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Optimising Kannada CBIR Using Particle Swarm Optimization

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Abstract: ***Content-based Image Retrieval (CBIR) makes use of the visual contents of an image such as color, shape, texture, and spatial design to represent and index the image. Active research in CBIR is gear in the direction of the development of methodologies for examining, interpreting cataloguing and indexing image databases. This paper presents an effective content based document image retrieval process for a Kannada document image collection. The data is pre-processed and features Gabor and Shape are extracted and an effective particle swarm optimization (PSO) algorithm is used to increase the content based image retrieval in colossal collection of document images. Performance evaluation using distinctive datasets of Kannada document shows the effectiveness of our approach.***

Keywords: CBIR; Gabor and Shape based Features; particle swarm optimization (PSO).

I. INTRODUCTION

Modern-day technologies have made it possible to easily produce, process, store, and transmit documents efficaciously. In an attempt to move forward in the direction of the paperless official transaction, a large volumes of printed files are now being scanned, digitized and saved as images in databases. In recent years, there has been so much interest developed in the area of document image retrieval systems. The ever increasing quantity of multimedia data creates a requirement for new refined ways to retrieve the information one is looking for. Content based image Retrieval (CBIR) employ image own information, in which the most commonly it is by means of the similarity comparison of image features such as color, texture, shape and structure of the layout, and so on, and then the related features of each image is used for retrieval. Recognition of the words in a document image is of most important for retrieval.

Document image Retrieval systems are now lucidly made available for printed Roman, Korean, English, Chinese language, and different oriental scripts. However, these provision for Indian scripts is still at an infrequency. The present work here addresses the problems involved in designing a font and dimension independent document image retrieval system for several printed Kannada textual content in a pool. Kannada is the reputable language of the south Indian State- Karnataka. Understanding Kannada characters is more knotty than many other Indian scripts, this is because of higher similarity in character shapes, a higher collections of characters and greater unpredictability crossways fonts within the characters belonging to the same character class.

The quick progress of technology has overcome the disadvantage of storing data of physical written information. We have huge data storage systems. Still, a huge quantity of people would be required to act together more frequently with computer systems. To make the human–computer interaction more potent in such instances, it's desirable to have programs capable of handling inputs in a form of varieties comparable to printed/handwritten paper documents. If the computers have to efficaciously process the scanned images of printed documents, the systems ought to be more sophisticated. Even though computer systems are used widely in nearly all the fields, surely paper documents occupy an awfully predominant place for a longer period. In addition, significant share of all sorts of trade inscription conversation exist in physical type for various functions, for example, to fax a document, to produce a document in the court, and so on. Therefore, application to mechanically extract, analyze and store expertise from the previous paper form is very much needed for maintenance and access wherever essential. All these methods go under the title of file image evaluation, which has acquired value as a major research concern in the recent days.

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II. RELATED WORK

In the course of project, we have considered many such previous works of this field by range of researchers. There is an availability of many approaches to be followed by diverse researchers such as Correlation based algorithms, font and size based, Characterization of the Image, Entropy based and segmentation and binarization based. Some of the previous works are given below.

Nithya.E. et al (2013) proposed an approach for content based Kannada image retrieval [1]. Initial step they followed is to pre-process an image for the removal of the noise if present in the input image and then it will be followed by the proocess of segmentation. Morphological operation is here considered like a repetitive dilations of the intended image, which can be called as marker image, until and unless the contour part of the marker image is made to fit behind a second image, which can be called as the mask image. Gabor base feature and shape based features are then extracted from the training images. this is done to match features of query image. In this paper [2] Namrata Dave has described a few methodologies which is to segment a given text document image. To achieve this segmentation involved in a text based image will now depend upon the presence of course of action in the given document. The exterior of course of action will eliminate the likelihood of expected twist. More than the this, course of action will restrict the character size in accordance of the total process of segmentation to become a basic sailing [8][9][10].

