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Moving Object Detection, Tracking and Classification Using Optimized Multiple Perceptron Neural Network

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Abstract— Currently, the detection of moving objects is being mandatory in most of the security systems. Moving objects are crucial in the areas of image searching, automatic annotation and for the understanding of scenes. Although the detection is a challenging task therefore, the detection of moving objects is essential to describe the accurate position and unique features of an object. The tracking of moving objects used in most of the computer vision applications. The detection and identification of objects form a moving scene or a video is called tracking. Some of the major challenges are occurred because of the position of moving cameras are not stable hence. The visibility of pictures is affected and the shadow area also considered as a challenge for the detection. In the previous research, Decision tree (J48), MLPNN (Multi-Layer Perceptron Neural Network) and KNN (K- Nearest Neighbor) used for the detection of moving objects but all these approaches are supervised that are not applicable to easily classify the data. The accuracy decreased and the false error rates increased. To sort out the previous work challenges, the current approaches are considered as namely as Optimized-MLPNN that easily stables the position and fix the location of objects.. For the classification, filters are trained that performed well and used the basic three operators as selection, crossover and mutation for the classification of moving objects. In proposed work, improve the accuracy rate, specificity, precision and reduce the FAR, FPR and FRR rate using simulation Tool MATLAB 2016a.

Keywords—Moving Object Detection (MOD), Tracking and Classifciation, OMLPNN (Optimized Multi Perceptron Neuron Network), Artifical Intellgience (AI) and GMM (Gassuian Mixture Model).

I. INTRODUCTION

Tracking and Moving object detection involves several platforms with various configurations working as a detailed coordinated framework with synchronization requirements to locate a moving object. Moreover, discovering moving objects which are ascertained with different moving vehicle on ground, or on airborne platform like aircraft, continuous updating required regarding position changing statistics of moving object. The accuracy of position updates and update rate relative to manoeuvrability of an object detected are fundamental operating features required to detect and track moving object(s) continuously [1].

A real time moving object detection is a challenging task in VSS (Visual Surveillance Systems). It gives as a starting stage for further processing like a moving object detection using clustering and classification.

To perform more difficult tasks is a main goal, for illustration, initially, we have to construct a precise method for identifying moving objects. A moving object detection method has the following characteristic:

1) Estimation of the stationary group of the foundation scenes and obtaining its considerable objects [2].
2) Difference images of frames taken at dissimilar interval of times and differences images of the series with the image of the stationary group of the scene.
3) Regions detect the objects.
4) Verify the moving object.

A video camera opinion in moving object recognition is a comparatively novel research field in CS (Computer Science) and due to its broad applicability in real-life this has been developing more earnestly. The camera CCTV is the major explanations for the developing interest and usage of video in SS (Security System). MOD (Moving Object Detection in an audio-visual stream is an important phase in video surveillance applications.

In some techniques, the object moves might become the scene of the segment, when they come to a stop. Also, the division might be affected by modifying in the light leaves convincing, camera trembling etc. [3].

Figure 1. Moving Object Detection [1]

Several methods for Object movable detect have been implemented in current years. In these involve background subtraction, optical-flow, temporal-difference and several methods for identifying moving objects. From these, the most worldwide used methods are BSM (Background Subtraction Method) which has several methods like scene difference, approx. median, GM (Gaussian Mixture).

II. BACKGROUND

Video surveillance system includes two noteworthy building squares, for example, movement location and movement estimation. Since there is extensive immaterial and repetitive data in the video crosswise over space and time, the video information should be compacted at the most punctual in video observation applications. Pressure can be accomplished by limiting the spatial and transient redundancies show in the video. Earlier, the video information is compacted either by decreasing the span of the casing or by outline skipping with little corruption in video quality. The 2D orthogonal changes and movement pay systems are associated with late video coding measures to evacuate the spatial and transient redundancies [4].

Video surveillance has been used to control security areas like stores, banks, highway traffic monitoring, public places, etc.

