An Improved Approach for Logo Detection and Recognition from the Images Using SURF

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Abstract: ***In this paper, matches and multiple instances of multiple archives quotes with equality logo to identify a variation framework to conceive of innovative mastering assistance through quotes logo and test images Planetarium localized symptoms like interest points are reflected at least one agreed by mixing the power function 1) Period of a loyalty of feature a district benchmark equivalent,2)Feature co-occurrence or geometry captures and controls the smoothness of response,3)Evaluate the value of a regularized period. We put a recognition or detection method. In addition, Effective methods are used to achieve scalability and rigid and non rigid matching logo changes using CDS and find the closest neighbor of the SURF process. Our purpose of project is efficient and robust feature extraction for detection as well as recognition for logo images. The basic objectives of this research are the analysis of different methods according to their detection accuracy and performance and make discussion is the proposed approach for logo feature extraction and recognition.***

Keywords: logo detection, Context-dependent kernel , recognition of Context-dependent kernel, CDS, SURF.

1. Introduction

The Expanding and massive production of visual data from companies and institutions , Logo or trademark recognition has been a well-studied subject for decades since it arises in many practical scenarios of modern marketing, advertising trademark registration. The most successful approach in an uncluttered background sketches, pictures or videos taken of it to deal with recognition from the white background and television station logo includes matching logo on the video later.

Detection of feature could be a method wherever it's automatically examine a picture to extract options that are distinctive to Associate in Nursing object within the image in such a way that we tend to are ready to observe Associate in Nursing object supported its options in several pictures. This detection should be possible when the image show the object with different transformations using mainly scale and rotation or when parts of the object are prohibited.

However often appear in images/videos of real world indoor or outdoor scenes superimposed on objects of any geometry, shirts of persons or jerseys of players, boards of shops or billboards and posters in sports playfields. In most of the cases they are subjected to perspective transformations and deformations, often corrupted by noise or lighting effects, or partially occluded. On the one side, they generally are simple geometric shapes and text and most planar surfaces appear to help detection can provide some useful prior knowledge logo. On the other side, they have a very wide range of near duplicates that are compared and taken many different forms or variants that can be global color or shape. Descriptors commonly recognize logo in clean environment that is used when it comes natural to images, because it is mainly they are extremely sensitive to background misunderstanding. However, such descriptors have been successful. We study the problem consists of a logo to the associated sections of the annotated database and a query image given the task to ascertain if brands to appear in one or more query. Database class per logo contain relatively small number of instances. However, a large number of classes can be more than one instances per class that makes detecting multiple variations against strong forms or logos.

People look into natural scenario, although they are harder to detect and image on the shirt of a soccer player for example 20 x 20 pixels can vary in shape although the generic object recognition and close duplicate detection to related problems that largely has been studied are natural scenes logo recognition should fall under any category.

Context of the peculiarities of the geometry and even with acknowledgment to object localized in one scene recognition of individual things is important. The Relevant type of data image, full-grade image classification approach for spatial pyramid as apparently not justified. But from the point of view of representation with the number of components increases the complexity and number of components and the model also suggest that more than a couple of flats to be impractical in most situations becomes harder. There are some suggested assembly local image features in flexible spatial forms to improve matching correctness between images. In this approach, matched characteristics are refined by applying clustering and form verification founded on semi local spatial constraints. Chum and Mata described an exceptional case where characteristic appearance is disregarded and only spatial relatives between pairs of features are been utilized. Object detection and the localized patches developed by dividing districts with similarities to a localization method combines. In particular, the histogram quantized segments of local facilities next to a district where spatial proximity of localized patch attributes used as area-based context attribute defined. Similarly, Mortensen SIFT descriptors form descriptors very size reference point for district (global context).

2. Literature Survey

This section is to identify multiple instances of the logo are submitted are presented in various ways. The address printed logo which is used for petty patent database searching for efficient retrieval of several publications Similarity of pictures and objects in pictures is reviewed for all of the types of features in close connections to the types and means of feedback The user of the systems is capable of giving by interaction. They briefly discuss aspects of system engineering like databases, system architecture and evaluation. In the concluding section, they present our view on: the driving force of the field, the heritage from computer vision, the influence on computer vision, the role of similarity of interactions with the requirements of databases, the problems of evaluation, and the role of the semantic gap.

A. Smeulders, m. Worring, Santini, a. Gupta, and r. Zain (2000) [1], at the end of the early years they content based image retrieval, content-based image retrieval in paper 200 presents a review of references. Paper-based content retrieval working conditions begins with a discussion on pattern Use of the picture, the role of semantics and sensitive ditch. Subsequent sections computational image retrieval system discussed steps which are reviewed an image by color, texture and local geometry is sorted to recover resources. Retrieval features are discussed next and sorted by cumulative and global features the main point, object, shape features, hints, and structural combination.

