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A Novel Approach : License Plate Identification from Videos

Sreelekshmi A.N
sree.an1989@gmail.com

***Abstract*—Object segmentation is the process of abstraction of object from an image or video frame. There are several techniques available to handle object segmentation from video frames. Existing methods have mainly two problems such as they do not consider the spatial parameters of an object in a frame, and it is not possible to handle complex scenes with highly dynamic background movements with existing methods. With varying scales, a robust analysis mechanism is required to handle background regions or foreground movements. This paper proposes a solution to these problems and provide an efficient algorithm to overcome these problems. Also suggested method for object detection, identification and license plate identification from dynamic background videos.**

***Index Terms*— Background Subtraction, Object Segmentation, Robust Principal Component Analysis, Sparse Decomposition.**

I. INTRODUCTION

Background subtraction or Foreground Detection, is a technique in the fields of image processing and computer vision wherein an image's foreground is extracted for further processing. Also it is a method used to detect moving parts by subtracting them from the established background. Principal component analysis is a technique used for dimensionality reduction. A new frame was projected onto the subspace spanned by the trained principle components, and the residues indicate the presence of new foreground objects. A more advanced method is robust Principal component analysis. It is proposed to use an`l1-norm to constrain the foreground matrix because these regions must be a sparse matrix with a small fraction of nonzero entries. It is also assumed that the background images are linearly correlated with each other, forming a low-rank matrix L. The methods now exist are based on the RPCA method.
Another concept in background subtraction is sparse signal recovery. It provides a framework to deal with various problems in machine learning and signal processing, also find low complexity methods with acceptable performance.

II. LITERATURE SURVEY

The RPCA (Robust Principal Component Analysis)concept can be used in motion saliency detection to trace a particular object in the video and detect its saliency.
"Motion Saliency Detection Using Low-Rank And Sparse Decomposition" by Yawen Xue,Xiaojie Guo and Xiaochun Cao proposes a simple application of this RPCA in which any variation in its appearance can be captured by the low rank matrix [3].Moving object in videos can be easily detect by human eyes than static

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based on these observations low rank and sparse decomposition of video segments along the X-T and Y-T planes. Due to the correlation between frames, the motion regions in the video can be identified from the background by low-rank and sparse decomposition. Adaptive threshold selection and refinement processes are there to reduce the effect of noise and missing pixels ,because spatial consideration of pixels are avoided. There is a chance that some salient pixels with small absolute values should belong to the background. An adaptive threshold selection process is there to eliminate the noise.

Main challenges to an object segmentation from video sequences are complex intensity variation, background motions whose magnitude can be greater than the foreground, poor image quality under low light, camouage etc.to overcome these problems Zhi Gao,Loong-Fah Cheong, and Mo Shan proposes "Block-sparse RPCA for Consistent Foreground Detection" method which makes little specific assumption of the background[4].The concept of Robust Principal Component Analysis is used to determine the sum of a low-rank background matrix and a sparse outlier matrix and solve the decomposition. The main challenge with the method is to automatically detect the blocks containing moving objects. The varying values of regularizing parameter, that can handle foreground objects of all kind of sizes, and how can identify an object and its probable size even before segmenting it? Are the major tasks to solve by the proposed method. There is a two pass process to solve these above problems. First-pass RPCA, motion consistency scheme, Second-pass RPCA are the algorithms that this paper included. The first-pass RPCA rapidly identifies the likely regions of foreground in a sub-sampled image. A simple motion consistency scheme is then used to measure the motion saliency of these foreground regions. Then in the second pass, a block-sparse RPCA imposes the spatial coherence of foreground objects, with the value set according to the motion saliency. This provide greater modularity, convergence, it also allows greater flexibility in the design of the motion consistency measure.

Sparse outlier matrix is the familiar concept with foreground detection and back ground subtraction. In this a linear combinations of small sets of variables are selected to describe the data. Basically l1 norm is used to determine the values of this matrix. It encourages the sparse solutions. Recently developed sparsity-inducing regularizations are capable of encoding higher-order information about allowed patterns of non-zero coefficients. A structured sparsity inducing norm defined as the sum of `l&-norms over groups of variables include a class of learning problems[5]. Connections between sparse methods and the literature of network flow optimization are included. Background Subtraction, Speed comparison, Multi-Task Learning of Hierarchical Structures are the applications of this proposed technique.

Misalignment, illumination variation, and occlusion are the main issues in developing a structured sparsity matrix. Sparse representation based classification (SRC) methods provide good performance and robustness against this. errors caused by image variations can be modeled as pixel-wisely sparse. A paper "Robust and Practical Face Recognition via Structured Sparsity" by Kui Jia, Tsung-Han Chan, and Yi Ma proposes structured sparsity-inducing norms into the SRC framework, to model various corruptions in face images caused by the above mentioned problems[6]. A systematic development of sparsity-inducing norms that can solve the problem like spatial continuity.The methods better model corruptions in practical face images due to shadows, occlusion or disguise, and misalignment. Robust face alignment via structured sparsity concept provide a theoretical proof to solve the above problems.

