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SPATIAL POOLING OF HETEROGENEOUS FEATURES FOR IMAGE RETRIEVAL BY GENETIC ALGORITHM

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ABSTRACT

Image classification and retrieval plays an important role in the computer vision. Bag of features is the most successful algorithm used in the image classification schemes. The algorithm has merits and demerits. Simplicity, generality and scalability are the merits and the demerits are limited semantic description of local descriptors, Lack of robust structures and missing of efficient spatial weighting. The new techniques such as extracting multiple descriptors, spatial context modelling and interest region detection are introduced to overcome this drawback. But this method does not fully improve the above drawbacks. To overcome the drawbacks new framework with spatial pooling of complementary features is introduced. The new frame expands the BoF model on 3 aspects by using Genetic Algorithm (GA). Genetic Algorithm is a class of optimization procedures inspired by the biological mechanisms of reproduction. First aspect is to introduce a new scheme for combining a texture and edge based local features. Second is to build a geometric visual phrase to model spatial context. At last, a simple and effective spatial weighting scheme is performed to capture the image based on smoothed edge map.

***Index Terms*— Genetic algorithm, HSV(Hue-Saturation-Value),BoF model,spatial weighting.**

I. INTRODUCTION

Image classification is a common problem.The method of image retrieval by genetic algorithm and Bag of Features(BoF) leads a rapid and effective searching for desired images from large scale image database becomes an important and challenging research topic.The stategy is to fuse multi feature similarity score. The method of assigning weights of multi feature similarity score by genetic algorithm. Modeling images and related visual objects as bags of pixels or sets of vectors. For instance, gray scale images are modeled as a collection or bag of (X; Y; I) pixel vectors. This representation implies a per mutational invariance over the bag of pixels which is naturally handled by endowing each image with a permutation matrix. Each matrix permits the image to span multiple configurations, capturing the vector set's invariance to orderings or permutation transformations. Permutation configurations are optimized .The solution is a uniquely solvable convex program which computes correspondence simultaneously for all images:

1.1 GENETIC PROGRAMMING AND BAG OF FEATURES

Genetic programming (GP) is a relatively recent and fast developing approach to automatic programming. In genetic programming, solutions to a problem are represented as computer programs. The principles of natural selection and recombination are used to evolve a population of programs towards an effective solution to specific problems. GAs are a class of optimization procedures inspired by the biological mechanisms of reproduction. GAs have been used to solve various problems including target recognition, object recognition, face recognition, and face detection/verification. Image classification has been playing a crucial role in the computer vision community. It is a basic task towards image understanding, and implies a wide range of applications. The Bag-of-Features (BoF) model is one of the most popular algorithms for image classification. In essential, the BoF model is a statistics based model aiming at providing better representation for images.

II. REVIEW OF EXISTING WORK

The Bag-of-Features (BoF) model is one of the most popular algorithms for image classification. Although the BoF model has many advantages, such as simplicity, generality, and scalability, it still suffers from several drawbacks, including the limited semantic description of local descriptors, lack of robust structures upon single visual words and missing of efficient spatial weighting. To overcome these shortcomings, various techniques have been proposed, such as extracting multiple descriptors, spatial context modeling, and interest region detection. In essential, the BoF model is a statistics based model aiming at providing better representation for images. For this purpose, local descriptors such as SIFT(Scale Invarient Feature Transform) are extracted from images, and a codebook is built upon all descriptors, depressing noises and forming a compact visual vocabulary for the dataset. Finally, descriptors are quantized onto the codebook, and visual words are pooled as a statistical histogram for image representation. The output of the BoF model could be applied for various tasks, such as image classification and image retrieval

2.1. SIFT (Scale Invarient Feature Transform)

For better representation for image local descriptors such as SIFT are extracted from images, and a codebook is built upon all descriptors, depressing noises and forming a compact visual vocabulary for the dataset.Descriptors are quantized onto the codebook, and visual words are pooled as a statistical histogram for image representation. The output of the BoF model could be applied for various tasks. Here, bag of pixels or vector set representation for images.For example, a gray scale image can be considered as a collection of N pixels each with spatial coordinates (X; Y) and an intensity coordinate (I).

