



Handwritten manuscripts image binarization

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**Workshop on Intelligent System and
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Abstract

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Handwritten manuscripts images are very important, since they contain a lot of information which they help us and all generations in increasing the knowledge base in different sciences such as; Chemistry, Physics, biology and etc.

Introduction

- Preserving the content of historic handwritten manuscripts are important for a variety of reasons. On the other hand, digital libraries are rapidly expanding and thus facilitate to store this information directly in digital form. For digitizing text documents, a crucial step is to binarize the captured images to separate the text from the background (Aboul Ella 2016).

Problem statement (graphical)



(a)



(b)

Fig. 1. Samples of degraded handwritten Arabic manuscripts. These images are collected from different websites.

Problem statement (cont.)

Fig. 2. Sample of degraded handwritten Arabic manuscript



Problem statement (DIBCO / H DIBCO)

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Fig. 2. Samples of degraded handwritten DIBCO / H DIBCO datasets

Scene text recognition

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Related work

Many binarisation methods have been proposed in the literature. Otsu's method depend on one threshold value while Niblack's and Sauvola's used different threshold values for regions based on local image statics. For degraded images, such local methods give typically better results compared to global approaches.

Proposed approach

- Starting with applying the optimization algorithm on the handwritten degraded manuscripts image for minimizing the distance between clusters in K -means.
- Depending on the gotten cluster centers to created BW (white, black) representing the foreground by white pixels where the darkest cluster denotes to the text.
- Actually. At each iteration, each search agent updates their position according to
to
(the best position).
- Finally, the cluster centers are updated and the binary image is created.

Performance measure (DIBCO / H DIBCO)

- **F-measure.** is a test of accuracy based on both precision and recall, where precision is the proportion of true positives to true positives and false positives and recall is the proportion of true positives to true positives and false negatives.
- **Pesudo-F-measure.** first used as a performance metric in DIBCO 2010. it is based on skeletonized ground truth.
- **PSNR.** Peak signal-to-noise ratio (PSNR) is a commonly used performance measure of how close one image is to another image. Hence a higher value indicates a higher similarity between two images.
- **DRD.** Distance Reciprocal Distortion Metric (DRD) measures the visual distortion in binary document images. Low value indicates to the best binary image.
- **NRM** (negative rate metric). Measures pixel mismatch rate between the ground truth image and the resulting image.
- **MPM** misclassification penalty metric (MPM). measures how well the resulting image represents the contour of ground truth image.

Quality Measures

Standard binarization quality evaluation process.

The document image is RGB or Gray-scale, while the binarization and the ground truth are white and black images.

The quality metric measures the observance of the binarization to the ground truth.

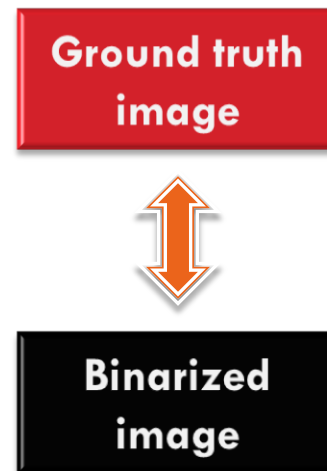


Fig. 3. Pixel based evaluation.

Approach Evaluation

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Visual inspection.

It is a process which it was done by an expert who able to discover any misclassified pixels, as well as, he checked each text carefully.