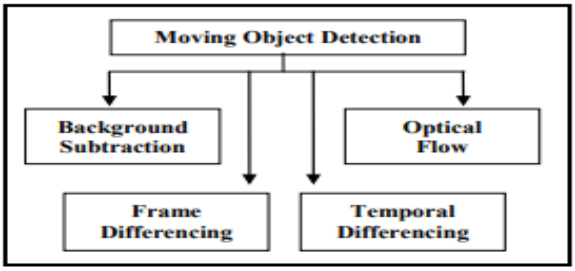

Figure 2. Traditional Approaches of Moving Object Detection [5]

Several methods used for detection of moving object are:

1) Temopral Differencing: This technique comprised of two adjacent frames relied upon time series image to subtract to get difference images, and the execution is identical to subtraction method. Later it provides moving target statistics via threshold value. Such technique easy to implement and simple and its adaptive to random changes. Moreover, other approaches also need to be adopted to detect non-moving objects for higher levels of success of computationally complex objects that are not applicable without particular hardware [6].

Figure 3. Temporal Difference

2) Frame Difference: Casing distinction strategy distinguishes the nearness of moving article by considering the contrast between two successive edges. The customary approach makes utilization of picture subtraction administrator that gets yield picture by subtracting second picture outline from first picture outline in relating sequential edges. Edge differencing strategy needs in getting the entire shape of the question because of which morphology tasks are generally used to acquire better outcomes [5].

A. Foreground Detection

In most of the computer vision application, the majority of tasks are performed by segmentation in specifically image processing. Foreground segmentation is a particular field that focused to detect the modifications and changes in the image sequences. Generally, the segmentation is a process to divide the image into small groups that called as segments. These segments contain more information about a particular object and these are simple to understand. Foreground segmentation is a video cut out which implies to extract the objects that are necessity for the further process and acquired from the input of video sample. In most of the video application, this task is difficult, and it also considered as the pre-processing step in the video analysis [7].

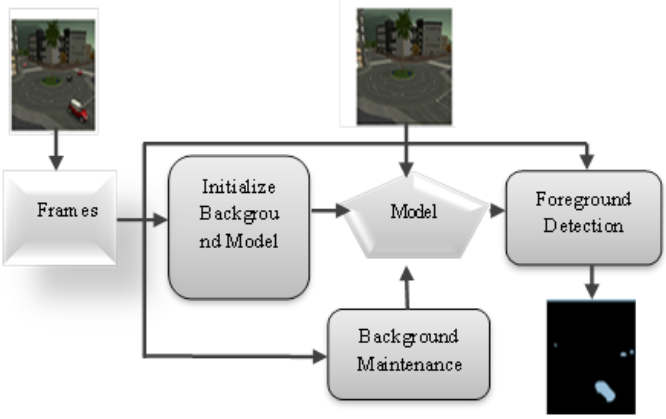

Figure 4 . Foreground Segmentation [7]

B. GMM (Gaussian Model for Foreground Object)

The R components for both foreground and background are without any distinction. In case of one mixture occurred quickly with high W_R then are not affected with low δ_R it assumed to the background. Hence, the R mixture components are based on $\frac{W_R}{\delta_R}$. Further, the A components are assumed as the foreground components and it is as follows-[8]

$$A = \text{ARG Minimum}_A \left(\frac{\sum_{j=1}^{A} W_j}{\sum_{R-1}^{R} W_R} > T' \right) \qquad (1)$$

In above Equation (1), T' is the threshold and the background subtraction is performed by considering each pixel as an input more than the 2.0 standard deviations from A components as foreground [9].

