Content Based Video Retrieval for Indian Traffic Signages

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Content Based Video Retrieval for Indian Traffic Signage's

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Abstract— The new arrivals and trends in the technology have attracted many different areas to make the world modernized and smart. The autonomous driverless car is unique example in the category. The aim of this work is to presents a computer vision-based system for real-time traffic sign identification, recognition and retrieval system for Indian traffic signage's. The system consists of two phases. Firstly the signage's are detected and recognized for a given video using state-of-art detector method known as aggregated channel features. Second, retrieval of videos is performed using two distance measures known as Euclidean and Jaccard matrices. Compared to the previous approaches our method offers the detection recognition and retrieval of signage's of different shape and colors in heterogeneous climatic conditions. The results demonstrate the proposed method performs good detection, recognition, and retrieval accuracy with 60 frames per second in less time complexity.

Keywords—Traffic Signage's, identification, recognition, retrieval, Traffic Sign recognition system.

I. INTRODUCTION

Traffic-sign identification and recognition is a technology by which a vehicle is able to identify the traffic signage's placed on the roads, like "Speed Limit", "Pedestrian crossing", and "Bus stop" etc. To meet this aspect, it uses image processing techniques for detection, recognition and retrieval. The identification methods are usually divided into colour based, shape based and learning based approaches. As the colour plays a vital role and gives the dominant characteristics of traffic sign boards [10] it is considered as key element for identification of any traffic signage's. The colour spaces like RGB, YCbCr, HSV, and L*a*b are used. The shape-based detection involves the geometrical structures of the sign boards, like triangle, rectangle, octagonal etc. The Advance Driver Assistance System (ADAS) is a system to assist the driver in the driving and navigation. ADAS systems are developed to automate, adopt and enhance vehicles system for well driving. The automat system, which is provided by ADAS to the vehicles, is proven to reduce road falsities by minimizing the human error.

The automatic detection of the signage's is difficult when worked with the real time scenery, as the background is highly complicated for identifying and recognizing the signage's in the road sides. To overcome this, very limited research has been carried out by adopting different methods and techniques for a robust traffic Sign Detection and recognition (TSDR) system. The objective of this works is to present a method to develop the detection, recognition, and retrieval of signage from videos for Indian traffic road signage's.

The section 2 presents the literature survey related to the TSDR system and video retrieval. The section 3 represents the system architecture, section 4 reveals experimental results analysis, and in section 5 presents the conclusions.

II. RELATED WORK

Various methods and techniques are studied and applied for the identification and recognition of traffic signage's during the years. It's difficult to compare between those approaches, as they are carried based on different datasets according to different environment and different countries like Indian traffic signage's differ from other counties, where the same application may fail to identifying the signage's from different countries. In [1] authors stated the differences of sign boards throughout the world. The system uses Integrated Channel Features (ICF) and Aggregated Channel Feature detector for the detection of United States traffic sign boards. The results performed on the LISA-TC traffic sign dataset gave worse result with ICF, and good with ACF detector. In [3] a framework for identification of traffic signs using ACF detector method. Methods like spatial distribution and Kalam Filter are used for more significant results. The experiments were carried on public dataset TS2009, TS2010, and TS2011 with good detection rate. In [2] authors have presented the traffic sign detection using feature combination and random forests classifier to detect the shapes of segmented sign boards. Technique like HOG, LBP, LSS, and Gabor are compared to categorize the information in the sign board and classified was carried using SVM. Authors conclude that the grouping of HOG and LSS with random forest given good results with 96% at 8 to 10 fps. In [5] the system makes use of sobel edge detection and morphological dilation methods for detection of sign boards. Feature sets like DCT, DWT and Hybrid DWT-DCT are used to categorize the dataset based on SVM classifier. The results obtained for DCT is 86%, DWT is 90% and 96% for DCT-DWT. In [8] the shape-based detection for recognition of sign boards, Nil-back threshold algorithm is used to segment the pattern from the signage's and the results are competitive.