A. Folkers and H. Samet(2002)[2],a system that enables the pictorial specification of queries in an image database is described. The queries are comprised of rectangle, polygon, ellipse, and B-spline shapes. The queries specify which shapes should appear in the target image as well as spatial constraints on the distance between them and their relative position. The retrieval process makes use of an abstraction of the contour of the shape which is invariant against translation, scale, rotation, and starting point that is based on the use of Fourier descriptors. These abstractions are used in a system to locate logos in an image database. The utility of this approach is illustrated using some sample queries

H. Bay, A. Ess, T. Tuytelaars, and L. Van Gool [5] presented a novel scale and rotation-invariant interest point detector and descriptor i.e SURF (Speeded Up Robust Features). This is achieved by relying on integral images for image convolutions by building on the strengths of the leading existing detectors and descriptors using a Hessian matrix-based measure for the detector and a distribution based descriptor. This leads to a corelation of novel detection, description and matching steps. The paper presents experimental results based on a standard evaluation set as well as on imagery obtained in the context of a real-life object recognition application. Both show SURF's strong performance.

Y Jing and s. baluja (2008) [6], described the product image search, the newsletter page rank for the image ranking problem "authority" nodes on the graph to identify an inferred sequence similarity in tasks and view link structure that a bunch of images can be created between the analysis proposes an algorithm for the computation of Page Rank on a walk through the process based numerical weight assigned to each image. It is believed to be its relative importance to the other images in the process of the incorporation of Visual cues in large-scale commercial use today since the majority of search engines. Commercial search-engines often solely rely on the text clues of the pages in which images are added to rank images and these often entirely ignore the contents of the images themselves as a ranking signal. To quantify the performance of our approach in a real-world system, they conducted a series of experiments depend on the task of retrieving image for 2000 of the queries of most popular products. An experimental results show significant improvement in terms of user satisfaction and relevancy in comparison to the most recent Google Image Search results.

C. Constantinopoulos, E. Meinhardt-Llopis, Y. Liu, and V. Caselles (2011) [13], have presented a method for detecting appearance of logo contain in low-resolution videos sequence. The method is based on matching the SIFT descriptors, plus several heuristics. The logos must come from small databases of possible logo. The emphasis is not on the speed but it is on reliability, although the method can be executed in real time using a parallel computer.

J. Schietse, J. P. Eakins, and R. C. Veltkamp (2007) [3], they outline some of these main challenges today facing on trademark searcher and discuss the extent to which current automated systems are meeting those challenges.

R. Dutta, d. Joshi, j. Lee and j. z. Wang (2008) [4], have described that image retrieval ideas, influences and new age trends of great interest and an emerging technology as content based image retrieval have seen a wealth. To integrate a large number of new technology and systems met many new people and triggered strong association weakly related fields also led the newspapers, current image retrieval and automatic image annotation major theoretical and empirical contributions to nearly 400 in the survey and in the process discuss the spawning of related sub-sectors. They also discussed all significant challenges occurred in the adaptation of available image retrieval techniques to build system that can be useful in the real world use. In retrospect of what has been achieved, they also conjecture what the future may hold for image retrieval research.

3. Proposed Approach Framework and Design

3.1 Architecture

The SURF algorithm is based on the same principles and steps off SIFT but it uses a different scheme and should provide better results. It works much faster. In order to detect characteristic points on a scale by using SIFT approach it uses cascaded filters, where SURF use the DOG (Difference of Gaussian) approches scaled images progressively.

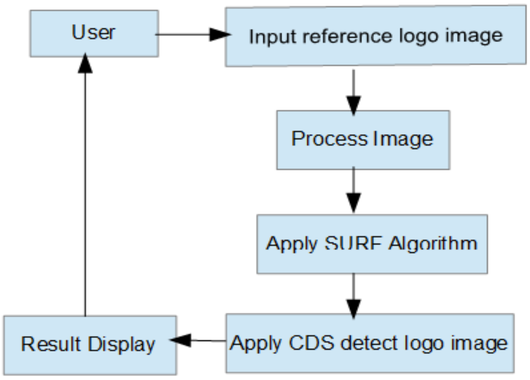

Figure 1: Proposed System Architecture

3.2 Process Flow

Our approach in this paper, we propose a novel detection descriptor scheme, named SURF (Speeded-Up Robust Features). It is based on the Hessian matrix.The determination of the Hessian matrix expresses the extent of the response and is an expression of a local change around the area. The detector is based on the Hessian matrix due to its high accuracy. More precisely, BLOB structures are detected in places where the determining factor is the maximum.