III. RELATED WORK

Anaswara S Mohan et al., 2014 [10] presented the moving objects often contain almost important information for surveillance videos, traffic monitoring, human motion capture etc. Background subtraction methods were widely exploited for moving object detection in videos in many applications. Moving object segmentation is the application in video processing. Segmentation helps in detecting various features of moving objects for further video/image processing. **Ms Jyoti J. Jadhav , 2014 [11]**described moving item identification and tracking has been broadly utilized as a part of differing control, for example, canny transportation framework, air terminal security framework, video reconnaissance applications, et cetera. They exhibited the moving item location and following utilizing reference Background Subtraction. In this strategy, they utilized Static camera for video and first edge of video is specifically consider as Reference Background Frame and this edge is subtract from current casing to recognize moving item and after that set edge T esteem. On the off chance that the pixel contrast is more noteworthy than the set limit T, at that point it establishes that the pixels from moving item, generally, as the foundation pixels. In any case, this settled limit appropriate just for a perfect condition isn't reasonable for complex condition with lighting changes. **Ronan Fablet et al., 1995 [12]** gone for identifying moving articles in shading picture successions procured with a versatile camera. This issue is of key significance in numerous application fields. To precisely recuperate movement limits, they abuse another spatial picture parcel provided by a MFR-based shading division calculation. They presented a locale level diagram displaying installed in a Markov system to identify moving items in the scene saw by a versatile camera. This was expressed as the double division into areas adjusting or not fitting in with the overwhelming picture movement thought to be because of the camera development. The technique was approved on genuine picture groupings. **Kalpesh R Jadav, et al., 2012 [13]** defined moving item recognition and following was frequently the initial phase in applications, for example, video reconnaissance. The fundamental point of undertaking a moving article location and following framework with a static camera has been created to appraise speed, separate parameters they proposed a general moving item discovery and following in light of vision framework utilizing picture contrast calculation. They concentrated on location of moving articles in a scene for instance moving individuals meeting each other, and following and distinguished individuals as long as they remain in the scene. This was finished by picture contrast calculation with tangle lab programming and it could figure separate, designer time, speed . **Isaac Cohen et.al., 1999[14**]addressed the issue of identification and following of moving articles in a video stream acquired from a moving airborne stage. The proposed technique depends on a diagram portrayal of moving items which permits to infer and keep up a dynamic layout of each moving article by authorizing their fleeting rationality. This deduced format alongside the chart portrayal utilized as a part of our approach enables us to describe objects directions as an ideal way in a diagram. The proposed tracker permits to manage incomplete impediments, unpredictable movement in extremely difficult circumstances. We exhibit comes about on various diverse genuine successions. **Hamza Ergezer et.al., 1997[15]** presented the issue of identification and following of moving articles in a video stream acquired from a moving airborne stage. The proposed technique depends on a diagram portrayal of moving items which permits to infer and keep up a dynamic layout of each moving article by authorizing their fleeting rationality. This deduced format alongside the chart portrayal utilized as a part of our approach enables us to describe objects directions as an ideal way in a diagram. The proposed tracker permits to manage incomplete impediments, unpredictable movement in extremely difficult circumstances. We exhibit comes about on various diverse genuine successions.

IV. DESIGN AND IMPLEMENTATION

In this research work, we work on region based methods and following steps described below: -

1) Determine the Foreground Segmentation method.
2) Using the Fuzzy Morphological Filtering to attain remove noises.
3) Feature Extraction (Quality Based Feature and Texture Based Features).
4) Track Object based on BOB ANALYSER.
5) Moving Objects Detection, Tracking and Classification proposed an OMLPNN (Optimized Multiple Perceptron Neural Network).
6) Performance Evaluation.
7) Comparison.

Description:-

In proposed methodology, the dataset is search from the UCI Machine Learning Repository Site. To collect the dataset in different – 2 video clips like cloudy, foundation, sea water, sunset and Normal views. Upload the video clip in the axes control tool. Extract the video clips in the various frames that are called single view images. We implement the preprocessing technique to convert the gray scale format in the single image view and store the all image in single folder. Then predict the maximum and minimum intensity values using color difference histogram. Extract the unique properties using MoG algorithm. Detection and classification

methods using Optimized MLPNN and Foreground detection, Bob Analyzer and Classification. After that detection, we calculate the performance parameters like accuracy, FAR, FPR, FNR, Precision and Specificity. In this research work, we implement the moving object detection, tracking and classify and calculate the performance with the accuracy parameters, FPR and FNR etc. We are applying the filtration method to generate the clear object of the images according to the intensity and pixel. Then, we extract the features and identify the unique features in the video clip and outer area discarded. After that extracted we implement the neural network approach to identify the moving object, remove the noises and classify the moving object. To compute the performance parameter like accuracy, FAR, FPR, FNR, Specificity and Precision.