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Spectral Residual based image saliency detection [7] is method to detect motion saliency in videos.The paper [8] proposes a method to detect fast moving objects in video segments. It is to locate semantic regions in images for further image understanding. The idea of saliency detectionis to find semantic regions and rejecting backgrounds.It is easy in videos than static regions according to human visual system.How to locate the motion objects from backgrounds is an important problem in this context.The paper include a fast motion saliency detection method Temporal Spectral Residual, inspired by Spectral Residual based image saliency detection.this method is based on Fourier spectral analysis, and free of training or initial labelling so it is a

pro processing process ,so that the complexity can be reduced. The motivation for Temporal Spectral Residual algorithm is based on the region of foreground is usually smaller than that of background, Background motion is usually smaller than foreground object motion ,more regular patterns, even when dynamic background exists. The first step of proposed concept is the Fourier transformation on the temporal slices along T axis (both X − T plane and Y − T plane). Then use a threshold selection scheme to reject noises. Finally, a saliency majority voting is applied to obtain final motion salient regions. With the varying value of threshold, it is able to alter the results also. This method is different from background modeling methods as it purely based on Fourier transform calculations.

Detection and segmentation of foreground objects from a video which contains both stationary and moving background objects is a difficult task compared with object segmentation from a still image. Foreground Object Detection from Videos Containing Complex Background" by Liyuan Li, Weimin Huang, Irene Y.H. Gu, Qi Tian proposes a method to easily segment the object from dynamic background[10].A Bayes decision framework is used to extract foreground objects from a real-time complex video. A general feature vector is formulated for the classification of background and foreground. The statistics of most significant colors are used to describe the stationary parts of the background, and that of most significant color co occurrences are used to describe the motion objects of the background. Extending the method used in [11], Bayes decision rule has been extended to general features and mathematical proof about the convergence of the learning process has been given. For real-time foreground object detection from video sequences ,the proposed method is efficiently abstract the objects from the video.

There are some difficulties with the above method in which the Bayesian framework does not consider the spectral, spatial,and temporal features to characterize the background appearance.It is based on the principal features at each pixel,and Bayesian formulation is derived only for the background modelling for foreground detection.A paper "Statistical Modeling of Complex Backgrounds for Foreground Object Detection" by Liyuan Li, Weimin Huang,Irene Yu-Hua Gu,and Qi Tian,proposes a new method to consider the spectral, spatial,and temporal features to characterize the background appearance[12]. A background model must be able to represent the appearance of a static background pixel,appearance of a dynamic background pixel,self-evolve to gradual background changes,self-evolve to sudden "once-off" background changes.Based on the background features such as spectral,spatial and temporal are used to design the background model.based on these, a new formula of Bayes decision rule is derived for background and foreground classification. stationary and nonstationary background objects are considered to determine the low rank matrix properly.Method proposes a novel algorithm to regularise and update the dynamic changes in the background motion.A new algorithm is introduced to detect the objects in complex background videos.

A unified and robust framework to effectively handle diverse types of videos is proposed in [13].The difficulties with Bayes formulations can be solved by this paper by introducing a group sparsity method.There are mainly two observations ,first is the background motion caused by orthographic cameras lies in a low rank subspace and the second is pixels belonging to one trajectory tend to group together.A trajectory can be formulated to track the foreground and background motions and based on this already developed law rank and structured sprse matrices,background and foreground are differentiated.There are several advantages by using the above proposed method which are the low rank constraint is able to handle both static and moving cameras,The group sparsity constraint leverages the information of neighboring pixels, which makes the algorithm robust to random noise, It is relatively insensitive to parameter settings.

By observing the methods,there are mainly two problems exists commonly.The first one is that the methods now exist do not consider the spatial parameters of an object in a frame and the second one is that it is not possible to handle complex scenes with highly dynamic background movements with existing methods. Inorder to overcome these problems a new algorithm is proposed in [14] which provide Background Subtraction Based on Low-rank and Structured Sparse Decomposition with group sparsity method.This will consider the spatial parameters and sudden background motions in the video frames. contain any vehicles(main consideration for four wheelers),then it goes to Licence plate identification process.If it doesn't contain any vehicles,ithe algorithm identify the obect and display the name.Algorithms such as LDA and OCR are used to identify the licence plate in the video.

Systematic steps are there to process the proposed method,after all Optimization Methods like Augmented Lagrange Multiplier (ALM) method are used to optimize the result.Frame work of the proposed method can be divided into three.

- Decomposition via LSD

- Motion saliency check
- Group-sparse RPCA

A. Decomposition via LSD

A structured sparsity based RPCA scheme can better estimate background.It is also sensitive to some dynamic background motions.The obtained candidate groups denote both foreground objects and a few background motions.