3.3 Mathematical Model

Step 1:
Input:
Test image containing logo only and train image containing logo in image.

Step 2

SURF:
In SURF, square-shaped filters are used as anapproximation of Gaussian smoothing. Filtering the image with a square is much faster if the integral image is used, which is defined as:

$$S(x,y) = \sum_{i=0}^{x}\sum_{j=0}^{y} I(i,j)$$

Given algorithm is used to extract features from an image. Given a point,
x = (x, y) in an image I, the Hessian matrix H(x, σ) in x at scale σ is defined as follows :

$$H(x,\sigma) = \begin{pmatrix} Lxx(x,\sigma) & Lxy(x,\sigma) \\ Lxy(x,\sigma) & Lyy(x,\sigma) \end{pmatrix}$$

where Lxx(x,δ) is the convolution of second order derivative $\partial x/\partial x^2$ g(σ) with the image in the point x, y similarly with Lxy(x,σ) and Lyy(x,σ).

Scale-space representation and location of points of interest:
Images are repeatedly smoothed with a Gaussian filter, then they are subsampled to get the next higher level of the pyramid. Therefore, several floors or stairs with various measures of the masks are calculated:

$$\sigma_{\text{approx}} = \text{Current filter size} * \left(\frac{\text{Base Filter Scale}}{\text{Base Filter Size}}\right)$$

Step 3:
Orientation Assignment and Descriptor:
Inproposed SURF descriptor relies on similar properties, with a complexnessstripped down even additional. the primary step consists of fixing a reproducible orientation supported data from a circular region round the interest purpose.
we have a tendency to determine a consistent orientation for theinterest points. For that purpose, we have a tendency to 1st calculate the Haar-wavelet responsesin x and y direction and this in an exceedingly circular neighbours ofradius 6s round the interest purpose, with s the size at that the interest purpose was detected. Accordingly, at high scales the dimensions of the wavelets is massive. Therefore, we use once more integral pictures for quick filtering. On the extraction of the descriptor, the primary step consists of constructing a square region targeted round the interest purpose, and orientating on the orientation selected within the previous section.

Four-dimensional descriptor vector **v**

$$V = \left(\sum dx, \sum dy, \sum |dx|, \sum |dy|\right)$$

The wavelet responses dx and dy are summed up over each sub regions. Extract the sumof the absolute values of the responses, |dx| and |dy|.

Step 4:
Context Formation:
Let $S_X = \{x_1, \ldots, x_n\}$, $S_Y = \{y_1, \ldots, y_m\}$ be respectively the list of interest points taken from a reference logo and a test image (the value of n, m may vary with SX , SY).

Generally, in order to take into account spatial information, an interest point xi ∈SX is defined as xi = ((ψg(xi),ψf (xi),ψo(xi),ψs (xi),ω(xi)) where the symbol ψg(xi) ∈R2 stands for the 2D coordinates of xi while ψf (xi) ∈Rc corresponds to the feature of xi (in practice c is equal to 128, i.e. the coefficients of the SIFT descriptor).

Let $d(x_i, y_j) = \| \psi_f(x_i) - \psi_f(y_j) \|_2$ measure the dissimilarity between two interest point features, where *L*2-norm is the sum of the square values of vector coefficients. The context of *xi* is defined as in the following:

$$N^{\theta,\rho}(x_i) = \{x_j : \omega(x_j) = \omega(x_i), x_j \neq x_i$$

such that

$$\frac{\rho-1}{N_r}\epsilon_p \leq \|\psi_g(x_i) - \psi_g(x_j)\|_2 \leq \frac{\rho}{N_r}\epsilon_p$$

And

$$\frac{\theta-1}{N_a}\pi \leq \angle\left(\psi_o(x_i), \psi_g(x_j) - \psi_g(x_i)\right) \leq \frac{\theta}{N_a}\pi$$

hold
where ‖ *ψg(x j)−ψg(xi)* ‖ is the vector between the two point coordinates *ψg(x j)* and *ψg(xi)*. The radius of a neighbourhood disk surrounding *xi* is denoted as $\epsilon_p$and obtained by multiplying a constant value _ to the scale *ψs(xi)* of the interest point *xi* . In the above definition, *θ* = 1, . . . ,

N_a, $\rho = 1, \ldots, Nr$ correspond to indices of different parts of that disk.