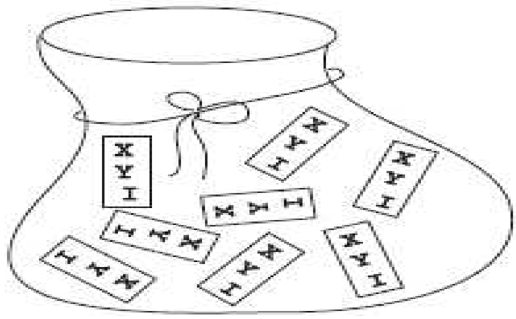

Figure 1: A bag of pixels

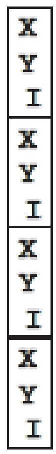

Figure 2: Vectorisation

Each image in our database is a bag of (X; Y; I) 3-tuples. Similarly, an edge or point image can be seen as a bag of (X; Y) tuples with no intensity information. Even color video can be described as a vector set of (X; Y;R; G;B; time) 6-tuples. Figure1 depicts the bag of pixels or collection of tuples representation. For comparison purposes, Figure 2 shows the appearance-based vectorized representation where the tuples are rigidly concatenated along a fixed ordering

Types of Digital Images,

For photographic purposes, there are two important types of digital images: color and
grayscale. Color images are made up of colored pixels while grayscale images are made of pixels in different shades of gray.

Grayscale Images: A grayscale image is made up of pixels, each of which holds a single number corresponding to the gray level of the image at a particular location. These gray levels span the full range from black to white in a series of very fine steps, normally 256 different grays.

Color Images: A color image is made up of pixels, each of which holds three numbers corresponding to the red, green and blue levels of the image at a particular location.

Binary Images: Binary images use only a single bit to represent each pixel.Since a bit can only exist in two states- ON or OFF, every pixel in a binary image must be one of two colors, usually black or white. This inability to represent intermediate shades of gray is what limits their usefulness in dealing with photographic images

III. OVERVIEW OF THE WORKING MODEL

Traditionally, there are three main steps in building a pattern classification system using supervised learning. First, some preprocessing is applied to the input patterns (e.g., normalize the pattern with respect to size and orientation, compensate for light variations, reduce noise, etc.). Second, feature extraction is applied to represent patterns by a compact set of features. The last step involves training a classifier to learn to assign input patterns to their correct category. In most cases, no explicit feature selection step takes place besides feature weighting performed implicitly by the classifier. Fig. illustrates the main steps of the approach based on Genetic Algorithms. The main difference from the traditional approach is the inclusion of a step that performs feature selection using Genetic Algorithm,

SUCCESSFUL EXAMPLE FOR PROPOSED SYSTEM.

