

# An Efficient Multiple Object Recognition using Gait Feature Extraction based on Gaussian Filter

S. Suchitra, S. Sangeetha

**Abstract:** Object tracking plays a major role of surveillance in the real time world of robot applications. The object tracking deals with different sizes of objects for better outcomes and the execution relies upon its exactness and its capacity that should track the objects at a high speed. The movement to remove valuable data from the video grouping and monitoring can be characterized toward fragmenting the locale of object tracking. The essential things of video perception, for example, object identification, tracking and recognition using various cameras. Objects are recognized by utilizing the background subtraction of every video frame, and are tracked by a Kalman channel with Gaussian method (KF-GM). To support multiple objects tracking, object recognized algorithm is connected utilizing Gait technique which is utilized with its vigorous execution. Handling of edge is done in MATLAB to get location, tracking and perceived outcomes. It yields promising tracking performance on the challenging videoset01 and videoset02 dataset.

**Index Terms:** Smart Video Surveillance, Moving Object Identification, Kalman Filter, Gaussian Filter, Multiple Object Tracking, Gait Feature Extraction.

## I. INTRODUCTION

Tracking numerous targets from video frames is the key innovation in video understanding, movement analysis and occasion analysis; however it is a vital challenge in PC vision. Despite the fact that incredible improvement has been appeared in the recent past, tracking in crowded and cluttered situations still experiences issues that should be tended to, for example, complex illumination varieties, visit impediments and collaborations among targets. Tracking by-identification is a standout amongst the most well known methodologies in multi-target tracking because of the incredible progress on object location. Target of intrigue are removed from the scene by an identifier and after that connected by various algorithms to shape directions. Along these ways, the tracking task can be viewed as an information affiliation issue. The tracker appoints every location a unique ID comparing to a specific target or disposes of it as a false caution. Video perception is a functioning developing and indispensable zone of research. Object tracking is a major and principal area of video observation structure. The goal of this article is to assemble the structure for constant after various articles moving over a fixed camera. In spite of the fact that there are numerous techniques for tracking have

been broadly considered in PC vision handle, a few difficulties should be routed to empower the intelligent surveillance frameworks. The troubles stood up to are brightening up, change of the light, aggravation due to outside clamor, etc. Be that as it may, tracking targets when the detector comes up short is an intense test that can't be ignored. Detectors are intended to identify and confine objects in static images. Be that as it may, identifiers experience a troublesome issue when used to identify objects, for example, person on pedestrian which can fluctuate incredibly in appearance. Illumination varieties, viewpoint or non inflexible distortions are some basic factors of identification failure. For instance, individuals of various genders orientations wear various types of garments or accept varieties of postures. Luckily, the detector reaction isn't the main data we can get from video sequences. It has been demonstrated effective for tracking to use more image data, for example, tracking, background modeling, and super pixel division and so on. In any case, they have restrictions in tracking target under moving camera or in requiring manual initialization. The likelihood of video frame tracking has been utilized during the zones of video observation, mechanical technology, and vehicle route and in biometrics identifiers. Amid latest couple of years, distinctive asks have experiencing the assorted algorithm that uses object distinguishing, tracking and perceiving in the video. Mean shift procedure, Cam shift system, Kalman channel, Background Subtraction methodologies are the particular strategies that uses the object path towards following an object from a video outline. Mean shift system is an iterative strategy which estimate and figured the present position of the article and subsequently track an object to its mean shift an incentive as the new position. The cam shift strategy utilized for tracking the object is the change of the mean shift technique. The fundamental complexity of the mean shift procedure has the fixed degree of the interest window, anyway in the cam shift framework the scope of the pursuit window can be balanced by the improvement of the article. In any case, the most straightforward and quickest thing distinguishing proof framework is establishment subtraction which is used in this paper. This not simply makes a point of convergence of thought for progressively elevated amount dealing with yet furthermore decreases count time stunningly. Normally used systems for thing disclosure are establishment subtraction. The background subtraction strategy is additionally proficient and simple technique to discover the entire moving object from a video outline sought after Kalman separating object identification. Kalman channel moreover found a way as a pointer rectifying technique.

