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Novel and Scalable Solution for Logo Detection and Recognition using CDS method

Amrapali A. Dudhgaonkar
VLSI & Embedded systems (University of Pune.)
PVPIT, Bavdhan, Pune 411021, India.

Prof. N. N. Thune.
VLSI & Embedded systems (University of Pune.)
PVPIT, Bavdhan, Pune 411021, India.

Abstract **- Nowadays Company Logos misuses become a major problem for their market values. There are different methods of Logo detection and recognition. The major limitation of these approaches is image resolution which requires multiple local features. This makes the above method very weak in case of small or partially occluded logos. In this paper we are implementing scalable and highly effective method for logo detection from real environment. We are extending CDS method [1] further for scalability as well as other rigid and non-rigid logo transformations. The practical analysis of proposed approach will be done using MATLAB.**

Index Terms-: Context-dependent kernel, logo detection, logo recognition.

I. INTRODUCTION

Logo or trademark recognition has been a well-studied subject for decades since it arises in many practical scenarios of modern marketing, advertising and trademark registration. Most successful approaches deal with recognition from sketches, images or video taken in an uncluttered background. This includes recognition and matching of clear logos on white background and television station logo recognition from videos. Later, already can be done, such as using information about logos and frame size, or temporal correlation between when people appear natural scenes although they are very difficult to detect and image on a t-shirt of footballers for example 20 x 20 pixels can vary in shape although the generic object recognition and close-duplicate detection two related Problems that largely has been studied in the last decades, natural scenes logo recognition must fall under any category.

On one hand, logos can provide some useful prior information to assist detection they usually contain text and simple geometric shapes and mostly appear on planar surfaces. On the other hand, they are a much broader category than near-duplicates and can take many different forms, or variants. A small part of the universe of the Adidas and Coca-Cola logos can be seen in Figure 1.

Global color or shape descriptors commonly recognized logo in clean environment that is used when it comes to natural images, that's because primarily they are extremely sensitive to background clutter; however, such descriptors have been successful. We study the problem consists of: a logo to the associated sections of the annotated database (or brand) and a query image given the task (or video frame) to ascertain if brands to appear in one or more query. Database class per logo consists of a relatively small number of instances; however, a large number of classes may be more than one instance per class locating builds against multiple forms or variations that can take a logo look again figure 1.

Typically, the database classes can scale to thousands of generic object detection in such scales. Or recognize very common. That powered detectors sequentially each square, (e. g. Viola & Jones) here whenever features are impractical to share such a big corpus to maintain fast response on recognition should be sub sections of line.

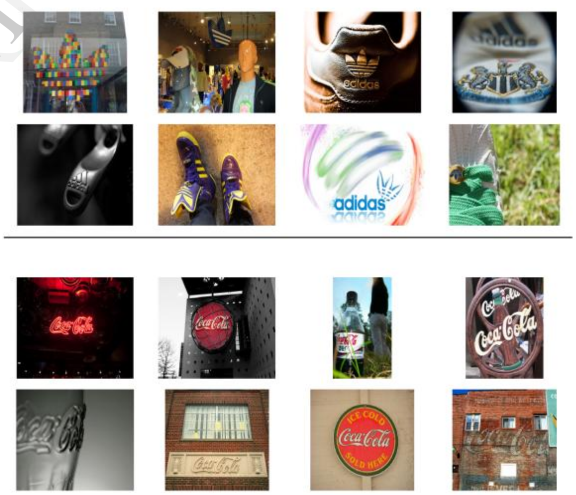

Figure 1: Sample instances of the Adidas (above) and Coca-Cola (below) logos, illustrating the different forms and appearance variations that logos may take in each class

A. Relevance of Subject

Graphic logos are a special class of visual objects extremely important to assess the identity of something or someone. In industry and commerce, they have the essential role to recall in the customer the expectations associated with a particular product or service. This economical relevance has motivated the active involvement of companies in soliciting smart image analysis solutions to scan logo archives to find evidence of similar already existing logos, discover either improper or non-authorized use of their logo, unveil the malicious use of logos that have small variations with respect to the originals so to deceive customers, analyze videos to get statistics about how long time their logo has been displayed.

Logos are graphic productions that either recall some real world objects, or emphasize a name, or simply display some abstract signs that have strong perceptual appeal. Color may have some relevance to assess the logo identity. But the distinctiveness of logos is more often given by a few details carefully studied by graphic designers, sociologists and experts of social communication. The graphic layout is equally important to attract the attention of the customer and convey the message appropriately and permanently. Different logos may have similar layout with slightly different spatial disposition of the graphic elements, localized differences in the orientation, size and shape, or – in the case of malicious tampering – differ by the presence/absence of one or few traits.

