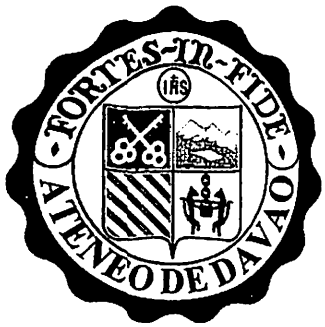
CREATING A CONTENT BASED IMAGE RETRIEVAL UTILITY USING OpenCV LIBRARIES



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ABSTRACT

Developing Content-based image retrieval (CBIR) utility/application is proposed to further the fields of Image Retrieval, Computer Vision and Digital Image Processing, in general. The proponents have seen the need to address the management of increasingly large image collections. Several industries have used CBIR in varied fields like Digital Forensics, Health Care and Medical Systems, Geomatics, Agriculture and other real-world applications that deal with large databases of digital images. Its forerunner and more common counterpart, image search and retrieval based on metadata has found to be limited in terms of usability and user preference in the different application contexts of the fields/industries that use it. Thus CBIR has been gaining acceptance, foothold and has become a widely-adapted method for searching immense image databases. It is content-based which means that the search will analyze the actual contents of the image by extracting its digital image properties also known as its digital signature rather than the metadata such as keywords, tags, and/or descriptions associated with the image. CBIR images are indexed on the basis of low-level features, such as color, texture, and shape that can automatically be derived from the visual content of the images. The software platforms that will be explored in this study include Image J, Matlab, Lire and etc. However, the proponents intend to develop the application and make use of OpenCV libraries by Dr. Vladimir Mariano of the University of the Philippines in Diliman that was given to us by our adviser, Ms. Michelle P. Ranawan. This study aims to fill in the gaps that will make CBIR more accurate in searching images and that will be easily used

by the end-users. The proposed utility will be searching for best matches to a given query, i.e. the entire image itself or a specific object in an image. Aside from similar images or images with instances of the query object in it, it also allows the user to filter the matches according to specific queries like color scheme requirements, object shape requirements, histogram values, and other queries.

Keywords:

Images, CBIR, Image Retrieval, histogram, segmentation, thresholding, rgb value extraction, grayscale, canny, contour

Chapter 1

INTRODUCTION

1.1 Background of the Study

The current image searching is based on the tags or metadata the image has, and with that stated the accuracy of the image retrieval is not that accurate because users can just add random tags to the image they provided even if the tag they made is not relevant to the image. The motivation of the study is to make image searching a content based and graphic search rather than keyword-based searches, another would be to make it easier to search for images because you do not need any more to know the exact keyword for the specific image you want but just a sample of that image you propose to be searched. The said study would be focused on photos and would be implemented as a search utility for the local file system. A major benefit of this study is to be able to manage large image collections; there have been various real-world applications of CBIR in education, geomantics, health care and other areas. This study aims to help improve the field of CBIR and this indirectly giving a positive result to all real-world applications currently using CBIR.

1.2 Technology Application Context

Also known as Query by Image Content (QBIC) and Content-based visual information retrieval (CBVIR). It is the application of computer vision techniques to the image retrieval problem, that is, the problem of searching for digital images in large databases.

By the term "content-based" it means that looking into and analyse the contents of the sample image rather than its metadata such as keywords, tags, descriptions associated to the image. Further more the word "content" in CBIR might refer to the colors, shapes, saturation, hue, or any more information that can be extracted from the image. Using

CBIR is desirable because as of now most applications rely purely on metadata and by that stated it returns a lot of images not related to the one being searched. Also by humans having to enter the keyword of images can be inefficient especially when the database is large, they may also not be able to capture the exact keyword that describes the image. Thus by developing a system that can filter images based on their content would provide better indexing and return more accurate results In doing so, the sample image would be segmented and necessary information from the image would be extracted to be used for analysis to come up with an output that is accurate.

The researchers have decided to use the libraries of OpenCV. OpenCV or Open Source Computer Vision is a library of programming functions for real time computer vision. It is also released under a BSD license and it is free for both academic and commercial use. OpenCv have many algorithms for different functions of a program and one of them is by image processing. The researchers used this libraries because it would generate more accurate results by using it's algorithms and it is free of use of every code.

1.3 Objective of the Study

The general objective of the study is to develop a CBIR application using the different Digital Image Processing techniques that will retrieve best matches to a user-provided query (or preferred digital signature).

And thus the Specific objectives are the following:

- To extract digital image properties (a.k.a. digital image signatures) of the query object/image and the images in the image database/collection/repository in the local file system;
- To be able to return images (a.k.a. "best matches") from a database which satisfy the digital signature or a combination thereof (a.k.a. "the filter criteria") of the query object/query image;
- To provide the user the flexibility of search criteria according to his/her preference;

1.4 Significance of the Study

This study is significant to all people who are related with imagery. This can be used in art collections, photograph archives, retail catalogs, medical diagnosis, crime prevention, and etc. It will be much simpler if they use this program.

1.5 Scope and Limitations of the Study

The proposed CBIR application/utility will include digital images of the format JPG, JPEG and PNG. The image database to be searched is located in the local file system of the computers. The query can be any of the following: (1) the entire image itself;(2) images of similar colors; or (3) the search of the object within an image; criteria for the result set (containing the best matches) will be the digital signature of the query, or any combinations of digital signatures that will be based on the user's preference. In addition, the limitations of this proposal include: (1)"search criteria" according to metadata will not be included in the scope of this proposed research; and (2) due to the fact that many known face recognition utilities are already in use and the progressive state of this well-researched area of study, the proponents recommend that its integration with CBIR be a further/continuing study and will not be addressed in this proposal.

1.6 Definition of Terms

Content-Based Image Retrieval - it is the application of computer vision techniques to the image retrieval problem, that is, the problem of searching for digital images in large databases.

Grayscale – it is an image in which the value of each pixel is a single sample, that is, it carries only intensity information. Images of this sort, also known as black-and-white, are composed exclusively of shades of gray, varying from black at the weakest intensity to white at the strongest.

RGB Color Model - is an additive color model in which red, green, and blue light is added together in various ways to reproduce a broad array of colors. The name of the model comes from the initials of the three additive primary colors, red, green, and blue.

Pixel - is a single point in a raster image, or the smallest addressable screen element in a display device; it is the smallest unit of picture that can be represented or controlled.

Segmentation - refers to the process of partitioning a digital image into multiple segments (sets of pixels, also known as superpixels). The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyze.

Thresholding - is a single point in a raster image, or the smallest addressable screen element in a display device; it is the smallest unit of picture that can be represented or controlled.

Color Histogram – it is a representation of the distribution of colors in an image. For digital images, a color histogram represents the number of pixels that have colors in each of a fixed list of color ranges that span the image's color space, the set of all possible colors.

Digital Image – it is a numeric representation (normally binary) of a two-dimensional image. Depending on whether or not the image resolution is fixed, it may be of vector or raster type. Without qualifications, the term "digital image" usually refers to raster images also called bitmap images.

Algorithm - A statement of predefined steps to be followed in the solution of a problem, such as a set of image processing steps (each a mathematical manipulation of the image data) to bring about a desired outcome.

OpenCV - (**Open** Source **C**omputer **V**ision) is a library of programming functions for real time computer vision.