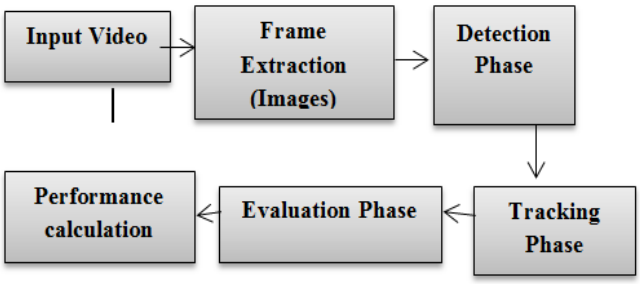

Figure 5. Work Flow Chart

V. RESULT AND DISCUSSION

The dataset MOT17, PETS2009 and FOOTBALL video is collected by various real outdoor and indoor series organized in dissimilar classified each of one covering a specific main challenge in MOD (Moving Object Detection) methods.

Some other datasets, if it is completed explained at all pixel level and object level. It is suitable only for schemes entirely focused on the detection of moving objects, but also for those that ITS (Integrate Tracking System) in their object detection methods.

It contains series recorded with the static and moving camera's and it also gives information about the MO (Moving Objects) left temporally static.

Individual series contains the following data like ids are :

1) Real Video Clip: Particular folder ID that contains a 24 bpp bmp file for each frame in the real video.

Categorized Images: Individual folder name ID_GT that gives a 24 png bmp record with the ground truth corresponding to each frame in the real video. An attractive into account that the series of this dataset contains a max of 3 moving.

In this section, we describe the results in moving object detection in video and image processing. Moving the object detection in real-time is a challenging task in visual surveillance systems. It acts as a starting phase for further processing like a detection of moving the object using classification, tracking and detection.

Figure 6. (i) Original Frame (ii) Gray Scale Image and (iii) Edge detection Image

The above figure 6(i) shows that the main GUI define the upload the video clip which is '*.avi" format extracts the video in the form of frames. Apply the pre-processing phase to convert the extracted frames in grey scale format. Foreground Detection method implements to extract the frame and identify the unique properties of the image. Identify all extracted frames to calculate the average image. Average image calculates and implements the object detection method to identify the object in the running video. Evaluate the performance parameters like Far, accuracy and precision etc. upload the video from the dataset. Figure 6(ii) and (iii) gray scale form means 2D transformation. Gray scale is a range of dark glasses of gray without obvious color. The darkest possible shade is black, which is the total absence of transmitted or reflected light. The lightest possible shade is white, the total transmission or reflection of light at all visible wavelengths. Middle shades of gray are represent by equal intensity levels of the three primary colors or transmitted light, or equal amounts of the three primary pigments for reflected light. The above figure shows that the binary image. In gray scale image the intensity values of the pixels vary from 0 to 255.

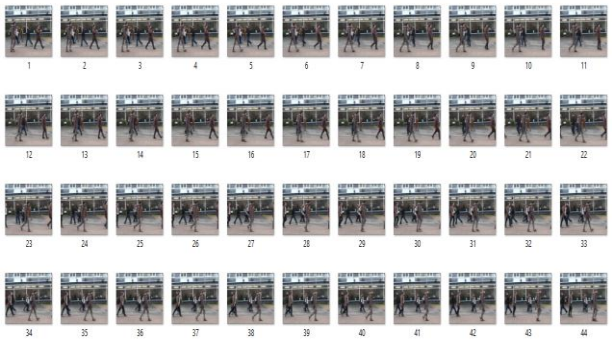

Figure 7. Frame Extraction

The above figure shows that the frame extraction from the video. Find that Video Reader does have a Number of Frames property that can be accessed after you have used Video Reader but before you have read any frames, but it turns out that the number it provides is an estimate assuming fixed frame rate; the estimate is almost always wrong for variable frame rate videos, and the estimate can be off by a couple of frames even for fixed frame rate videos.