A generic system for logo detection and recognition in images taken in real world environments must comply with contrasting requirements. On the one hand, invariance to a large range of geometric and photometric transformations is required to comply with all the possible conditions of image/video recording. Since in real world images logos are not captured in isolation, logo detection and recognition should also be robust to partial occlusions. At the same time, especially if we want to discover malicious tampering or retrieve logos with some local peculiarities, we must also require that the small differences in the local structures are captured in the local descriptor and are sufficiently distinguishing for recognition.

The recent method presented in [1] showing the better performance in terms of FAR and FRR against the existing methods. In [1], method presented to the design of a novel variation framework which is able to match and recognize multiple instances of multiple reference logos in image archives. Reference logos and test images are seen as constellations of local features (interest points, regions, etc.) and matched by minimizing an energy function mixing: 1) a fidelity term that measures the quality of feature matching, 2) a neighborhood criterion that captures feature co-occurrence/geometry, and 3) a regularization term that controls the smoothness of the matching solution.
In this project this work is further extended and improved for better scalability in case of real time environment.

In next section II we are presenting the literature survey over the various methods security at data sharing systems. In section III, the proposed approach and its system block diagram is depicted. In section IV we are presenting the current state of implementation and results achieved. Finally conclusion and future work is predicted in section V.

II. Literature Survey

There are several publications that address the retrieval of printed logos, e.g. for efficient search in logo databases used for petty patents Bagdanov et al. [2] these images video logos are directly into the descriptor to retrieve the matching video game database. Joly et al. Geometric compatibility sift descriptor [3] with a database query to a new query expansion strategies approach to an ever increasing database size check after both with scale perspective.

To reduce quantization errors we therefore a relatively small vocabulary the Word 2000 view work we rotate the image and other features from the perspective transformations are more robust to describe the picture as a sift [4] function descriptors derived from Hessian affine interest points [5] use. Kleban et al. [6] also consistent item sets Mining Association rules in spatial pyramid of Visual words to search by performing for logo identity.

Logo recognition on one of the earliest works, global affine shape logo matching sorting and renew 116 Doermann et al. Use [7] [8], where the characters are represented by Fourier descriptors and geometric shapes comprise a content-based queries retrieve, Folkers and Samet logo proposal. In [9] and [10] the authors focus on documents and use OCR techniques to keep the logo while discarding all text. On the contrary, in [11], regions containing text are first detected and regarded as tentative logo positions; logos are then recognized using color and shape features. All the above methods require logos to be on a clean white background. Kleban et al. [12] use the Apriori algorithm to identify frequent spatial configurations of local features extracted on a spatial pyramid. In [13] Joly et al. Use an LSH-based approach and query expansion. The query is a clean cropped logo rather than an entire natural image as in our case. In [1] Hichem Sahbi, Lamberto Ballan introduced in this work a novel logo detection and localization approach based on a new class of similarities referred to as context dependent. This method delivered several advantages over existing SHIFT method.

III. PROPOSED APPROACH FRAMEWORK AND DESIGN

A. *Problem Definition*

The main aim of this paper is to present a highly effective and scalable framework for matching and recognizing logos from real environment. Given a query image and a large logo database, the goal is to recognize the logo contained in the query, if any. Previously efficient method presented which outperform the existing method in terms of FRR and FPR. In this paper we are extending the same method for improved scalability of logo detection and recognition. The recent method of logo detection and recognition which is based on the definition of a “Context-Dependent Similarity” (CDS) kernel that directly incorporates the spatial context of local features is under investigation. Formally, the CDS function is defined as the fixed-point of three terms: (i) an energy function which balances a *fidelity* term; (ii) a *context* criterion; (iii) an *entropy* term. In this project we are extending this method further for scalability as well as other rigid and non-rigid logo transformations. The practical analysis of proposed approach will be done using MATLAB. During the simulation we will first do comparative analysis proposed CDS matching and detection procedure against nearest-neighbor SIFT matching and nearest-neighbor matching with RANSAC verification so that we can claim the proposed method is best as compared existing once. Second we will evaluate the performance of proposed by considering the scalability factor and compute its precision and recall rate.