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That unequivocally assesses a situation of article in every bundling of a movement. Kalman channel uses to diminish noise from a video outline with the perspective on the enlightenment, the refinement in the light, and so on relies on the body shape and stride which set up a configuration that organizing a technique dependent on its video outlines, that may be key edges for individual conspicuous verification. From this article we examine a strategy of pipeline stream for recognizing, after that affirmation of things can reproduced results. Approach of this article is dealt after the portrayed in area III. Getting ready pipeline of the proposed calculation is depicted in area IV. The getting ready methodology is delineated in segment V. likewise, finished up in segment VI.

## II. RELATED WORK

Various color histograms based tracking algorithm [1] has been proposed lately. The mean shift tracking algorithm has been reached out by Collins [2] with the scale variety of object of interests in a video frame. Perez et al. [3] utilized color histogram moreover with a molecule channel for object tracking in video outlines. A spatiogram based methodology has been proposed to capture spatial connections of measurable properties of pixel, in Birch field and Rangarajan [4]. He et al. [5] built up a territory delicate histogram at each pixel for object tracking is better dissemination of the visual component centers for objects in video scenes. Histograms of oriented gradients (HOGs) [6] are proposed for object tracking in addition to the necessary histogram. Spatio locale descriptors [7] based methodologies were presented for tracking, to join diverse features. Local binary patterns (LBP) [8] just as Haar-like highlights [9] were proposed for appearance based object tracking. Spatio-worldly depiction united with hereditary computation has moreover been used for highlight extraction [10]. As of late pixel based divisions have been connected to manage object tracking. Different generative models have been proposed for multiple objects tracking in past years. In [11] and [12], Sparse Generative Appearance Modeling is actualized to construct an appearance model of objects. Gaussian Mixture Models (GMM) [13] is prominent generative methodology for tracking. Beside from GMM, a few other blend models have been utilized in tracking in earlier days, for example, limited blend models [14]. Priebe et al. [15] presented an algorithm dependent on recursive mixture thickness estimation. To remove time-invariant attributes, the creators of [16] present a Bayesian Tracking approach utilizing auto regressive Hidden Markov Model (ARHMM) for powerful visual tracking. In the recent, discriminative models are leading the way in the field of object tracking [17]. In this strategy, a binary classifier is prepared from the information video sequences, for division of target and background. The classifiers comprehensively use the tracking of objects that are: situating SVM [18], semi-boosting [19], support vector machine (SVM) sorted out yield SVM and online multi case boosting. In [20], a prepared SVM classifier is incorporated for tracking, to handle appearance based changes with differing illumination. A confidence map [21] in each frame is built utilizing a discriminative component combination, learned online, separation of background from target objects. Larese et al. [22] have utilized SIFT descriptor to separate the

patterns and after that utilized it to assemble Bag of Words model and lastly characterized with SVM. Different object tracking codes are open for assessment with huge exertion of the creators.

## III. PROPOSED METHODOLOGY

The approach strategy has three phases object distinguishing proof, object following and object acknowledgment. The object distinguishing proof is used by foundation subtraction strategy which trailed by object tracking. The object is tracked using Kalman sifting and acknowledgment finished by Gait procedure as showed up in Fig 1.

### A) Multiple object Identification

It identifies the objects from video outline of the camera and then performs object extraction. The foundation subtraction is directly applied for closer view/foundation partition of every discovered pixel that weighted shading histogram. Then the approached object division is to get edge parallel veil for late recognized article. At last, weighted hued histogram of new article will be isolated from an object spread as showed up in Fig.1 object distinguishing proof.

