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Image-Abstraction Framework as a Preprocessing Technique for Extraction of Text From Underexposed Complex Background and Graphical Embossing Images

Pavan Kumar, Jawaharlal Nehru New College of Engineering, India
https://orcid.org/0000-0002-9372-9065
Poornima B., Bapuji Institute of Engineering and Technology, India
H. S. Nagendraswamy, University of Mysore, India
C. Manjunath, Jawaharlal Nehru National College of Engineering, India
B. E. Rangaswamy, Bapuji Institute of Engineering and Technology, India

ABSTRACT

Underexposed heterogeneous complex-background and graphical embossing text documents are treated using proposed preprocessing image-abstraction framework that can deliver the effective structure preserved abstracted output by manipulating visual-features from input images. Reading of the text character in such images is extremely poor; hence, the framework effectively boosted the significant image properties and quality features at every stage. Work effectively preserves the foreground structure of an image by comprehensively integrating the sequence of NPR filters and diminishes the background content of an image, and in this way, the framework contributes to separation of foreground text from image background. Effectiveness of the proposed work has been validated by conducting the trials on the selected dataset. In addition, user's visual-feedback and image quality assessment techniques were also used to evaluate the framework. Based on the obtained abstraction output, this work extracts text-character by wisely utilizing traditional image processing techniques with an average accuracy of 98.91%.

KEYWORDS

Coherence Shock Filtering (CSF), Connected Component Analysis (CCA), Image Abstraction, Joint Laplacian Interval Gradient Filtering (JLIGF), KiranaTMO (K-TMO), Non-Photorealistic Rendering

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1. INTRODUCTION

In the prehistoric days palm leaves were used to carry information in script form. Extraction of text information from preserved leaves is a real challenging issue due to the organic nature of leaves which makes them decay gradually over the years, resulting in difficulty in extracting the information. Hence, recognition and extraction via traditional computer vision techniques may not yield the good success rate. The advancement in science and technology facilitates end users to synthesize, modify and capture the heterogeneous data using image acquisition devices and multimedia interactive tools. This led to collection of millions of digital documents in the form of digital electronic medium, digital-videos and still photographs published and stored in various social sites and storage repositories. According to the 2019 Flickr survey there are about 100 millions images stored every month in the Flickr repository. Availability of multimedia interactive tools allows the end users to stylize and enhance the image background using rich graphical elements in a sophisticated way and multimedia documents become more attractive and colorful although extraction of text information remains elusive. Analysis and extraction of text information in multimedia still photography is very much essential in the computer vision domain for the analysis of information in the image. Text in an image plays a very important role and furnishes indispensable information to make optimal decisions like document analysis, content based text information retrieval, identification of vehicle number plate, identification of street sign, guidance to blind people, automatic geo-coding, automatic email sorting, unmanned assistive navigation of vehicle, recognition of varies physical parts in industrial automations, guidance for foreign tourists (Lu, S, et al., 2015).

Text extraction from uniform background is much easier than underexposed heterogeneous complex background and graphical embossing images (to be referred as sampled images). The sampled 2D images not only consist of the text information but also non-textual information and are considered to be a mixture of natural scene text images, caption text images and documentary text images. Graphical embossing images are the combination of document text images and natural scene text images and in most of the situations they are captured via camera by amateur users and the text extraction process becomes tedious under this condition. Some of the examples of sampled 2D images are magazine papers, marks/grade cards, decorated power point slides, news papers, children story books and random clicking of images captured under low-illumination condition etc (P.Nagabhushan and S. Nirmala, 2010).

Since two decades various traditional text extraction techniques are being developed to extract the text from complex background by many researchers such as multilevel thresholding, adaptive local thresholding, global thresholding, gamma correction algorithm, histogram equalization, wavelet decomposition and combination of wavelet and moments of DWT wavelets and HAAR wavelets, homomorphic filtering, local binarization, connected component analysis (CCA) technique, hybrid binarization K-mean clustering (HBK), histogram oriented gradients, expectation maximization (EM), constrained run length algorithm (CRLA), morphological operations, median filtering, canny edge detection, sobel edge detection, markov random field (MRF), spiral run length smearing algorithm (SRLSA), support vector machine (SVM), hybrid CCA etc. Despite of all this, the best result is not possible by adopting the above mentioned one or two text extraction techniques. With the increase of multimedia image data is vehemently demands extraction of text from the sampled images. However, extraction of text from these 2D color images is not so easy because of various constraints posed in the extraction process by situations such as text characters embedded in graphically embossed background images, shading of characters being mixed with graphical embossing images, background of image content being stylized and text having multiple color in the background and foreground, varying text size with respect to row and column with variable distance in between them. A typical single page line text character may contain multiple colors for better visualization, edge strength of the text character may vary from character to character due to improper illumination effect and orientation of the text character in an image may be inconsistent and poor in contrast. In addition to

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