B. Motion Saliency Detection

Background motion is usually smaller and more regular than foreground object motion.So the foreground object will form a distinct trajectory from the background in a temporal slice on planes.The analysis of temporal slices will detect and generate a motion saliency map. Calculate each group's average saliency from the motion saliency map.From these values, setting threshold value to eliminate small groups and small motions

C. Group Sparse RPCA

Group-sparse RPCA is used to carry out the final foreground detection from those motion saliency groups.Non-stationary background motions are filtered out by adjusting the value of λ and get the foreground object.

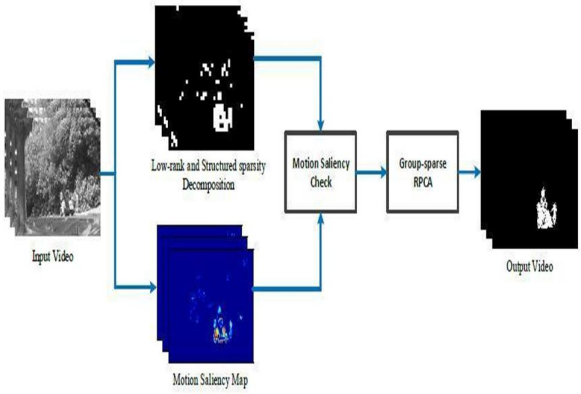

Fig.2.1 Framework of the Proposed Method

III. PROPOSED SYSTEM

The main aim of the project is to identify the licence plate from the given input video.That is basically the process of object detection from video frames.The given low resolution video can be first divided into different frames.These frames are consider as the processing units for the system.An algorithm called Low rank and Structured Sparsity Decomposition based on Robust Principal Component Analysis is used to detect the object in complex background videos.All objects in the given video are identified.Then background subtraction is done based on the algorithm MOG2.After the background subtraction,objects which have high priority(low priority objects are avoided by LSD method) can be identified by LDA classifier.If the video The existing methods related to the background subtraction or foreground detection have several disadvantages such as the methods could not consider the spatial parameters,and they could not handle complex background videos.Objects and the background in the video are sometimes very dynamic as they move from one place to another.To detect the moving objects in the video,the spatial parameters such as moving path,structure etc can be considered.the methods now exist does not consider these moving path as they assume some particular value for tha or ignoring that feature.Also existing methods consider the background as still or not moving.This leads to difficulty in calculating the exact movement of an object in complex background videos.

The proposes an algorithm for foreground detection, which falls into the category of low-rank based methods. Formulating the problems in a unified framework named Low-rank and Structured sparse Decomposition (LSD) method.This particular algorithm can solve the above mentioned problems,also

methods for object identification and licence plate identification are included to use the proposed algorithm in a specific field.

Licence Plate Identification from complex background videos is a very difficult task with the existing methods.They only assume some threshold value for the background motion,so there is a chance of error by detecting the object motion.For the proper estimation of position of a moving object,one has to consider the background motion also.Foreground objects are more motion oriented compared with background.This background is subtracted using specified algorithm. It is done based on the algorithm MOG2.After the background subtraction,objects which have high priority(low priority objects are avoided by LSD method) can be identified by LDA classifier.If the video contain any vehicles(main consideration for four wheelers),then it goes to Licence plate identification process.If it doesn't contain any vehicles,ithe algorithm identify the obect and display the name.Algorithms such as LDA and OCR are used to identify the licence plate in the video.

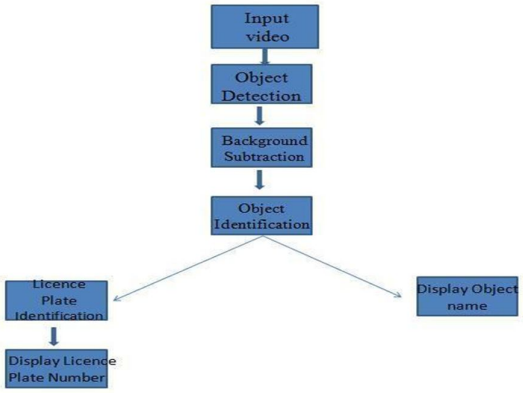

Fig 3.1 Block Diagram of the proposed system

IV. Conclusion

There are several techniques available to handle object segmentation from video frames.Existing methods have mainly two problems such as they do not consider the spatial parameters of an object in a frame,and it is not possible to handle complex scenes with highly dynamic background movements with existing methods. With varying scales, a robust analysis mechanism is required to handle background regions or foreground movements. This paper proposes a solution to handle these problems and provide an efficient methods to overcome these problems.Also suggested method for object detection,identification and licence plate identification from dynamic background videos.Licence Plate Identification from blurred images is one of the study area related to proposed system.The main application areas are Liscence plate identification,Medical field,Object detection,Traffic control system etc. It may be possible to elaborate the paper in case of real time requirements.It may be possible to modify the method to handle more noisy frames.Possible to elaborate the method to detect a particular object only in a frame.

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