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Implementation of Speeded Up Robust Feature Algorithm for Real Time Logo Detection

Amarja Indapwar, Hemangi Oke, Madhura Chikte, Poonam Barai, Pratima Katre, Prof Nirmal Mungale
Computer Science Department, Rajiv Gandhi College of Engineering and Research, RTMNU, Hingna Road, Wanadongri, Nagpur, India

ABSTRACT

Logo detection in unconstrained pictures is testing, especially when just exceptionally inadequate marked preparing pictures are open because of high naming expenses. In this work, we depict a model preparing picture blending strategy equipped for enhancing essentially logo detection execution when just a modest bunch of named preparing pictures caught in reasonable setting are accessible, evading broad manual marking costs. In particular, the framework gives detail data in regards to the area of logo in the live video and pictures. This procedure is completed by utilizing Speeded Up Robust Feature (SURF) algorithm. It reveals either uncalled for or unapproved utilization of logos. Reference logos and test pictures are changed over into twofold shape and their features are coordinated in like manner. The primary point of this venture is to show an effective and robust armature to find and also perceive logo pictures using Computer Vision (OpenCV). The restriction and acknowledgment of logos from live video is a major test that has been embraced in this examination. For benchmarking model execution, we present another logo detection dataset TopLogo-10 gathered from top 10 most famous apparel/wearable brand name logos caught in rich visual setting. Broad comparisons demonstrate the benefits of our proposed SCL display over the best in class options for logo detection utilizing two genuine logo benchmark datasets: FlickrLogo-32.

Keywords : Logo detection, OpenCV, SURF, logo extraction, recognition, Visual Data

I. INTRODUCTION

Logo detection is a testing errand for PC vision, with an extensive variety of uses in numerous areas, for example, mark logo acknowledgment for business inquire about, mark slant explore on Internet social group, vehicle logo acknowledgment for astute transportation. For non-specific question detection, profound learning has been an awesome achievement. Building a profound protest detection display regularly requires an expansive number of named preparing information gathered from broad manual marking. Be that as it may, this isn't really accessible much of the time, for example, logo detection where the freely accessible datasets are little. Little preparing information measure is inalienably lacking for adapting profound models with a great many parameters. Expanding manual explanation is to a great degree exorbitant and unreasonably expensive as a rule, in fiscal as well as more basically in timescale terms.

In the present writing, most existing examinations on logo detection are constrained to little scales, in both the quantity of logo pictures and logo classes, to a great extent because of the high expenses in developing huge scale logo datasets. It is non-unimportant to gather consequently expansive scale logo preparing information that covers a substantial number of various logo classes. While web information mining might be a potential arrangement as appeared in other acknowledgment issues, it is hard to gain precise logo explanations since no bouncing box comment is accessible from run of the mill web pictures and their meta-information.

In this work, we show a novel engineered preparing information age algorithm for enhancing the learning of a profound logo identifier with just meagrely named preparing pictures. This approach develops altogether the varieties of both logo and its setting in the preparation information without expanding manual naming exertion, so a profound locator can be enhanced to perceive the objective logos against various and complex foundation jumbles not caught by the first inadequate preparing information.

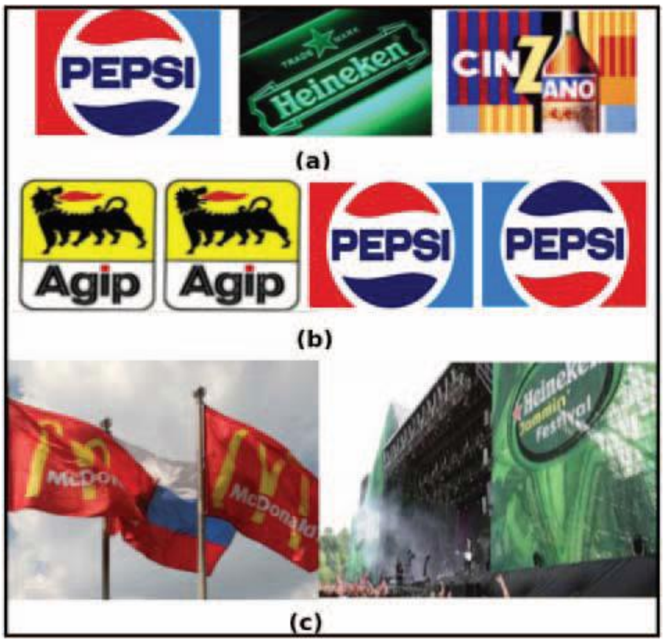

Fig. 1 Examples of popular logos depicting real world objects, text, graphic signs, and complex layouts with graphic details