Mostafizur Rahman and Muzameel Ahmed have put together about an approach regarding 2-D shape characterization[3] for content based image retrieval. Based upon the three main factors they have further done retrieval of images. The first factor is morphological means such as opening and closing dilation, erosion. The second factor is in identification of the type of images used in contour based approach. The third factor will combine both first and second factors in a way to find analogous images in a database. SVM was used to be a classifier. Jomy John, Pramod K. V and Kannan Balakrishnan made a study work on Handwritten Recognition System of South Indian Language scripts. In this paper [4] they have made reviews on multiple papers and algorithms made use by each of papers referred and their corresponding results.

In this paper [5]Thanuja C andShreedevi G R all together proposed on Content Based Image Retrieval System for Kannada Query Image from Multilingual Document Image Collection; here they presented a visual clues based approach in order to identify the Kannada text in other many languages like Hindi, English and Malayalam documents. M.C. Padma and P.A.Vijaya thought about Extracted Texture based features dealt for the purpose of automatic script identification [6].

III. EXISTING SYSTEM

Content based approach is to manage image document pool with their visual contents. These visual contents will define their characteristics. For the purpose of indexing the image in the database we will take characteristics like texture, color, spatial relation and others. Initially the extraction of these characters is done then matching the similarities in them is to be carried out. Defining them each at a time is tougher. The usage of global color contents and shape characters is dealt hand in hand, other times combinations are dealt. Combining some or few of them sounds better but will result in addition unrelated images. Figuring out the similarities is far from human perception. Bridging this semantic gap is at most important. Shape content is comparatively more difficult to quantify. Only one feature can't fully define an image. There can result in loss of data too. This scenario should be dealt in dual step. Initially we lessen the search range and then improve precession for getting similar search result.

IV. PROPOSED SYSTEM

Today's technologies have made it possible to produce, process, store, and transmit document images efficaciously. In an effort to transport in the direction of the paperless office, huge quantities of printed records are scanned, digitized and stored as images in databases. There was so much interest in the study field of document image retrieval these days. The ever mounting amount of multimedia knowledge creates a need for new sophisticated methods to retrieve the expertise one is looking for. Content based image Retrieval (CBIR) makes use of image own information, mainly by the resemblance of image features like colour, texture, shape and structure of the design, and so on, and the related features of each and every image for retrieval.

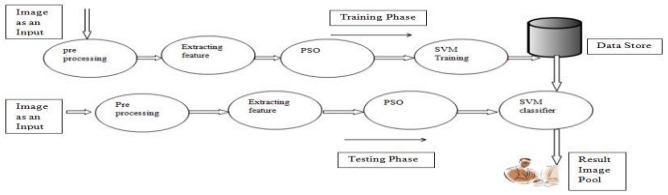

Figure 1: Proposed Architecture

In our proposed work, we partition the job in dual phases. they are testing and training phase. In the initial training phase we here train the text document taken under consideration by performing operations like extracting features from the pre-processed images. Extracted features are then stored in the hard core knowledge base. In the next phase i.e., testing phase, input document is now pre-processed. this preprocessing will include the resizing process of the image, grayscale, CLAHE and Wiener filter. Based upon the features extracted, that is the shape and Gabor features, we then will optimize the stored features by the simple application of practical swarm optimization (PSO) and retrieve the results. The work can be explained in simple words as below

A. PRE-PROCESSING

Pre-processing is a stage where the conversion of the input image will happen to gray scale image. This gray values range between 0-255. Contrast of an image will be distributed using CLAHE. The noise if present in the image should be removed using wiener filter.

CLAHE: In contrast limited histogram equalization (CLHE), the histogram is sliced at some particular threshold and then equalization is applied. Contrast limited adaptive

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histogram equalization (CLAHE) is an approach of adaptive contrast histogram equalization [11]. Here, the contrast of an image is tried to be enhanced using CLHE on small areas of data which are referred to as tiles instead of the complete image. The resultant next-door tiles are then combined back seamlessly by utilizing the concept of bilinear interpolation. The contrast in the homogeneous region will be limited in the way that noise amplification is avoided.

