drawings, which illustrate, by way of example, the principles of the invention.

Brief Description of the Drawings

[0019] The present invention, in accordance with one or more various embodiments, is described in detail with reference to the following figures. The drawings are provided for purposes of illustration only and merely depict typical or example embodiments of the invention. These drawings are provided to facilitate the reader's understanding of the invention and shall

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