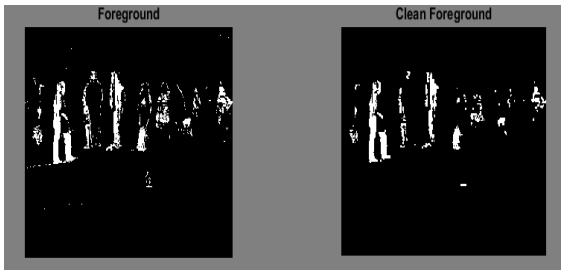

Figure 8. Foreground Detection

The above figure shows that the foreground segmentation of the video is done by the mixture components that frequently occur with high a priori probability and small variance. A pixel in the mixture model is analysed evaluating the data color density at particular pixel on time. It can be expressed as mixture with components modeling the distribution of a random variable. modeling the mixture components we applied formalism of General Gaussians instead of Gaussian distributions. According to this the new frames which are sequentially fetched with new mixture parameters. For a background model GGDs is used to obtain a better outlier which are occurred due to the sudden illumination change in indoor scenes or non-stationary backgrounds caused due to the swaying tree branches or shadows. Even though the GGDs have the ability to adopt as per the data shape than Gaussian; Gaussian can reduce over fitting more easily. The GGD formalization is applied for online estimating new mixer model.

Figure. 9 Track and Classify Objects

The blob detectors have two main classes with various methods according to its derivative expressions and landscape intensities. As per the modern approach these operators are referred to interest point operators, or alternatively interest region operators. There are lot of motivations in analysing and improvising the blob detector. The main reason is it will provide the complementary information of the regions which are not gained during edge detectors or corner detectors.

A textured region in one image can be matched with a uniformly colored region in the other image as long as they have a similar spatial layout.

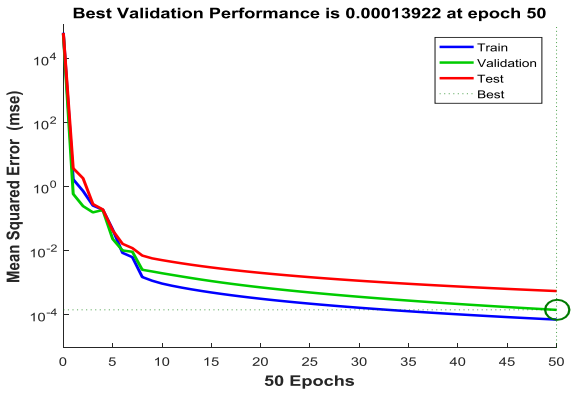

Figure 10. Performance (OMLPNN)

The above figure shows that the best performance calculates the means square error rate on the basis of train, validation, test and best point. The best performance value is 0.00013922 at epochs 50.

Table 1. Comparison – Proposed and Existing Work

Classifier	Accuracy Rate	False Acceptance Rate	False Positive Rate	Precision
J48	0.8 ~ 80	0.29	0.2	0.71
KNN	0.65 ~ 65	0.36	0.4	0.64
MLPNN	0.45 ~ 45	0.53	1	0.47
OMLPNN	84.85	0.14	0.8579	0.99

Table 1 defined that the performance comparison between proposed and existing work with various classification methods like as a j48, KNN (K Nearest Neighbour), MLPNN (Multi-layer perceptron Neural Network) and OMLPNN (Optimized Multi-layer Neural Network).

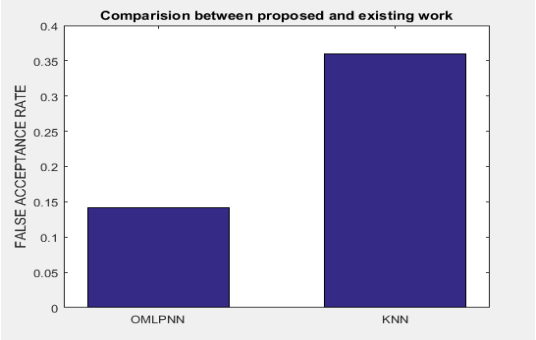

Figure 11. FAR – Comparison

The above figure shows that the comparison between proposed and existing works. In proposed work reduce the acceptance rate but in existing work high FAR values.