WIENER FILTER: The core intention of the Wiener filter is to take away noise that has tarnished a signal. It is based on a simple statistical approach. Natural filters are well designed for a expected frequency response. The Wiener filter approaches will filter from a very different angle. One is assumed to fully have knowledge on the spectral properties in the common signal and the noise. Then in addition, one should seek the LTI filter for which the output would come close to the original signal. Wiener filters are characterized by the following features.

- ✓ Assumption that signal and (additive) noise are very much stationary linear random processes with respect to known spectral characteristics.
- ✓ Requirement is that the filter should be physically realizable, in other words it should be causal. This requirement can be dropped, to get a non-causal solution.
- ✓ Performance criteria to be met is a minimum mean-square error.

B. FEATURE EXTRACTION

In this paper we extracted both the kinds of Gabor features and shape based features.

Gabor Feature is a two-dimensional band-pass spatial filter with special selectivity to both orientation frequency as well as spatial frequency. It is expressed as follows:

$$G(x,y,\theta_k) = G(x,y)\left[\cos(R) - \exp\left(-\frac{\sigma^2}{2}\right)\right] + iG_1(x,y) * \sin(R) \quad \text{eq. (1)}$$

$$G_1(x,y) = \frac{\lambda^2 \exp\left[-\frac{\lambda^2(x^2+y^2)}{2\sigma^2}\right]}{\sigma^2}, \sigma = \pi \quad \text{eq. (2)}$$

$$R = 2\pi[x\cos(\theta_k) + y\sin(\theta_k)], \quad \lambda = \frac{2\pi}{l} \quad \text{eq. (3)}$$

$$\theta_k = \frac{\pi k}{D}, k = 0,1,2, \dots \dots, D-1 \quad \text{eq. (4)}$$

Where l is the wave length, θ_k is the oscillation direction, and D is the number of directions.

For the purpose of extracting the Gabor features, initially elastic meshes are to be constructed on the character image and we let the center of each mesh to be the sampling point itself. Then the Gabor feature at the sampling point (x_m, y_m) is extracted as,

$$f_{gabor}(x_m, y_m) = \sum_{x=0}^{M-1}\sum_{y=0}^{N-1} f(x,y)\, G(x - x_m, y - y_m; l, v_k) \quad \text{eq. (5)}$$

Where M, N, is the size of filter image, $f(x,y)$ is the pixel value on each point (x,y).in practice amplitude of $f_{gabor}(x_m, y_m)$ is usually used as a feature.

C. OPTIMIZING USING PSO

Particle Swarm Optimization (PSO) is used for feature selection technique. PSO is a computational method that optimizes a problem by iteratively trying to improve a candidate solution with regard to a given measure of quality. The feature vectors are saved in the database with a pointer to the model image to which they are belonging. In the retrieval process, a query image is presented to the system and the features of the image are extracted as described above. Each individual feature vector from the query image is compared using the Euclidean distance measure with all the other features‟ vectors stored in the database of the model images. When improved positions are being discovered these will then come to guide the movements of the swarm. The process is repeated and by doing so it is hoped, but not guaranteed, that a satisfactory solution will eventually be discovered. The images are retrieved from database which is relevant to the given input image.

D. CLASSIFICATION: SVM

Support Vector Machines (SVMs) are well supervised learning methods for image classification. It will view the image database as two separate set of vectors in an ‘ n ’ dimensional space and then construct a separating hyper plane which will maximizes the margin in between the images relevant to query class and the images not relevant class of the query. SVM is found to be a kernel method and the kernel function used is very crucial for determining the performance. The crucial standard of SVMs is a maximum margin classifier. Usage of the kernel methods, the data can be implicitly mapped to a high dimensional kernel space. The maximum margin classifier is then determined in the kernel space and then the equivalent SVMs choice function in the original space can now be non-linear. The non-linear data in the feature space is here classified into linear data in kernel space by the SVMs. The main aim of SVM classification method is to figure out an optimal hyper plane separating relevant and irrelevant vectors by maximizing the size of the margin between both classes.

III. EXPECTED RESULTS AND DISCUSSIONS

In this section explains the results of the proposed system.