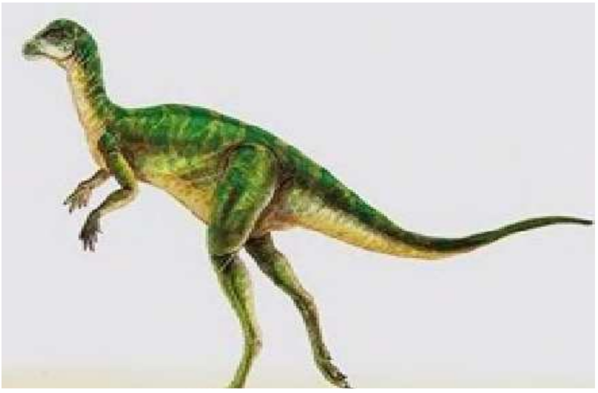

FIGURE3.1INPUT IMAGE

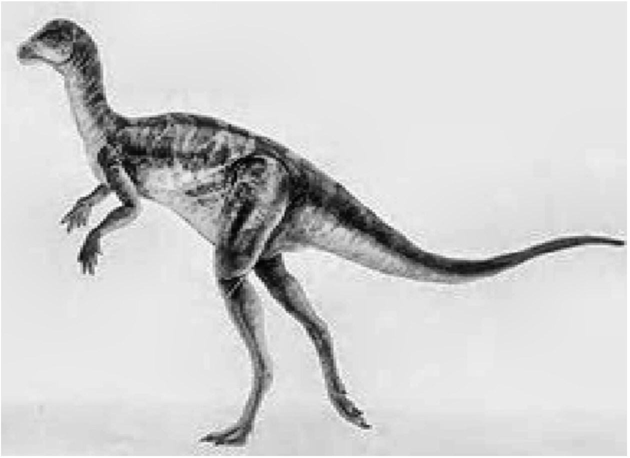

FIGURE3.2CONTRAST ENHANCED IMAGE

FIGURE3.3 GRAY IMAGE

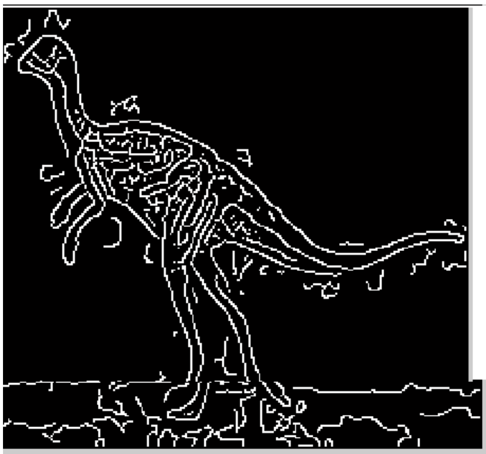

FIGURE3.4 PIXEL DETECTED IMAGE

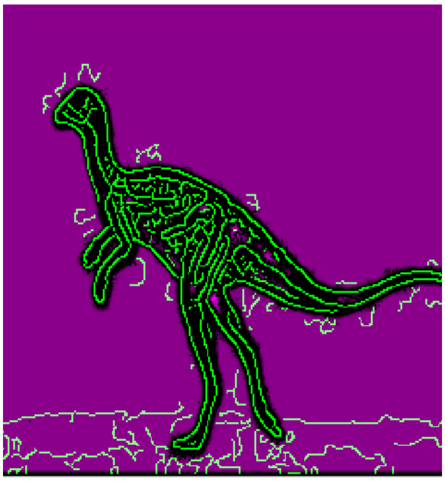

FIGURE3.5.FUSED IMAGE

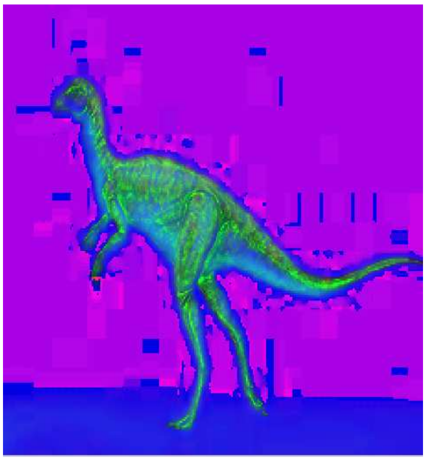

FIGURE.3.6 HSV IMAGE

FIGURE.3.7CORNERS OF IMAGE 1

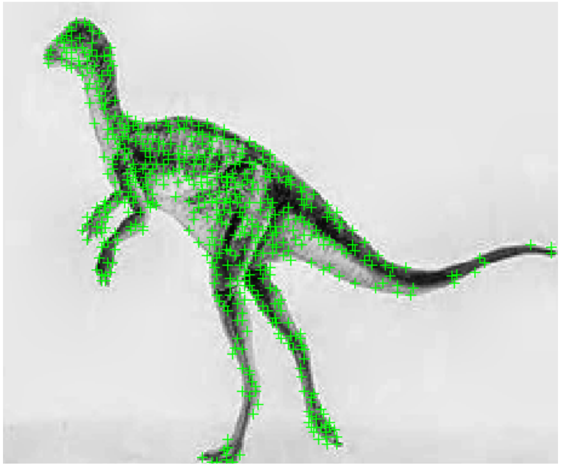

FIGURE.3.8 CORNERS OF IMAGE 2

FIGURE 3.9 SIMILAR IMAGES DATA BASE

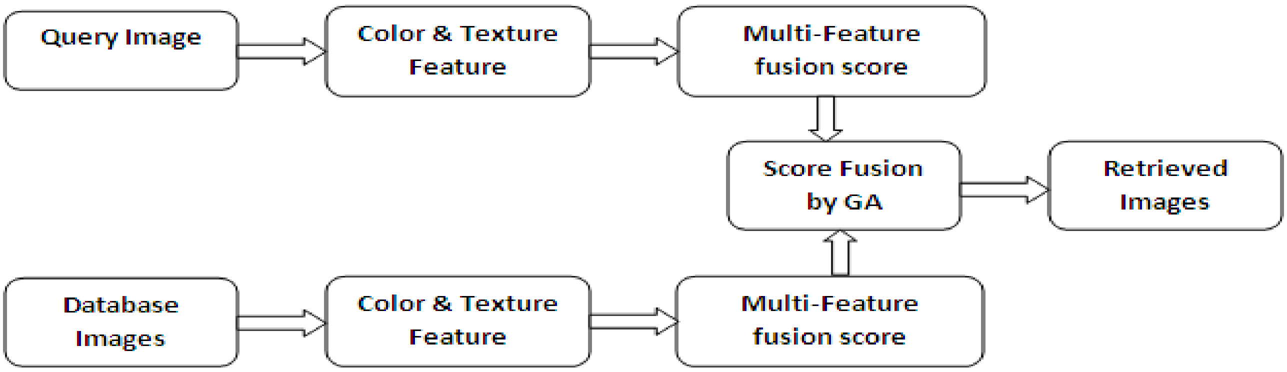

FIGURE 3.10: WORKING MODEL

IMAGE RETRIEVAL USING GENETIC ALGORITHM

Color and texture extraction

The image content is mainly embodied in color, texture and shape etc. the color feature and shape feature describe the image content from different angles.The RGB color space is commonly used in computer displays.RGB to HSV colorspace is used for image retrieval.An image texture is a set of metrics calculated in image processing designed to quantify the perceived texture of an image. Image texture gives us information about the spatial arrangement of color or intensities in an image or selected region of an image. Each image is added to the collection is analyzed to compute a color histogram which shows the proportion of pixels of each color within the image

Multi-feature fusion score

Image fusion is the process of combining relevant information from two or more images into a single image. The resulting image will be more informative than any of the input images.The images used in image fusion should already be registered. Misregistration is a major source of error in image fusion. Some well-known image fusion methods are;

•High pass filtering technique

•Gabor filtering technique - Gabor filter, is Image retrieval method based on multi-feature similarity score fusion using genetic algorithm. Single feature shows image content only one-sided. Fusing multi-feature similarity score is expected to improve the system's retrieval performance.The retrieval of image from color feature and texture feature are analyzed, and the method of fusing multi-feature is performed.

For the purpose of assigning the fusion weights of multi-feature similarity scores reasonably, the genetic algorithm is applied. For comparison, other three methods are implemented.The image retrieval based on color feature, texture feature and fusion of color-texture feature similarity score with equal weights

Score fusion by genetic algorithm(GA)

GA that relate to signal processing & applications, such as adaptive filtering.Genetic algorithms (GAs) are stochastic global search and optimization method.GA includes.

Mutation.: Mutation is a key concept throughout evolutionary algorithms. Genetic algorithms usually have a very small mutation probability, often in the region of 0.01 or 0.001. In some cases GAs are implemented with no mutation operator at all.