In [6] authors present a traffic sign detection system for circular signs using colour thresholding, sign validation and shape detection based on ellipse fitting and HOG techniques and implemented their system using Rasberry Pi Type 3 module. The experiment results gained are 0.92 TPR and 0.97 precision rates with time of 48.17ms. The dataset was collected from German Traffic Sign Detection Benchmark and Japanese red circular traffic signs. In [7, 11] Colour based approach are used for revealing and Neural Network for recognition of traffic signage's. The template matching and Euclidean distance is used to categorize the signage's. The results obtained were competitive with 90% of recognition rate. In [9] a detection of pedestrians using HOG features and sparse representation for classification of traffic sign boards. The experiments were carried on Belgium and German traffic sign benchmarks. The results gained for detection were 95%. Convolution Neural Network is used for the detection of traffic sign detection by gaining the good performances for adopted datasets [10]. In [23] authors have presented an approach for detection and segmentation based on block of pixel method along with Hough transform and counter methods. In [25] authors have worked on video similarity detection based on Pyramid Density Histogram and Nearest Feature Trajectory technique. The approach gives 90% of precision rate and 85% of recall rate.

Further, several methods have been used in the retrieval of digital videos like use of local feature descriptor and detector known as Speeded-Up Robust Feature for the retrieval of similar videos [12]. In [13, 14] feature like Histogram, RGB Algorithms, Eccentricity algorithm is considered, K-Mean's clustering Algorithms, and B+ Tree for indexing are used for video warehousing, and retrieval is performed by SVM classifier using Euclidian Distance for similarity of videos from the data base. For the better performance of the video retrieval frequency domain analysis with 2D correlation is matched with SURF implementation [15]. The representation of videos is also carried using methods like low level features and high-level semantic object annotation that give 13% to 19% better results when paralleled to traditional colour-based approaches of video retrieval systems [18].

In [17], authors present recognition based on multilevel feature and Latent Structured SVM (LSSVM). Gaussian mixture model is used for representing local spatio temporal contexts. The compatibility between multilevel action feature and action labels LSSVM method is used. The experiments were carried on UCF sports, YOUTUBE and UCF50 database. The recognition rate of 86.91% for SVM and 88.04% for LSSVM is achieved. The videos are classified using hierarchical semantics sensitive technique using Expectation Maximization algorithm. This approach has achieved 0.9% of precision as well as recall rate with less time complexity [16]. Another approach in [19] present a video retrieval system based on Edge detection, Entropy, Black and White colour features. The database creation is carried using GLC matrix. To regain the videos Black and white feature points are calculated on edges using Prewitt edge detection. The performance of the algorithm is competitive. In [20] the multimodal system for effective CBVR system with capacity to work with text, image, and audio, embedded text in signal, embedded text in image for video searching, video surveillance, and clustering. Method like Hierarchical Clustering Tree is used for clustering and similarity matching by feature extraction is done using SIFT descriptor based on colour, texture and shape. In [21] the multiple feature extraction method for video retrieval, Experiment was concentrated on colour, texture features and motion vectors. The system has obtained 80% precision and recall rate for online retrieval of data. In [22] a sketch-based multimedia retrieval using motion trajectory. The approach makes use of histogram indexing, gray level co-occurrence matrix for feature extraction along with motion trajectories. The ranking of videos is carried using the Gradient mapping and correlation, and videos were retrieved using indexing. The experiments were carried on different videos like sports, movies, e-learning, animated were used. As a result, the system has obtained good number of videos matched. In [24] author present visual recognition based on 3D point clouds collected by MLS system for traffic sign system recognition. The work concentrates on many of the factors like size, position, placement, mounting height, shape damage etc. Their system makes use of Traffic Sign Timely Visual Recognisability Evaluation model. The system is efficient for large scale transportation environment. In [27] authors propose a retrieval system based on motion features. Global motion, object trajectory with MPEG-7 parametric motion, and motion trajectory descriptors are used and discussed. Experimental outcomes show that the estimated system is reliable and effective. In [28] authors worked on video retrieval system using features like motion, edge, colour and texture, methods like L2 distance function, geometric approach, HSV conversion and Gabor Wavelets, Kullback distance were used. Authors concluded that system exhibits a satisfactory precision which proves the system is effective. Similarly [29] have also worked on integrated multimedia retrieval system using low level and motion features. In [26] authors present the video segmentation using different modes to identify change detection, background registration techniques and real time adaptive threshold techniques respectively for video segmentation. Statistical-testing algorithm and noise robust threshold method are used to calculate threshold noise. The generated segmentation results show less computation convolution and high efficiency as compare to other algorithms. In [30] Video indexing is been also used for video retrieval based on Recurrent Neural Network model and Optical Character Recognition techniques, the experiments were carried on Visual Story Telling Dataset, obtaining good results.