In this paper, we talk about a system that has been produced for extricating logos from advanced pictures and live recordings. The proposed technique utilizes SURF algorithm which incorporate pre-handling the test picture took after by extraction point, setting calculation and plan similitudes. This conquers the impediments of preparing an uncertain or corrupted picture which contain logo. Client will pick the picture to be checked and select the objective logo picture to be recognized. The framework at that point forms the picture for logo detection and concentrates the focused on logo.

The proposed system contains an alternative same armature, for logo detection, based on a new class of similarity functions. Speeded-Up Robust Features (SURF), is used for extracting features from reference logo and test image.

II. Related Works

A. Logo Detection

Most existing ways to deal with logo detection depend close by created features, e.g., HOG, SIFT, and shading histogram, edge [8]. They are restricted in acquiring more expressive portrayal and model robustness for perceiving a substantial number of various logos. One reason is because of the inaccessibility of adequately extensive datasets required for investigating profound taking in a more discriminative portrayal. For instance, among all freely accessible logo datasets, the most widely recognized FlickrLogos-32 dataset [9] contains 32 logo classes each with just 70 pictures and altogether 5644 logo objects, while Belga Logos [10] has 2695 logo pictures from 37 logo classes with jumping box (bbox) area marked.

In any case, a couple of profound learning based logo detection models have been accounted for as of late. Iandola et al. [12] connected the Fast R-CNN show [11] for logo detection, which definitely experiences the preparation information shortage challenge. To encourage profound learning logo detection, Hoi et al. [13] manufactured an expansive scale dataset called LOGO-Net by thoroughly gathering pictures from online retailer sites and after that physically marking them. This requires a colossal sum of development exertion and also, LOGO-Net is difficult to reach freely. Rather than every single existing endeavour above, we investigate the possibilities for taking in a profound logo detection demonstrate by blending a substantial scale measured preparing information to address the inadequate information explanation issue without extra human marking cost. Contrasted with [13], our technique is substantially more financially savvy and versatile for logo varieties in various visual setting, e.g., precise logo explanation against assorted visual scene setting can be quickly created with no manual naming, and possibly likewise to generalize to an expansive number of new logo classes with negligible marking.

B. Synthesising Data Expansion

Producing manufactured preparing information takes into consideration growing conceivably ground-truth explanations without the requirement for comprehensive manual marking. This technique has been appeared to be viable for preparing extensive CNN models especially when no adequate preparing information are accessible, e.g., Dosovitskiy et al. [14] utilized manufactured gliding seat pictures for preparing optical stream systems; Gupta et al. [14] and Jaderberg et al. [15] created scene text pictures for learning content acknowledgment models; Yildirim et al. abused profound CNN features upgraded on engineered countenances to relapse confront posture parameters. Eggert et al. connected manufactured information to prepare SVM models for organization logo detection, which shares the soul of the proposed strategy however with a basic contrast in that we investigate engineered preparing information in various setting varieties without extensive scale sensible logo dataset in setting.

III. Literature Review

Until now work on logo detection and acknowledgment has been worried about giving some programmed support to the logo enlistment process. The framework check whether other enlisted logos in chronicles of millions, exist that have comparative appearance to the new coming logo picture, with a specific end goal to guarantee that it is adequately particular and keep away from perplexity. Logos of various arrangements and in addition styles are there in the database. To perceive the distinctive sorts of logo pictures of various logo trademarks can be utilized for removing the feature esteems. From the preparation and testing logo pictures, comparative arrangement of trademarks are separated. At that point the coordinating algorithm is utilized to coordinate the comparability amongst preparing and testing logo pictures. Following are distinctive strategies or descriptors utilized by numerous creator to perform logo coordinating to enhance the precision and speed as takes after. This area is separated by the classes of descriptors. It for the most part incorporates the descriptor which was all around acknowledged for different applications.