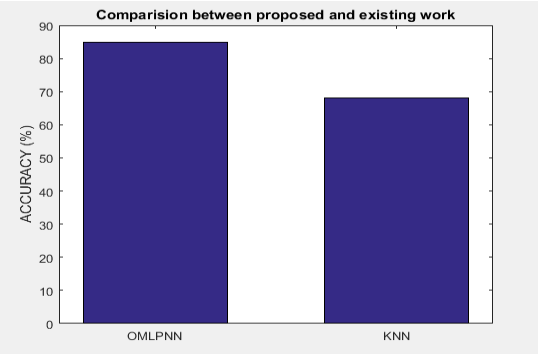

Figure 12. Accuracy – Comparison

The above figure shows that the comparison between proposed and existing work in proposed work improve the accuracy rate but in existing work reduce the accuracy rate.

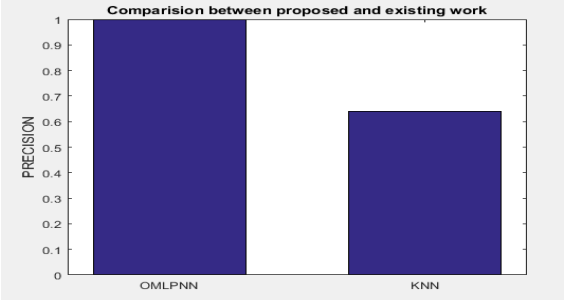

Figure 13. Comparison – Precision

The above figure shown that the precision rate with comparison means Positive true value acceptable.

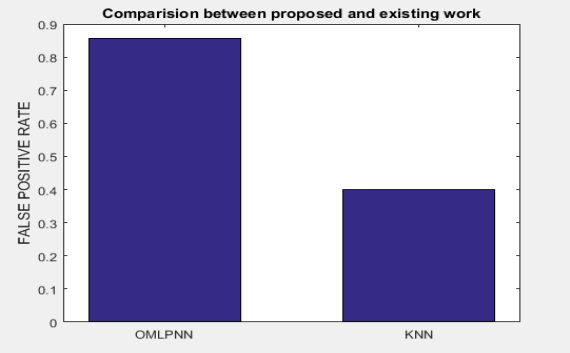

Figure 14. FPR – Comparison

The above figure defined that the comparison between proposed and existing works in false positive rate. The number of cases correctly identified.

VI. CONCLUSION AND FUTURE SCOPE

In this conclusion, have addressed various issues regarded to the study of video stream. The design framework proposed is depend on the OMLPNN method representation of the MO (Moving Objects) or regions extracted from a video acquired by a Moving system. Several paper are studying and found the problem in this moving object detection, tracking and evaluation. The main problem is occlusion that could define in a real-time scenario. In a congested situation, all these occlusions might affect the accuracy of the method. The issue becomes more difficult due to the illumination alters in the scene. Different lighting situation might affect the visibility of an object and even modify the appearance of the object. The way of light is placed in a scene, might cause an object to different look. It isn't easy for one to develop a reliable real-time ordinary detection and tracking method i.e., is able to address all these problems. Though various researchers have employed dissimilar to identify this particular issue, there is still no defining method in terms of accuracy, time and speed. In this proposal work, detection and classification methods using Optimized MLPNN and Foreground detection, Bob Analyser and Classification. After that detection, we calculate the performance parameters like accuracy, FAR, FPR, FNR, Precision and Specificity. In this research work, we implement the moving object detection, tracking and classify and calculate the performance with the accuracy parameters, FPR and FNR etc.

Although the future scope in visual tracking algorithm proposed here is robust in many of the conditions, it can be made more robust by eliminating some of the limitations as in the single visual tracking, the size of the template remains fixed for tracking. If the size of the object reduces the time, the background becomes more dominant than the object being tracked.

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