From the literature it is observed that the retrieval of signage's from the video is one of the challenging aspects because of its complexity and with an different environmental condition. Hence, our objective in this work is to analysis of video signage identification, recognition, and retrieval is been implemented using a state-of-art detector known as aggregated channel features for Indian traffic signage's. The use ACF are helpful in detecting and recognizing signage's for different climatic conditions, and the retrieval of videos using similarity measurement shows good number of videos matched from the database.

III. METHODOLOGY

A proposed system for the identification and recognition of the Indian Traffic Signage's is shown in the Fig 1. and it consists phase's like identification and recognition of signage's and video retrieval. The system evaluates state-of-art detection scheme known as Aggregated Channel Features detector.

Data set: The aim of this work is to identify and recognize the Indian Traffic signage from video samples. To collaborate with the objective, the video samples are collected from nearby area in different climatic conditions using a mobile camera of 17 mega pixel which is fixed on a vehicle for capturing the video in non-stationary environment with the angle in which one can see the road while driving a vehicle. Further videos are normalized to 60 frames per second, with size of 320*240 pixels, 3000kpbs video quality, and .mp4 format.

Labelling and Training of data using ACF detector: Labelling or indexing of the objects in an image plays a significant role in many visual learning and recognition application that need training data, like video retrieval, object identification and recognition. Hence in our proposed work we use ground truth co-ordinates of a particular traffic sign in a group of frames and label each of signage's like left turn, side road right, speed limit 80, bus stop and stop sign etc. The datasets are trained using ACF object Detector. For a given input image 'I', ACF computes several channels $C = \Omega(I)$, with summing every block of pixel in channel C and then smooth the resulting lower resolution channels [4]. ACF mainly performs two operations: Feature extraction from the labelled images using Histogram Oriented Gradient features and training these features using SVM classifier. The trained classifier along with relevant variables is usually known as a Model. Hence, we consider these models of traffic signage's for further process.

Detection of traffic signage's: The test video is passed for the detection of traffic signage's, the system computes each frames in the video by using the model generated for all the signage's in training phase. If the percentage of model matches with the test sample than it detects and recognize it accordingly as one of the valid signage, otherwise moves to the next frame. This process is carried by a threshold score defined for each of the signs by manually observing the output of detector such that if current score is more than the threshold, there is a maximum chance that the sign is actually present. Frames are extracted and being examined for detecting every sign serially. So, there is a chance of any one of the signs to be detected or many of them can be detected. Also, detection of same sign at more than one location within a frame is also possible. We need to show and label all the detected signs which are non- overlapping to each other. Therefore, the following two conditions should be applied before finalizing and labelling a traffic sign in the frame.

(a) Score of the detected sign should be greater than their respective threshold. If two bounding boxes of same sign are overlapped, the one with highest threshold will be selected as final candidate for labelling.
(b) If two bounding boxes of different signs are overlapped, their respective thresholds will be compared and the one with highest threshold will be selected.

Algorithm: The proposed algorithm is presented below.

Input: Video with mp4 format consisting traffic road signage's.
Output: Video showing the detected and recognized ROI with Video retrieval.
Step1: Read an input video.
Step 2: Extract frames from the video and store in a database.
Step 3: Labelling of signage's in a given frames using state-of-art ACF detector.
Step 4: Feature storage and matching.
Step5: Prepare a labelled dataset of all the detected and recognized videos.
Step6: Pass a query video for retrieval of the video from the dataset.

Step7: Computation of feature is done for the recognized video and stored in a database.
Step8: Feature matching of query video is done using similarity measurements.
Step9: Outputting the best matched video.