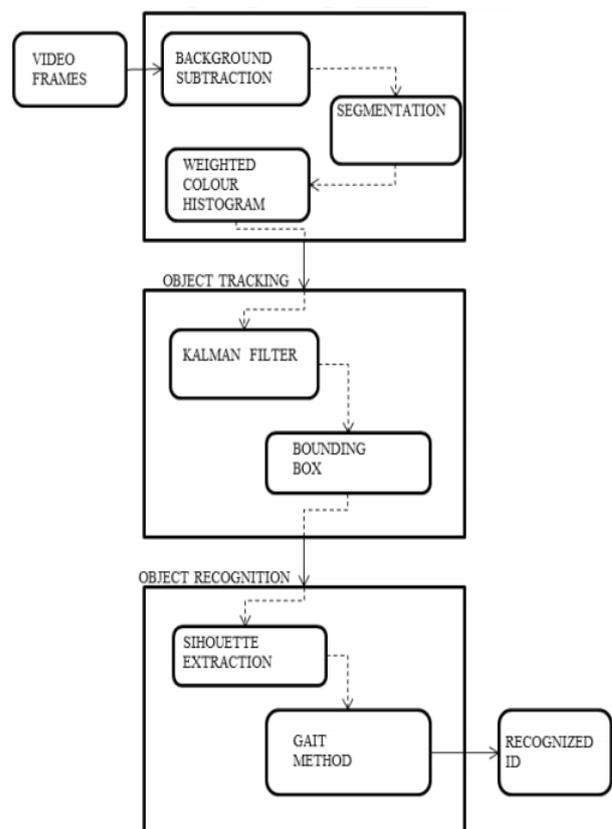


Fig1. Block diagram of proposed method

### B) Multiple object Tracking

It uses the Kalman separating procedure of object tracking. The system fuses forecast that rectifies the object from next position using the past evaluations.



The outcome reduces the probability of consolidating to the uproarious foundation with practically identical shading information as the tracking of objects. The weighted shading histogram of lately entered object is used in the following. Furthermore, the object cover gained from the recognizable proof square is used to refresh the bounding box and shading histogram of the object tracking.

**C) Multiple Object recognition**

The gait method is used to classify the object that has been tracked, in fact that the shading and shape information of the objects causes a gigantic errors that differentiate in the outcome. Along these outlines are use to removed the highlights. The height and width of the video outlines are separated by highlights that used in gait acknowledgment.

**IV. IMPLEMENTATION OF PROPOSED WORK**

Accurate detection of objects of interest across multiple frames and tracking of the recognized objects are still a challenge. In order to do that, first we model the background and remove the hard shadows from the background to extract the exact area occupied by the object in a frame. Next, we model the foreground subtract the foundation demonstrate without shadow to acquire the mass of an object. The proposed technique is executed in MAT LAB. It is a work space that programs and simulates the video frame to get the ideal following by Kalman filtering. The tracked object is removed by silhouette and recognition of object by utilizing gait strategy. The principle goal of this paper is the identification, tracking furthermore, acknowledgment of object that entering the video edge and continues its tracking until it disappeared from the video outline.



**Fig. 2(a) objects detected in Vietnam road**

**A) Background Subtraction**

The Background subtraction is also called as frontal area recognizable proof. Treatment of video is game plan of edges in regards to time. The camera takes video outlines continually. So prompt dealing on video isn't basic it is troublesome. After the video change to outline, the pre-processing is associated on each edge for decreasing the noise that accessible to video frames. The preprocessing finished utilizing average move, convolution channel, at last

focus channel. The spread gained will be copied with the noise and video frame will get ousted so the result is accurate.

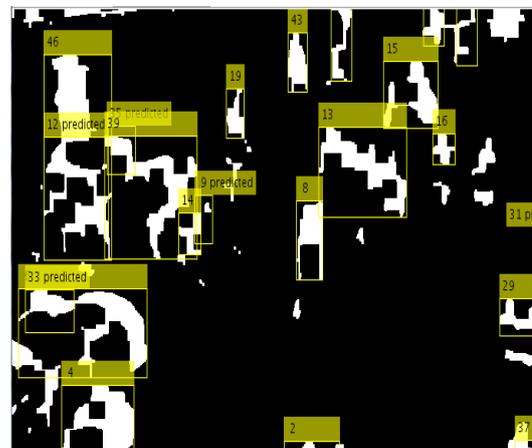


**Fig. 2(b) Object detected in shopping mall**

At the point when the foundation outline is presented it referred as reference outline P [C]. It has several methodologies that gain basic foundation image. For instance, acknowledge of essential edge from foundation begins the video outline. Finally the foundation of video outline displayed the subtraction of present edges and referred plot are developed by the multiple objects. The subtraction applied pixel by pixel from two reference edges that are design from