Recombination: Recombination plays the dominating role for genetic algorithms, with mutation almost completely neglected. Recombination in GAs consists of z-point and uniform crossover . In evolution strategies, recombination is discrete and intermediate

Selection: Selection refers to the method of choosing members from a population Genetic algorithms insist on probabilistic selection. In contrast, evolution strategies use strictly deterministic extinctive selection

FIGURE 3.11 INPUT IMAGE

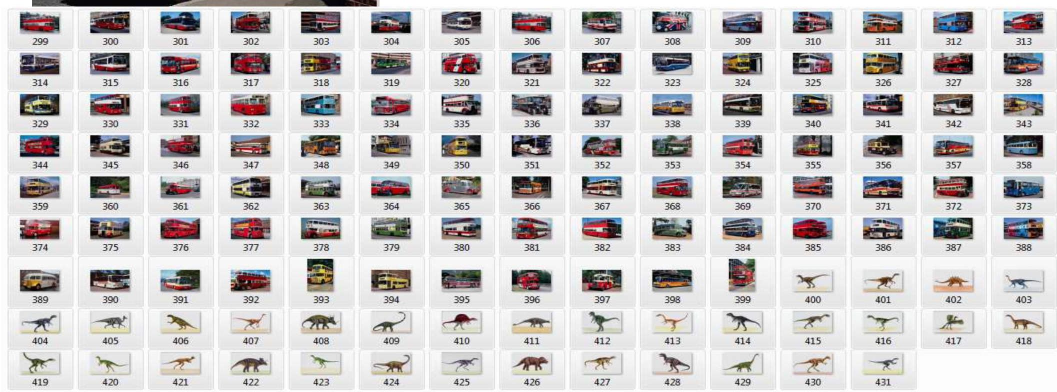

Figure 3.12 data base images

FIGURE 3.13 RETRIVED IMAGES

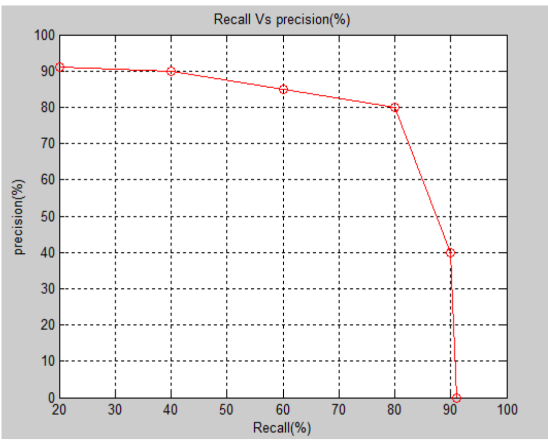

FIGURE 3.14 RECALL VS PRECISION

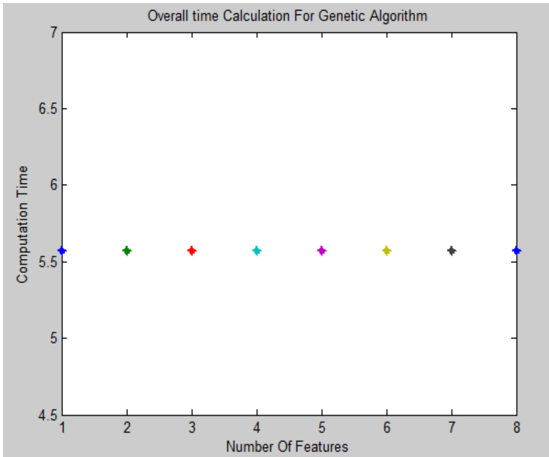

FIGURE 3.15COMPUTATION TIME FOR GA

IV CONCLUSION

The method for image retrieval using genetic algorithm and bags of pixel technique makes it possible to select important parts of image for retrieval. Closed space of pixels takes advantage of automatic conformity approximation and indicates the increase of meaningful linear variations such as morphing and transitions. For image retrieval, use the best color features of the retrieved image which are selected based on genetic algorithm. In this method, the massive of saved information becomes less and the speed of retrieval operation increases.

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