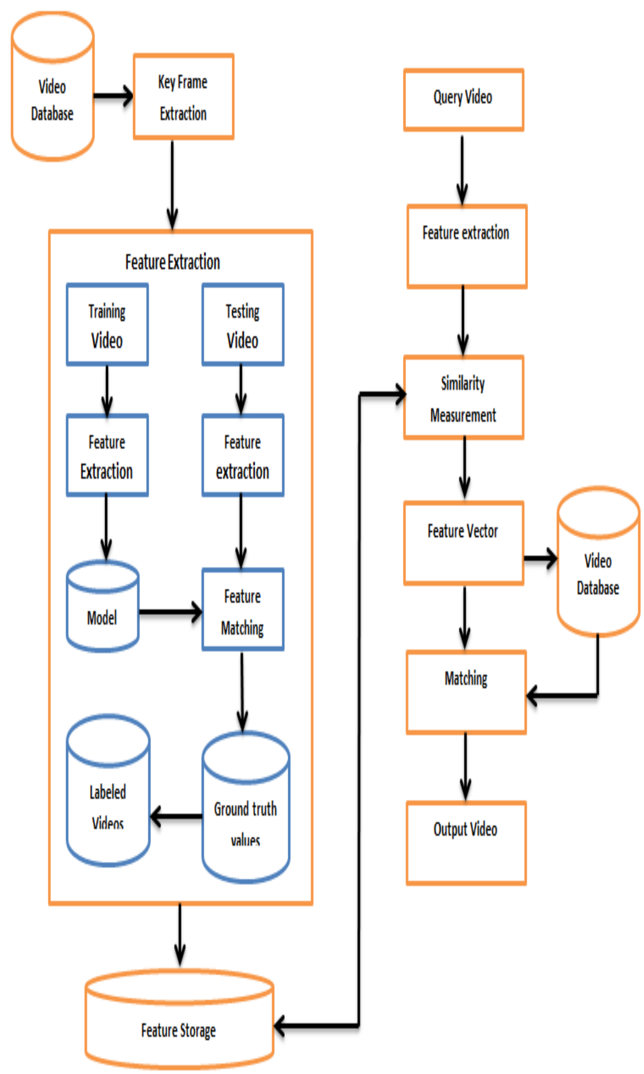


Figure. 1 Architecture of the system for identification, recognition and retrieval of the Traffic signage's Videos.

Retrieval of Video: Retrieval refers to searching/detection of a particular video from a dataset in response to a query video such that the output is the video that is closest to the query video. We define similarity using a set of features that must be similar in both query and dataset videos. In this case, the total number of traffic signs is calculated for each of the signs in all frames of the video. Therefore, every video in the dataset has a 1xns feature vector (ns=No. of signs). Feature extraction is done by counting the number of detected signs and the value is stored in the form of vector so that at the end of the loop, total count of each of the signs is obtained. In this way feature vector is obtained for all the videos in the data set. The videos are retrieved using the similarity measurements.

IV. Results and Discussion

The experiment is carried on the heterogeneous videos captured from the mobile camera of 17 mega pixel fixed on the vehicle in different climatic variations. The total numbers of videos collected are 81 videos of different duration from 30 seconds to 10 minutes each. The videos are normalized to gain the better performance to 60 fps, with 320X240 video sizes. In this work the state-of-art detector ACF is used for identifying and recognizing of Indian Traffic signage's from a given video. The identifying and recognition of videos are shown in the Table 1 of different detected and recognized output videos. In identification and recognition phase the system generates the .avi format videos that include the signage's marked using bounding boxes based on ground truth values.

a) Performance evaluation for Retrieval of traffic signage's:
The Query video is passed and the same steps are followed as in detection phase of signage's as explained above and with addition to it counting the sign to gain the retrieval feature vector and then comparing the query video features with the dataset video features. The evaluation is done on the basis of Euclidean distance features. That is, if two feature vectors are:

F1={x1, x2,… xn,}

And

F2= {y1, y2,… yn,}

Then the Euclidean distance between them is defined as,

$$D_{Euc} = \sqrt{(x_1 - y_1)^2 + (x_2 - y_2)^2 + \ldots + (x_n - y_n)^2} \quad (1)$$

The dataset video with which there is least Euclidean distance of the test/query video is retrieved as the best match. Similarly, the Jaccard Distance is also used for finding the similarity index which is given by.

$$D_J(x, y) = 1 - J(x, y) = \frac{|x \cup y| - |x \cap y|}{|x \cup y|} \quad (2)$$

In Jaccard Distance, the value of DJ is equal to one or less than one, no negative value is allowed. If the value is equal to one the video is exactly matched and if less than one then there is a chance of getting the mismatched videos.
The performance measure of the quality of the video retrieval are taken from observation of all the videos in the data base and recorded the count of the videos as true positive (tp), true negative (tn), false positive (fp), and false negative (fn), so to perform the accuracy of the system [4].
Accuracy: the overall accuracy of the system is performed by using the following eq (3)

$$Accuracy = \frac{t_p + t_n}{t_p + f_p + f_n + t_n} \quad (3)$$

Sensitivity/specificity: Two measures that separately estimate a recognition performance on different classes are sensitive and specific in nature, and are given by the following eq (4) and eq (5) respectively

$$Sensitivity = \frac{t_p}{t_p + f_n} \quad (4)$$

$$Specificity = \frac{t_n}{f_p + t_n} \quad (5)$$

Precision and Recall: The measures of choice calculated on the positive classes are given as eq (6) and eq (7) respectively.

$$Precision = \frac{t_p}{t_p + f_p} \quad (6)$$

$$Recall = \frac{t_p}{t_p + f_n} \quad (7)$$

(a)80 speed limit

(b)Side road ahead

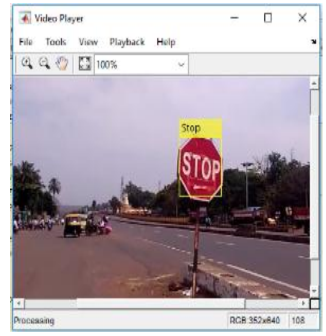
(c)Left turn

(d)No overtake

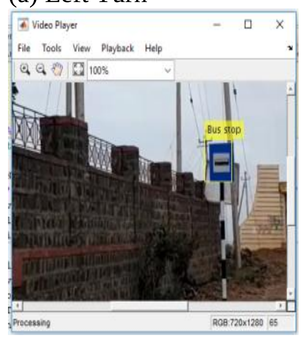
Figure 2. Screen shots of output video in avi format obtained by identification and recognition using ACF. (a) 80 speed limit, (b) Side road ahead, (c) Left Turn, and (d) No Overtake, are the few signage's obtained from experimentation.

For the retrieval of the videos from the database the system dataset is evaluated for two similarity measurement Euclidean distance and Jaccard distance. The Figure 2 represents the detection and recognition of signage's, whereas the Figure 3 shows the screen shots of videos retrieved from the database. The overall retrieval performance using Euclidean distance is 92.59% accuracy whereas Jaccard distance performed 80.25% accuracy. In the Figure 4 and Figure 5 the retrieval obtained by Euclidean measure and Jaccard measure are predicted, and Figure 6 gives the accuracy performances of both the distance measurements.

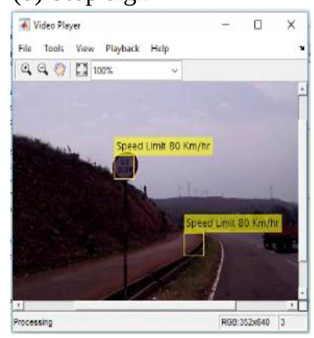
(a) Left Turn



(b) Stop sign



(c) Bus stop



(d)Mismatched sign

Figure 3. Screen shots of output videos obtained by the retrieval phase, (a) Left turn, (b) Stop sign, (c) Bus stop, and (d) it is a screen shot of the video that has been mismatched.