A. SIFT Descriptor

SIFT (Scale Invariant Feature Transform)is used to recognize and portray neighborhood features in the image [23]. SIFT distinguishes extensive no of features from images,which decreases the blunders caused by nearby variety in the normal mistake of all feature coordinating blunders. S.Shamini, Dr.N.Jaisankar(2014)proposed a technique for matching,which is changed CDS. This technique contains four channel connected at pre-preparing step. Filter is utilized for feature extraction, which upgrade execution regarding exactness and calculation time [20]. Hichem Sahbi, L Giuseppe Serra (2013) proposed a framework for logo coordinating where SIFT is utilized for feature extraction and CSD is utilized for coordinating reason. Here new structure is planned which coordinate and distinguish numerous reference logo in picture. It is reasonable for detection close duplicate, halfway duplication and logos with some distinction in appearance. [8]Ku. Prachi Jivan Dikey(2015) proposed a technique for logo coordinating i.e SIFT is utilized for feature extraction and CDS is utilized for picture and video coordinating. Here pre-processing is done before extraction and exactness is enhanced as far as corrupted images. Ch. Divya (2014) done logo resization, subsequent to taking information picture normal accuracy is figured. C Thejesh (2015) proposed a strategy for logo coordinating in video and picture by utilizing SIFT, Focus on impediment and legitimacy and CDS is utilized for matching. Prof. Mrunalinee Patole (2014) proposed a strategy which center around adaptability, inflexible and non-unbending logo. Here SIFT is utilized for feature extraction and CDS is utilized for picture and video Matching. Hichem Sahbi, Lamberto Ballan(2010) proposed a framework for logo coordinating which SIFT is utilized for feature extraction and CDS is utilized for picture Matching on trademark 720 dataset.Liangfu Xia(2008)proposed another technique for logo coordinating ,where estimated closest Neighbor looking strategy is utilized with SIFT for matching. Amrapali A. (2014) proposed a novel answer for logo coordinating, center is around inflexible and non-unbending logo which is high scalable.

B. SURF Descriptor

SURF (Speeded Up Robust Feature) [20] is quick descriptor as contrast with SIFT. SURF is quick since it extricate features according to region, whereas SIFT remove feature of entire picture so it take more time, but SURF separate less no of feature as contrast with SIFT.P M Panchal (2013) demonstrates the examination amongst SURF and SIFT.SURF is quick as contrast with SIFT however it distinguish less key point as contrast with SIFT.SURF is quick since it utilizes indispensable pictures for quick calculation [17]. Herbert Bay a (2008) proposed a descriptor which is turn and scale invariant locator and descriptor called SURF. It is quick as contrast with SIFT, but find less key point as contrast with SIFT. A technique proposed by Andrews Jose (2014) contains SURF descriptors for extraction of intrigue focuses from reference logo and test picture. Discs is utilized for coordinating. The execution is assessed and comes about is contrasted and SIFT descriptors. SURF algorithm is superior to the SIFT algorithm and will give better matching.[19] Luo Juan (2009) compared three techniques SURF,PCA-SIFT and SIFT and conclusion is that SURF is superior to both however in particular circumstance its relies upon application in which we utilize this methods.

C. PCA Descriptor

PCA (Principal Component Analysis) has great advantage, remaking of unique picture from given no of features. Sami M. Halawani and Ibrahim A. (2010) proposed another descriptor called PCA,which is utilized for feature extraction IEEE Sponsored World Conference on Futuristic Trends in Research and Innovation for Social Welfare (WCFTR'16) and Euclidean separation is utilized for coordinating. In the coordinating procedure, the removed features from picture are mapped onto figured feature spaces, and the separation between the source picture and reference picture is utilized as a basic leadership tool.

IV. Proposed Approach

The user inputs the test image and reference logo image that is required to be converted into binary image. After binarization the current images is the images to which SURF is applied for extracting the features. Here, we are using SURF algorithm because from literature survey it is found that SURF algorithm is better than other techniques. After extracting the features CDS (Context Dependent Similarity) is applied for matching the key points of the images. In this way, the logo will be detected in an image. Following Figure 2 Shows the process of logo detection.