Figure 2: Shows the input image

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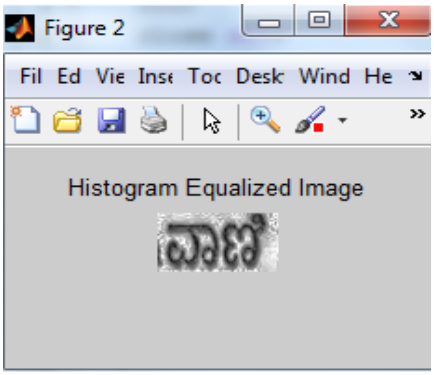

Figure 3: Shows the Histogram Equalization of input image

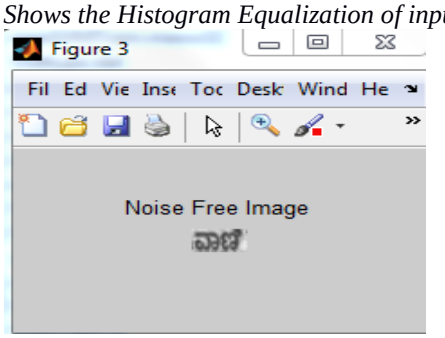

Figure 4: Shows Noise removal of the image

Figure 5: Shows the image retrieved.

IV. CONCLUSION

In this paper we have proposed a new methodology to recognize Kannada characters from content based document. PSO is an algorithm which we have adapted in our work. This approach will match the query document texts with the stored documents and then the character will be recognized.

V. FUTURE WORK

There is so much left to cover on this large topic of image retrieval and important algorithm called PSO. What would be interesting to do as a part of further study is to premeditated to travel around better strategies for the PSO retrieval system, which is independent of font size and style and to guarantee the absolute occurrences query image. It is to be set to take a trip around the higher level approach for better search efficiency in quality and speed in future. It would be interesting to do a further extensive performance judgment using different types of datasets, dealing more on scalability of frameworks and the proposed algorithms.

REFERENCES

[1] Nithya.E Dr. Ramesh Babuand Chandrakala, "A Font and Size Independent Content Based Retrieval System for Kannada Document Images", Computer Technology & Applications, Volume 4, Issue 2, pp 196-201, 2013.
[2] Namrata Dave, "Segmentation Methods for Hand Written Character Recognition", Volume 8, Issue 4, pp. 155-164, 2015.
[3] Mostafizur Rahman, Muzameel Ahmed, "2D Shape Image Retrieval System Based onthe Characterization of the Image", Volume. 4, Issue 8, August 2015.
[4] Jomy John, Pramod K. V and Kannan Balakrishnan, "Handwritten Character Recognition of South Indian Scripts: A Review", 2011.
[5] Thanuja C and Shreedevi G R, "Content Based Image Retrieval System for Kannada Query Image from Multilingual Document Image Collection", Volume 3, Issue 4, pp 1329-1335, Jul-Aug 2013.
[6] M.C. Padma and P.A.Vijaya, "Entropy Based Texture Features Useful for Automatic Script Identification", Volume 2, Issue 2, pp 115-120, 2010.
[7] Chandrakala H T, "A Kannada Document Image Retrieval System based on Correlation Method", Volume 77, Issue 3, September 2013.
[8] Rodolfo P. dos Santos, Gabriela S. Clemente, Tsang Ing Ren and George D. C. Calvalcanti, "Text Line Segmentation Based on Morphology and Histogram Projection", 2009.
[9] Dr.S.BasavarajPatil, "Neural Network based Bilingual OCR System: Experimentwith English and Kannada Bilingual Documents", Volume 13, Issue 8, January 2011.
[10] Ms V. A. Gaikwad and Dr. D.S.Bormane, "An Overview of Character Recognition Focused on OfflineHandwriting", Volume 1, Issue 3, December 2008.
[11] Neethu M. Sasi, V. K. Jayasree,Contrast Limited Adaptive Histogram Equalization for Qualitative Enhancement of Myocardial Perfusion Images, pp 326-331, 2013.