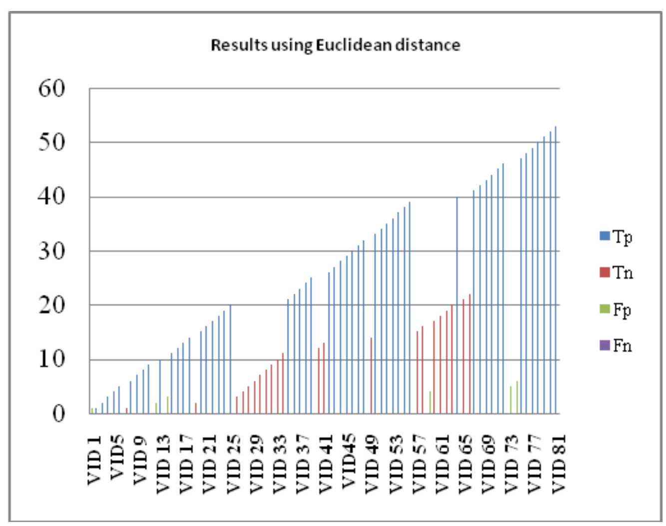


Figure. 4 The Retrieval of videos using Euclidean distance.

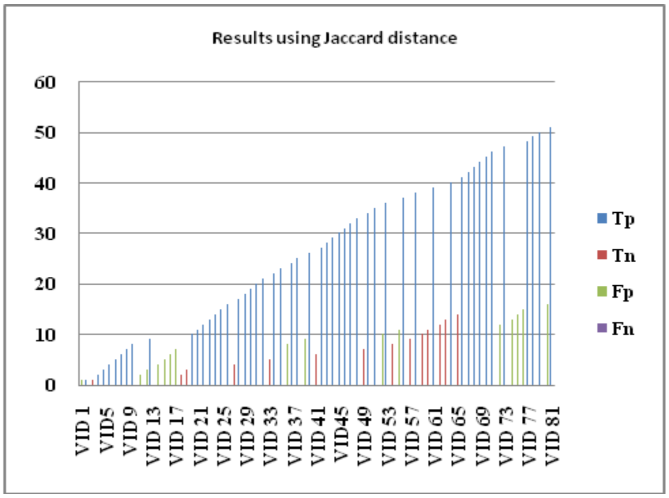


Figure.5 The Retrieval of videos using Jaccard distance.

In the Figure 4, and 5 Tp, Tn, Fp, Fn, represents the true positive, true negative, false positive, and false negative respectively. The retrieval using Euclidean distance is Fp.

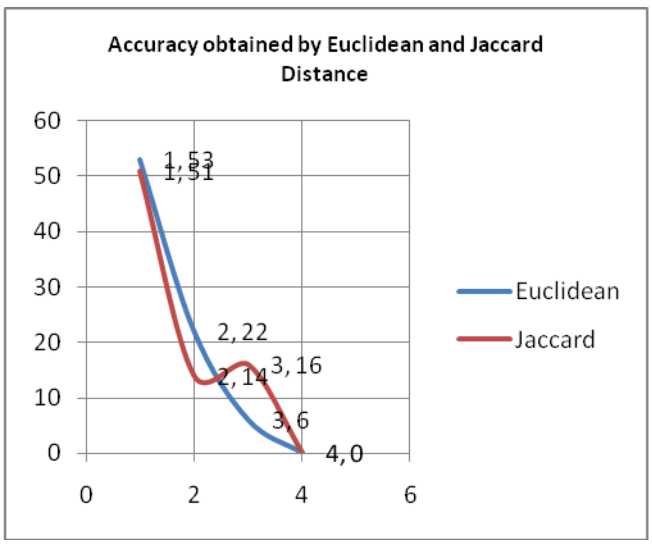


Figure. 6 The performance accuracy of Euclidean and Jaccard distance. This chart shows that the Euclidean distance measure gives the linear performances whereas Jaccard varies the performance non-linearly.

V. Conclusion and Future Scope

In this work we have examined the usage of ACF detector for the identification, recognition and retrieval of Indian Traffic Signage's. The experiments are carried on the dataset collected from the local area in different scenarios. The accuracy performance of the system on the datasets have given satisfactory results with 92.59% for Euclidean distance and 80.25% for Jaccard distance, with zero false negative rates for both the retrieval distance measures. The observation of the experimentation was lack in the same shaped boards, the algorithm gets confused to recognize the signage's and gave mismatched video. Hence the work has to be integrated for getting further robustness in the recognition the boards.