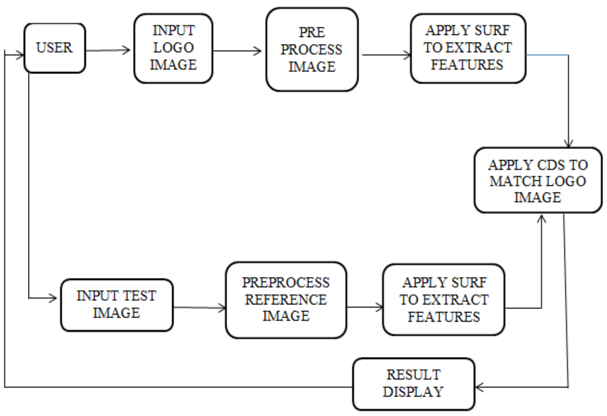

Figure 2: Steps for Logo detection

V. Implementation Details

A. Speeded up Robust Feature (SURF)

SURF algorithm is used to extract the interest points from reference logo and test image instead of SIFT algorithm. SURF is faster than SIFT. The main difference of SURF algorithm is it mainly applied to the DoH (Determinant of Hessian), the extraction of the feature points in the image are realized through simplification and approximation, compared to the SIFT algorithm, it reduces the complexity of feature point extraction and it also has better real-time performance.

The major steps of SURF are:

- Fast-Hessian Detector
- Constructing the Scale-Space
- Accurate Interest Point Localization
- Interest Point Descriptor
- Orientation Assignment
- Descriptor Components

Much of the performance increase in SURF is due to Integral Image.

- The integral image IΣ(x, y) of an image I(x, y) represents the sum of all pixels in I(x, y) of a rectangular region formed by (0, 0) and (x, y).
- Now calculate the Hessian matrix, as function of both space and scale.
- Then calculate Hessian determinant using the approximated Gaussians.
- The task of localizing the scale and rotation invariant interest points in the image can be divided into three steps.
  - ➢ First determine threshold value for the responses such that all values below the predetermined threshold are removed.
  - ➢ Then, find a set of candidate points. To do this each pixel in the scale-space is compared to its 26 neighbors, comprised of the 8 points in the native scale and the 9 in each of the scales above and below.
- Once interest points have been localized both in space and scale, the next steps are:
  - ✓ Key point descriptor
  - ✓ Orientation assignment

The SURF descriptor describes how the pixel intensities are distributed within a scale dependent neighborhood of each interest point detected by the Fast-Hessian. This approach is similar to that of SIFT but integral images used in conjunction with filters known as Haar wavelets are used in order to increase robustness and decrease computation time. In order to achieve invariance to image rotation each detected interest point is assigned a reproducible orientation.

- ✓ The image is convoluted with two first-order Haar wavelets.
- ✓ The filter responses at certain sampling points around the Key point are represented as a vector in a two-dimensional space.

A rotating window of 60^0 is used to sum up all vectors within its range, and the longest resulting vector determines the orientation.

Now the present worker has Interest Point descriptor vector of length 1x64 for each Interest Point. For an image the present worker have got 20-120 Interest Points. Suppose for image no. of Interest Points are 80. So a 2D matrix D1 of size 64x80 is generated.

AB = norm (D1(x, :));

D3 (1, x) = AB;

Where x=64; And a scalar value from Orientation assignment. Combining these two features the present worker has got a vector of length 1X65 for each Image sample.

(a) Input image (b) Output of SURF algorithm

Figure 3 Feature Extraction by SURF algorithm From Image

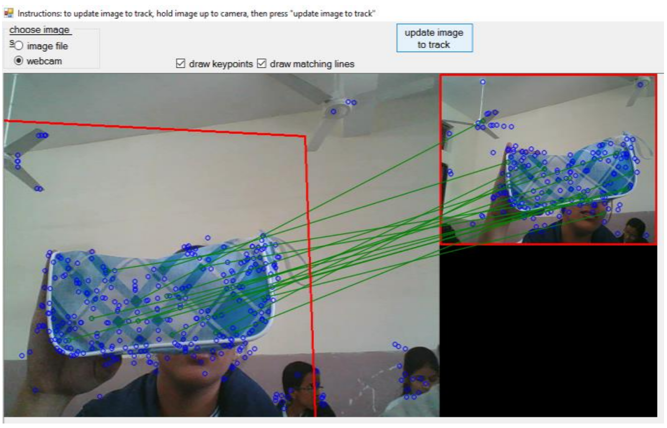

Figure 4: Feature Extraction from Live video feeds

B. CDS Logo Detection Algorithm

Let SX = {x1. . . xn}, SY = {y1, ... ,ym} 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).

