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Applications
- Optical character recognition
- Handwriting recognition

Inventors

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Computationally Distinguishing Handwritten Pencil Marks from Preprinted Marks in a Scanned Document

Written surveys and assessments are routinely administered by providing users (respondents) with response sheets which include pre-printed artwork and locations for the user to enter responses. In the automated response evaluation process, the user marks must be separated from the pre-printed artwork on the response sheet, so the pre-printed artwork is "dropped out" to create a document including only the user response marks, and other necessary information typically used in OMR (optical mark reader) processing. Conventionally, separating user response marks from background material, such as the pre-printed artwork, requires the use of an expensive infrared scanner and non-carbon-bearing inks and also required pre-knowledge of the artwork as part of the decoding process.

Invention

The present invention systematically detects and isolates the graphite elements in scanned test documents with varying background colors and artwork without the need for an infrared scanner and non-carbon-bearing inks. A sequence of image processing operations and a pattern recognition algorithm is used to isolate the graphite response image from a test document by systematically removing the components of the background image. The image processing operations consist of grayscale, color segmentation and the application of the Hough transform. Components that are not removed by image processing operations are identified by calculating their texture features, and removed using a multivariate Gaussian classifier.

Key Advantages
- Allows boxes and artwork to be decoded without the need for an expensive infrared scanner or non-carbon bearing inks
- Pre-knowledge of the background elements are not required
- Allows for optical mark recognition sheets to be customized according to specific needs
- Allows for a reduction of file size as large image files containing the background information are no longer required for each document tested

Status

U.S. patent #9,019,570 was issued on April 28, 2015. The technology is available for license.

Other opportunities related to this technology, included but not limited to sponsored and/or collaborative research, may be available. Please reach out to the designated contact identified at left for more information.