References

[1] Andreas Mogelmose, Dongran Liu, Mohan Manubhai Trivedi, *"Detection of US Traffic signs"*, IEEE Transactions on intelligent transport system, **2015**.

[2] Ayoub Elrahyani, Mohamed EL ANSARI, Ilyas EL JAAFARI, *"Traffic Sign Detection and Recognition using Features of Combination and Random Forests"*, International journal of Advanced Computer Science and Applications, Vol **7**, No.**1**, **2016**.

[3] Yuan Yuan, Zhitong Xiong, and Qi Wang, *"An Incremental Framework for Video-Based Traffic Sign Detection, Tracking, and Recognition"*, IEEE Transactions on Intelligent Transportation Systems, Vol. **18**, No. **7**, July **2017**.

[4] P. Dollar. R.Appel, S.Belongie, and P.Perona, *"Fast Feature Pyramids for Object Detection"*, Pattern Analysis and Matching Intelligence, IEEE Transactions on, vol.**36**, no. **8**,pp. **1532-1545**, Aug **2014**.

[5] S. Sathiya, m. Balasubramanian, and, S. Palanivel, *"International Journal of Engineering and Technology"*, vol.**6**, no.**2**, Apr-May **2014**.

[6] Aryuanto Soetedjo and I Komang Somawirata, *"An Efficient Algorithm for Implementing Traffic Sign Detection on low cost Embedded System"*, International Journal of Innovative Computing, Information and Control, vol. **14**, no.**1**, February **2018**.

[7] Huda Noor Dean, and Jabir K V.T, *"Real Time Detection and Recognition of Indian Traffic Signs using Matlab"*, International Journal of Scientific and Engineering research, vol.**4**, Issue **5**, May **2013**.

[8] K. Arun Kumar, S.Gowtham, M. Manoj Kumar, and A. Lakshmi, *"Automatic Recognition of Sign-Boards using myROI"*, International Journal of Pure and Applied Mathematics, vol.**119**, no.**12**, **2018**.

[9] Markus Mathias, Radu Timofte, Rodrigo Benenson, and Luc Van Gool, *"Traffic sign Recognition- How far we are from the solution"*, International joint Conference on Neural Networks, ISBN:**978-1-4673-6129-3**, January **2014**.

[10] Hee Seok Lee and Kang Kim, *"Simultaneous Traffic Sign Detection and Boundary Estimation using Convolution Neural Network "*, IEEE Transactions on Intelligent Transportation Systems, vol.**19**, no.**5**, pp. **1652-1663**, Feb **2018**.

[11] Shivanand S Gornale, Ashvini K Babaleshwar, Pravin L Yannawar, *" Detection and Classification of Signage's from Random Mobile Videos Using Local Binary Patterns"*, International Journal of Image, Graphics and Signal Processing(IJIGSP), vol.**10**, No.**2**, pp. **52-59**, **2018**.

[12] Dipika H Patel, *"Content-Based Video Retrieval using Enhanced Feature Extraction"*, International Journal of Computer Applications **0975-8887**, vol.**119**, pp.**4-8**, **2015**.

[13] Madhav Gitte, Harshal Bawaskar, Sourabh Sethi, Ajinkya Shinde, *"Content BasedVideo Retrieval System"*, IJRET: International Journal of Researchmin Engineering and Tecnology, vol.**3**, pp.**430-435**, **2014**.

[14] Milan R.Shetake. Sanjay. B. Waikar, *"Content Based Image and Video Retrieval"*, Proceedings of 33th IRF International Conference, pp.**34-37**, **2015**.

[15] Navdeep Kaur, Mandeep Singh,*"Content-Based Video Retrieval with Frequency domain Analysis using 2- D Correlation Algorithm"*, International Journal of Advanced Research in Computer Science and Software Engineering ,vol.**4**, pp.**388-393**,**2014.**

[16] J. Fan, A. K. Elmagarmid, X. Zhu, W. G. Aref, and L. Wu, "*Classview: hierarchical video shot classification, indexing, and accessing*", Multimedia, IEEE Transactions , pp. **70–86, 2004**.