B. Proposed Architecture and Design

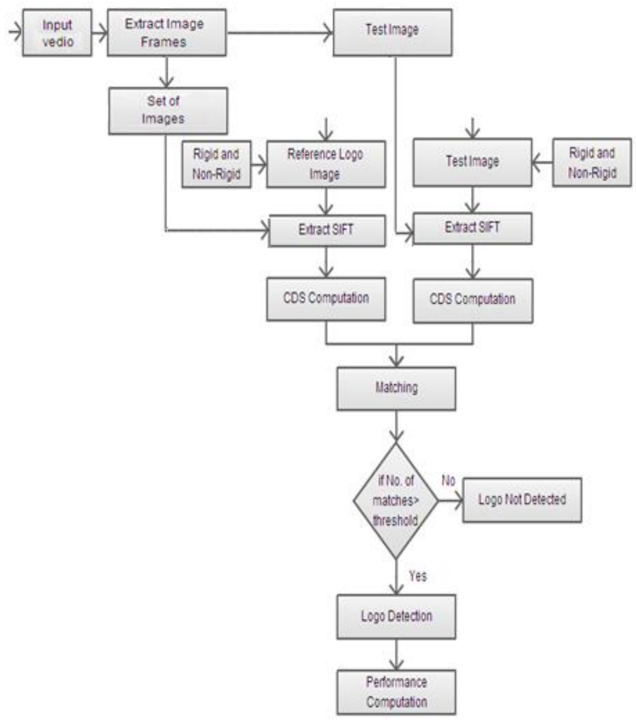

Figure 2: Proposed System architecture

C. Algorithm:

CDS Logo Detection and Recognition

Input: $I_X = Reference\ Logo\ Image, I_Y = Test\ Image,$
$CDS\ Parameter: \epsilon, N_a, N_r, \alpha, \beta, \tau$

Process:

Extract Features Using SIFT from $\mathrm{I_X}, \mathrm{I_Y}$

$\mathrm{S_X} := \{\mathrm{x_1}, \dots, \mathrm{x_n}\}$

– List of Interest points taken fron $\mathrm{I_X}$ image

$\mathrm{S_Y} := \{\mathrm{y_1}, \dots, \mathrm{y_m}\}$

– List of Interest points taken fron $\mathrm{I_Y}$ image

1. for i from 1 to n do
   Compute $\mathrm{x_i}$ using CDS parameter $\epsilon, \mathrm{N_a}, \mathrm{N_r}$
   end for
2. for j from 1 to m do
   Compute $\mathrm{y_j}$ using CDS parameter $\epsilon, \mathrm{N_a}, \mathrm{N_r}$
   end for
3. Set $\mathrm{t} = 1, \mathrm{max_t} = 30$

repeat
   for i from 1 to n do
     for j from 1 to m do
       Compute CDS matrix entry $\mathrm{K}^{(t)}_{\mathrm{x_i,y_j}}$ using α, β

   end for
   Set $\mathrm{t} = \mathrm{t} + 1$

until conversion $= \left\|\mathrm{K}^{(t)} - \mathrm{K}^{(t-1)}\right\|_2 \rightsquigarrow 0$ or $\mathrm{t} > \mathrm{max_t}$

4. $\mathrm{K} \leftarrow \mathrm{K}^{(t)}$
   for i from 1 to n do
     for j from 1 to m do

compute $\mathrm{K}_{\mathrm{y_j|x_i}} \leftarrow \dfrac{\mathrm{K}_{\mathrm{x_i y_j}}}{\sum_{s=1}^{m} \mathrm{K}_{\mathrm{x_j, y_s}}}$

match between $\mathrm{x_i}$ and $\mathrm{y_j}$ = true if

$$\mathrm{K}_{\mathrm{y_j|x_i}} \geq \sum_{s \neq j}^{m} \mathrm{K}_{\mathrm{y_s|x_i}}$$

   end for
 end for

4. if matches = true in $\mathrm{S_Y} > \tau|\mathrm{S_X}|$ then
     return true i. e Logo detected
   else
     return false i. e Logo not detected

Output: boolean value (i. e. true or false) which determine whether the reference logo in $\mathrm{I_X}, \mathrm{I_Y}$

IV. Work Done

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

4.1 Input:

For our practical experiments we use the dataset consist of rigid and Non-Rigid images.

4.2 Matrix Computation

Logo detection is achieved by finding for each interest point in a given reference logo using False Acceptance and False Rejection Rates as:

$$\mathrm{FAR} = \frac{\#\text{ of incorrect logo detection}}{\#\text{ of logo detection}}$$

$$\mathrm{FRR} = \frac{\#\text{ of unrecognized logo appearance}}{\#\text{ of logo appearances}}$$

and comparative accuracy results.

4.3 Results of work done

Following graph shows the comparative accuracy results with respect to number of training images.

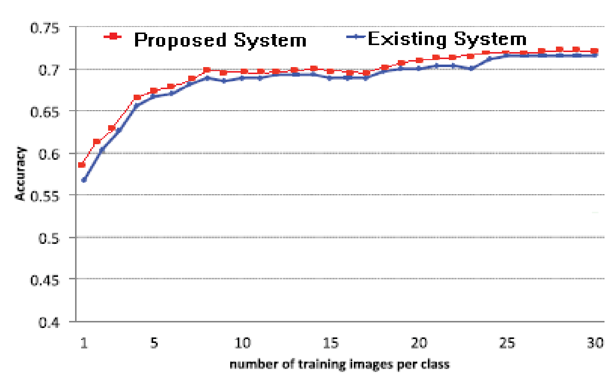

Figure 1: Input original image

Figure 2: Input Test Image.