Fig. 4. Visual inspection

Application. Quality assurance of strip steel

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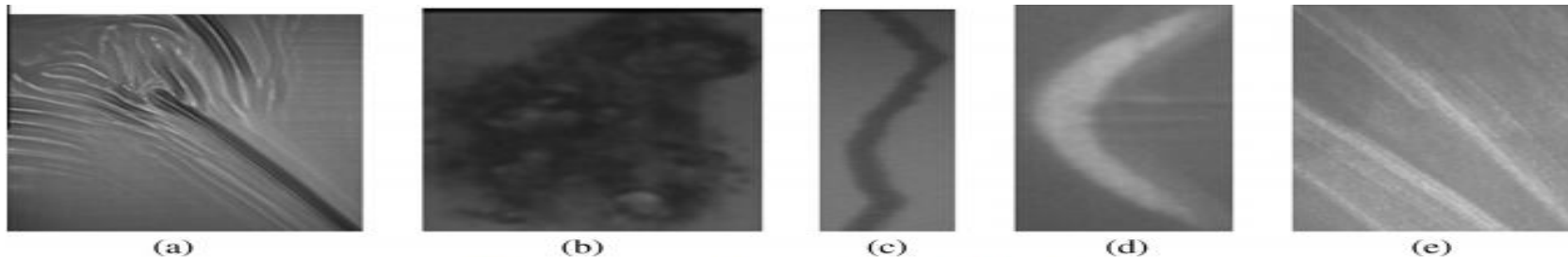


Fig. 6. Five images from the five kinds of strip steel defect image.



Fig. 6. Five images from the five kinds of strip steel defect image.(Maofu Liu et al. 2015.)



Application.

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OCR.

Word spotting.

Indexing.

Application.

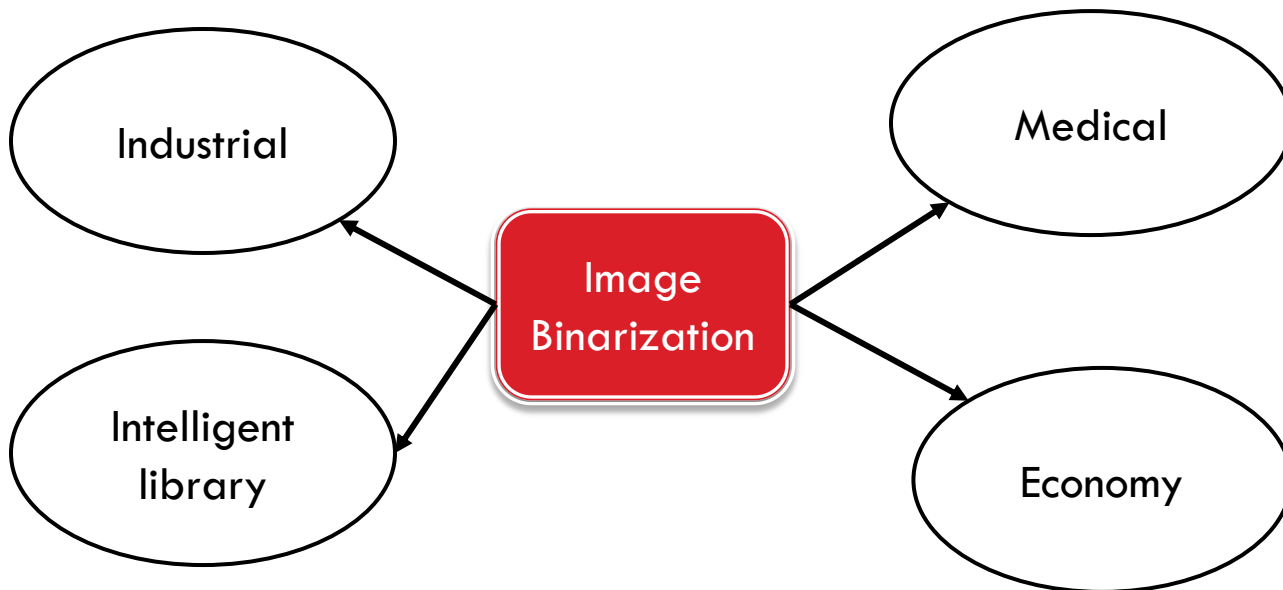


Fig. 6. Taxonomy of Image binarization and its applications

Conclusions and future work

- In this lecture, a quick review about handwritten manuscripts image binarization is presented.
- A solution based on swarm optimization algorithm is proposed.
- Finally, different application were presented.

Notes; all presented images are collected form internet as well as DIBCO / H DIBCO datasets.

Knowledge is the real investment

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