Input: {reference logo image: lx Test image: ly, CDS parameter: Є, α, τ, β, Na, Nr}

Processes: Extract SURF from lx, ly and let Sx = {x1, xn},

Sy = {y1, yn} be respectively the list of interest points taken from both images;

Step 1:

For i=1 to n

Find context matching for xi where it is key point of reference image.

End for

For i=1 to n

Find context matching for yi where it is key point of test image.

End For

Step 2:

Set t=1 to max=30

Step 3:

For i=1 to n

For j=1 to m Compute CDS matrix

Increment t i.e. does t++;

End for

End for

Repeat step 3 until t > max or convergence.

Step 4:

For i=1 to n do

For j=1 to m do

Compute Kyj|xi

Match between xi and xj is declared only if

Kyj|xi >= ∑ ms=j Kys|xi

Step 5:

If number of matches in Sy>τ|Sx|

Then logo matched i.e. detected

Otherwise

Logo not detected.

Output: A Boolean value determining whether the reference logo in lx is detected in ly.

In our approach, SURF algorithm will be used for extracting features and CDS for matching features as these techniques are efficient comparatively.

I. Experimental Result

In view of exploratory outcomes in paper by Hichem Sahbi, Lamberto Ballan, Giuseppe Serra, and Alberto Del Bimbo [1], it is presumed that the precision of SURF algorithm is higher than SIFT. The SIFT algorithm separates more number of armatures, however the principle issue is the speed for the computational advances. Through the paper by Sami M. Halawani and Ibrahim A. Albidewi [5] it is discovered that the SIFT has recognized more number of features contrasted with SURF yet it has endure with the speed. The SURF is quick and has great execution as the same as SIFT. Based on experimental results, it can be concluded that the accuracy of SURF algorithm is higher than SIFT.

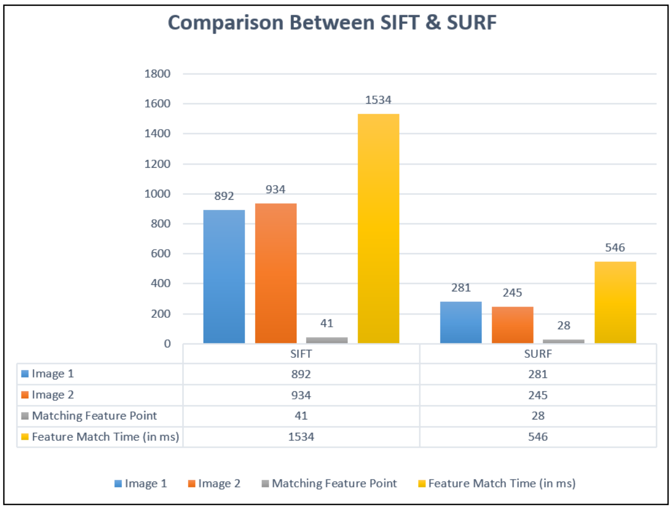

Figure 4 Comparitive results of SIFT & SURF

Process	Percentage Accuracy
SIFT	56.66%
SURF	81.66%

Table 1 Percentage Accuracy Based on Feature Matching

VI. Conclusions

Logo detection is presented on new class of likenesses to a setting subordinate. Logo detection and coordinating is of indispensable use in this day and age to recognize non approved utilization of logos. Logo detection used to be done just in pictures and spared recordings. However, utilizing the proposed technique, logo detection should even be possible in live recordings. This technique introduces a proficient picture acknowledgment algorithm for logo coordinating framework. Speeded-Up Robust Features (SURF), are utilized for removing features from reference logo and test picture. A few employments of this framework are the programmed ID of items on the web and the check of the perceivability of publicizing logos in sports events. This framework is utilized to distinguish both close duplicate logos and also logos with some variations in their appearance. To think about the outcomes executed logo matching systems utilizing both SIFT and SURF algorithms. The execution is additionally assessed. The test demonstrates that the proposed framework reliably beats other existing system in logo coordinating and acknowledgment.

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