Step 5:

Logo matching and recognition
Applications of CDS to logo detection and recognition require to establish a matching criterion and verify its probability of success in order to identify.
Let $\mathcal{R} \subset \mathbb{R}^2 \times \mathbb{R}^{128} \times [-\pi, +\pi] \times \mathbb{R}^+$
denote the set of interest points extracted from all the possible references logo images and X is a random variable standing for interest points in $\mathcal{R}$
Similarly, we define
$\mathcal{T} \subset \mathbb{R}^2 \times \mathbb{R}^{128} \times [-\pi, +\pi] \times \mathbb{R}^+$
as the set of interest points extracted from all the possible test images and Y is a random variable standing for interest points in $\mathcal{T}$.

Let consider SX ={X1,...,Xn}and SY ={Y1,...,Ym} as n and realizations with the same distribution as X and Y respectively. To avoid false matches we have assumed that matching between Y and X is assessed if

$$\mathbf{K}_{Y_J|X} \geq \sum_{j \neq J}^{m} \mathbf{K}_{Y_j|X}$$

Being

$$\mathbf{K}_{Y|X} = \mathbf{K}_{X,Y} / \left(\sum_{j=1}^{m} \mathbf{K}_{X,Y_j} \right)$$

The intuition behind the strong criterion above comes from the fact that when
$\mathbf{K}_{Y_J|X} \gg \sum_{j \neq J}^{m} \mathbf{K}_{Y_j|X}$, the conditional probability distribution K.|X can be close to 0, so the uncertainty about the possible matches of X will be reduced. The reference logo SX is declared as present into the test image if, after that the match in SY has been found for each interest points of SX, the number of matches is sufficiently large.

4. Work Done

In this section we are discussing the practical environment, scenarios, performance metrics used etc.

4.1 Input
In this Training and Testing Image is the input for our practical experiment.

4.2 Hardware Requirements
Processor : Pentium IV 2.6 Ghz
Ram : 512 Mb
Hard Disk : 20 Gb

4.3 Software Requirements

Front End : J2SE
Back End : MySql 5.1
Tools Used : Net Beans 7.2.1 or above
Operating System : Windows 7/8

4.4 Results of Practical Work

Following figures are showing results for practical work which is done. Following figure showing the main screen. That takes the input data set,

Figure 1: Take the input data set Load input images and extract features using SURF.

Figure 2: Interest points Identified by SURF of Training Image

Figure 3: Interest points Identified by SURF of Testing Image

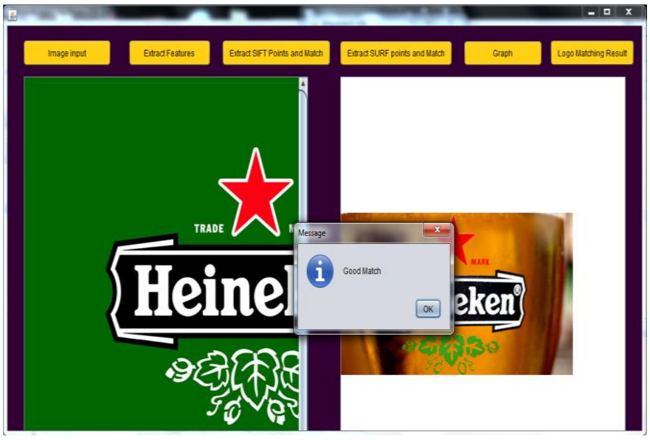

Figure 4: Matching logo result using CDS

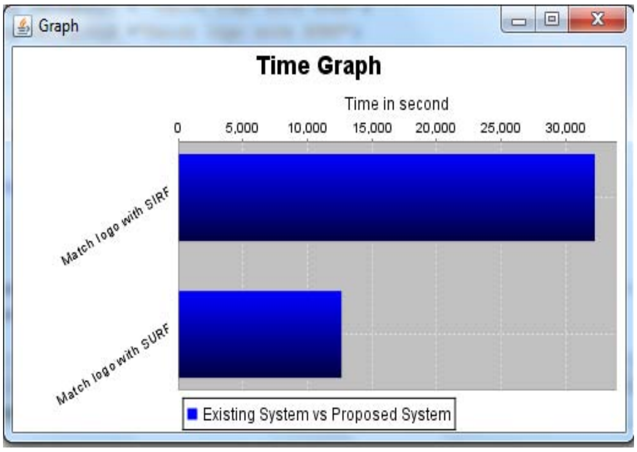

Figure 5: Time Graph

5. Conclusion and Future Work

We have introduce a detection/recognition procedure and study its theoretical consistency ,we have presented afast and performance interest point detection description scheme i.e. SURF algorithm which outperforms the current state-of-the art, both in speed and accuracy. The SIRF algorithm is slower than our SURF algorithm as shown in results.The descriptor is easily extendable for the description of affine in variant regions. Future work will aim at optimizing accurate result by applying this approach on video.

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