[17] Xingxiao Wu, Dong Xu, LixinDuan, JieboLuo, "*Action Recognition Using MultilevelFeatures and Latent Structural SVM*", IEEE Transactions on Circuits and Systems for Video Technology, vol.**23**, pp.**1422-1431, 2013**.

[18] Hamdy K. Elminir, Mohamed Abu ElSoud, Sahar F. Sabbeh, Aya Gamal "*Multi feature content based video retrieval using high level semantic concept* "IJCSI International Journal of Computer Science Issues, vol.**9**, pp.**254-260, 2012**.

[19] B. V. Patel, A. V. Deorankar, B. B. Meshram, "*Content Based Video Retrieval using Entropy, Edge Detection, Black and White Color Features*", Proc. **2**nd International Conference on Computer Engineering and Technology (ICCET), vol.**6**, pp.**V6-272** - **V6-276, 2010**

[20] S. B. Mahalakshmi, Capt. Dr.Santhosh Baboo, "*Efficient Video Feature Extraction and Retrieval on Multimodal Search*", International Journal of Advanced Research in Computer and Communication Engineering, vol.**4**, pp.**355-357, 2015.**

[21] D.Asha, Madhavee Lata, V.S.K. Reddy, "*Content based video retrieval system using Multiple Features*", International Journal of pure and Applied Mathematics, vol. **118**, pp.**287-294, 2018.**

[22] Avinash N Bhute and B B Meshram, "*System Analysis and Design for Multimedia Retrieval Systems*", The International Journal of Multimedia and Its Applications (IJMA), vol.**5**, pp.**25-44, 2013**.

[23] Tam T. Le, Son T. Tran, SeichiiMita, and ThucD.Nguyen, "*Real Time Trafffic sign Detection using Color and Shape-Based Features*", ACIIDS **2010**, partII, LNAI **5991**, pp.**268-278, 2010**, springer-verlag berlin Heidelbery **2010**.

[24] Shanxin Zhang, Cheng Wang, ZhuangY, Chenglu Wen, Jonathan Li, and Chenhui Yang, "*Traffic Sign Timely Visual RecognizabilityEvalution Based on 3D measurable point clouds*", Journal of LATEX class Files, vol.**14**, No.**8**,August **2015.**

[25] Chu-Hong Hoi, Wei Wang, and Michael R. Lyu, 2003, "*A Novel Scheme for Video Similarity Detection*", Department of Computer Science and Engineering, the Chinese University of Hong Kong ©Springer-Verlag Berlin Heidelberg. Pp.**373–382, 2003**.

[26] Yasira Beevi C P et.al.**2009**, "*An efficient Video Segmentation Algorithm with real time Adaptive Threshold Technique* ", International Journal of Signal Processing, Image Processing and Pattern Recognition vol.**2**, pp.**13-27**.

[27] Wu, Chuan, Yuwen He, Li Zhao, and Yuzhuo Zhong. "*Motion feature extraction scheme for content-based video retrieval."* In Electronic Imaging **2002,** pp. **296-305**. International Society for Optics and Photonics, **2001**.

[28] T.N.Shanmugam, and Priya Rajendran "*An Enhanced Content-Based Video Retrieval System Based on QueryClip*", International Journal of Research and Reviews in Applied Sciences, vol.**1,** pp.**236-253, 2009**.

[29] Hong Jiang Zhang ,Jianhua Wu, Di Zhong and Stephen W. Smoliar "*An Integrated System For Content-Based Video Retrieval And Browsing*",Institute of System Science, National university of Singapore Pattern recoganition. vol.**30**, pp.**643-658, 1997.**

[30] Jaimon Jacob, Sudeep Ilayidon, V.P.Devassia, "Content Based Video Retrieval System Using Video Indexing", Internation Journal of Computer Sciences and Engineering, vol.**7**, Issue.**4**, pp.**478-482**, **2019**.

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