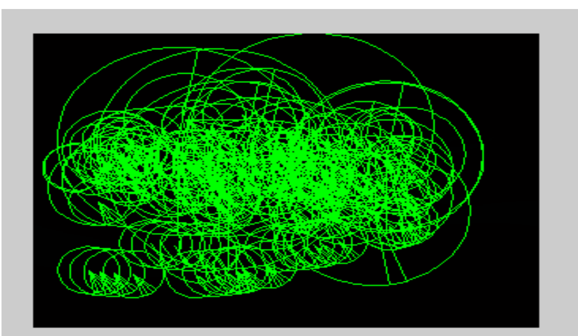

Figure 5: SIFT internal Features.

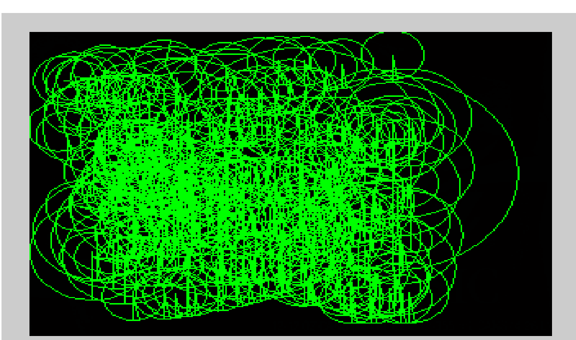

Figure 6: Extract sift points

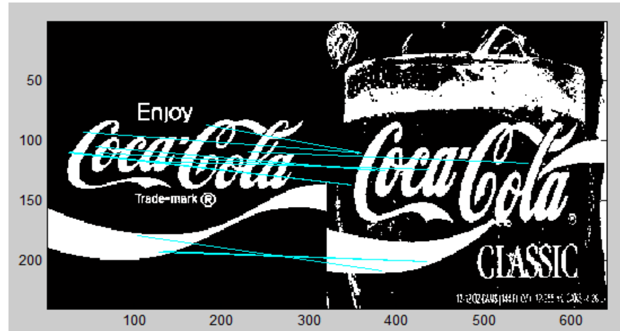

Figure 7: Number of matched points for Logo image.

V. Conclusion and Future Work

We introduced in this work novel logo detection and the CDS function is defined as the fixed-point of three terms: (i) an energy function which balances a fidelity term; (ii) a context criterion; (iii) an entropy term. In this project we are extending this method further for scalability as well as other rigid and non-rigid logo transformations.

We are also detecting the logo from video archive.

References

[1] Hichem Sahbi, Lamberto Ballan, Member, IEEE, Giuseppe Serra, and Alberto del Bimbo, Member, IEEE, image processing, vol. 22, no. 3 March 2013 "depends on the context of matching logo and recognition", IEEE transactions.

[2] A. Ballan Bagdanov, l, m. Bertini and a. Del Bimbo. Match the trademark and sports video retrieval, ACM multimedia information retrieval database. proceedings of the international workshop on 2007.

[3] a. Joly and o Buisson. A contrario view query expansion with seventeen ACM International Conference proceedings logo retrieval. Multimedia, ACM, 2009.

[4] d. Lowe. Scale image features real estate specific keypoints. Computer vision, 60 (2) of the International Journal: 91 {110, 2004.

[5] K. Mikolajczyk, t. Tuytelaars, c. Schmid, a. Zisserman, j. Matas, f. Scha_alitzky, t. Kadir and l v. Gool. Affine region detectors than. Computer vision, 65 (1-2), 2005 international magazine.

[6] j. Kleban, x. Xie and w. Ma. Spatial pyramid natural scenery to explore mining logo in. multimedia and Expo, IEEE, 2008 IEEE International Conference.

[7] d. Doermann, Rivlin and i. Weiss. Logo recognition in ICDAR using geometric 116.1993.

[8] a. Folkers and h. Samet. Using Fourier descriptors on a logo database content-based image retrieval in the ICPR 2002...

[9] Jade Lee, m. Schulte-Austum, and m. Neschen. Fast logo and identity document images...

[10] g. Zhu and d Doer man. Document image retrieval in ICDAR, page matching logo. 606 {610, 2009.

[11] And a. Sinha. Add at the end the hyper sports channel consumer video recognition of trademarks in ISCE 2009.

[12] j. Kleban, x. Xie and w. Ma. Spatial pyramid natural scenery to explore logo in mining in 2008. ICME.

[13] a. Joly and o Buisson. Logo with the expansion of a retrieval query contrariwise. ACM multimedia, 2009.