$$P [A (i)] = P [J (i)] - P [C]$$

$$| P [A (i)] - P [A (i+1)] | > \text{Threshold value}$$

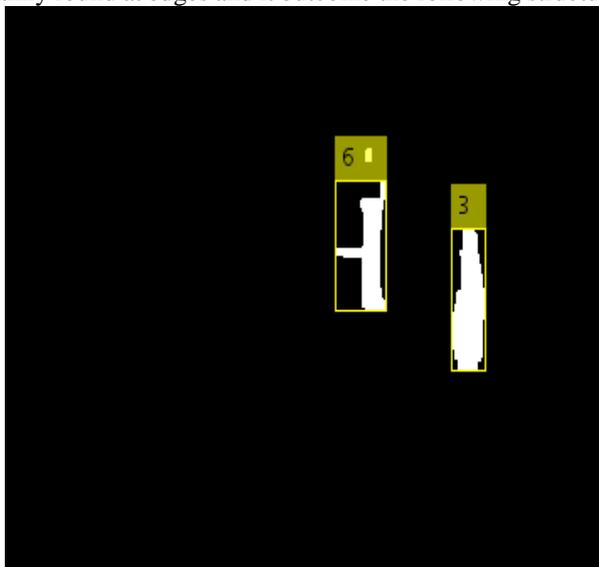


**Fig. 3(a): Background frame from videoset01**

Video outline. After subtraction the subtracted image are partitioned by using distant point. These division subtracts the current and reference outline. The subtracted edge estimate each pixel from pixel esteem which differentiated from an incentive, if the subtracted pixel value is important than the limit value will imply to 1 and not increasingly imperative, then it implied to 0. The video outline which estimates 1 is addressed to dim and 0 to white. From the divided outline it shows the objects in white and the foundation is dull.



The yield isolated edge is provided by applying morphological sifting task to decrease noise. This isolating ability to expel the little areas in all likelihood made by noise tops off holes, smoothing limits, evacuates edge. It demonstrates pixel level as showed up in Fig 3. Finally the division of morphological sifting in multiple objects is plainly found at edges and it outcome the following structure.



**Fig. 3(b): Background frame from videoset02**

### B) Object Tracking Using Kalman Filtering

Kalman separating is used for object Tracking. It has more focal points stood out from other Tracking methodologies. It is large and called as linear quadratic estimation (LQE). Kalman Filtering assume to the development of estimations after some time, containing authentic disturbance and particular slip-ups, and passes on assessments of darken variable that is definite than those depend upon a solitary estimation, it uses Kalman filter for estimation of connection dispersal for each time length of object. The algorithm approaches two methodology phases. In the expectation, the Kalman channel yields the assessments of current factors and nearby vulnerabilities. Once in case the consequence of next estimation is anticipated, then examinations are invigorated by a weighted average, the loads are revived to appraisals high sureness. The algorithm is recursive then it keeps running continuously, utilizing just the present information see surveyed and the starting late chosen state and its vulnerability cross segment yet no extra past assessed respect is required. The Kalman channel doesn't make any doubt because the errors are Gaussian. Regardless, the channel conveys the careful contingent likelihood which surveys in the extraordinary case as showed up in Fig 4.

### C) Gait Recognition method

The gait acknowledgments are ordinarily suggested to distinctive confirmation of individuals in video outline progressions in which individual walk. Gait acknowledgment is second identifier of bio measurements that doesn't require individual cooperation. The gait acknowledgment observes an individual's style of walking in unique and it classifies the individual in a distinctive verification as showed up in Fig 4.

The outlines of different individuals are taken and incorporates are extracted as showed up in Fig 3 which is connected in this methodology. It helps powerful outcomes to various classes of portrayals. The gait acknowledgment in perspective on their exceedingly versatile and basic showing capacity can named as speculation of delta rule. If back engendering is begun, a data configuration is spread to the output units through which the interceding contribution is loads. The input vector is highlight and the apparent id of the chosen individual is recognized. Along these lines is prominent and comprehensively used in image and signal preparing.



**Fig. 4(a) object recognized by using Kalman filter and Gait method**



**Fig. 4(b) object recognized by using Kalman filter and Gait method**

## V. EXPERIMENT

This section clarifies the experiment result of two video dataset (videoset01 and videoset02) which contains different objects and individuals always moving. For Experiment, we took two distinctive situations dependent on two diverse video datasets. To begin with, we took traffic Video that is the craziest traffic ever and this video was shot totally in Hanoi, Vietnam where there is no traffic light to follow.



The vehicles won't follow any traffic rules and the general population is additionally crossing the streets in substantial rush hour without following any traffic guideline and they all move as indicated by their own desire. The people on foot won't walk through the zebra crossing and the pathway. So there are numerous objects which are in movement. The proposed framework effectively identifies and tracks the different objects and somewhat recognizes the blocked articles in the video. Second situation is a shopping center video dataset. For this situation there are not many individuals moving objects. The frameworks did investigation on the floor of shopping center and effectively distinguished and track the numerous objects in movement. The proposed framework effectively recognizes and tracks the numerous objects in movement. Both Kalman filter and gait technique were probed the video dataset. Fig. 3 (a) and (b) demonstrates the background image from videoset01 and videoset02 and Fig. 4(a) and (b) demonstrates the outcome acquired in the wake of applying Kalman filter with the moving object recognized. Fig. 2(a) and (b) is the first video frame.

**Trackers:** We analyze about the proposed Kalman channel along with Gaussian method (KF-GM) algorithm with a SMOT tracker which utilizes the desire and accurate system where the objects of next position are being tracked by utilizing the past evaluations. For reasonable examinations, the SMOT is additionally actualized dependent on a similar MOT system portrayed in BKF\_SGM yet with self movement model. We additionally analyze our strategy (BKF\_SGM) with other best techniques which utilizes the reported outcomes in this paper. For new benchmark groupings we contrast the proposed BKF\_SGM and the SMOT. To accomplish reasonable correlations, we utilize a similar identification results and recognizing results. To encourage comprehension of the proposed Multiple Object Tracking uses MATLAB programming, and the video datasets were utilized.

**Runtime:** in the given object recognizable of proof and acknowledgment, the average computation time using MATLAB will execute around  $5.64 \times 10^{-2}$  seconds and it get accompanying outcome without code upgrade. It unequivocally uses BKF\_SGM and then the object K takes  $6.0 \times 10^{-4} \times K(K-1)^2$  seconds. The object state estimation around  $5.1 \times 10^{-5} \times K$  seconds. The proposed algorithm can be associated on the web and progressing applications.

**Assessment measurements and programming:** For appraisal, we utilizes definitely comprehended estimations which are commonly used in MOT evaluation, which involves Precision (precisely tracking over total following outcomes), and false positives frame (FPF). The report numbers of video frames (Frm) are directed in object tracked. The extent of tracks with advancement totally object tracked parts for over 85% (generally pursued (MT)), under 15% (generally lost (ML)), or under 80% and more than 10% (to some degree object tracked (PT)). The amount of followed results (TR) is accounted in Table 1. We use a similar assessment programming to use in the different previous papers that diverse assessment programming's execution in

an unexpected way.

**Comparative Results:** We compute the exactness of proposed BKF\_SGM algorithm opponent to self development demonstrate similarly an error on the given video dataset are divided as showed up in Fig.2. We noticed different MOT procedures rely upon RMN and Simple Multiple Model (SMM). The mistakes prepared on the detachment of anticipated object positions and remedy procedure reliant on explicit criteria. We register mean division error from MOT. It is evaluated from mix-up evacuates that are assessed when the objects tracked. As showed up in Fig. 2 and 3, the prediction of object depends upon on the BKF\_SGM is progressively accurate in video set, similarly as foundation video set by the SMM, and its capability is increasingly significant when mis-IDs occur. As seemed Table 1, the BKF\_SGM beats the MOT in the greater part of measurements in fact that the BKF\_SGM can overcome camera movement issues as appeared in Fig. 2. Instances of our subjective outcomes are appeared in Fig.4. From Table.1 demonstrates comparison work with ethz proposed RMN and Jelmoli et al proposed SMM along with our proposed BKF\_SGM. Proposed SMM dataset, were taken from the sites when mis-identification happen with camera movements, self movement model uses in the SMOT and RMOT technique that becomes unreliable because the RMOT and SMOT can't remunerate the movement changes brought by the camera without related observation. Subsequently, whether the comparing object is unrecognized, then tracker can't discover the tracked object and the identification of expected subject to SMM is inaccurate outcome as showed up in Table.1 and also the exactness of object identification by utilizing different techniques are shown in Fig.5.

## VI. RESULT AND DISCUSSION

The model of input video outline are used to perform background subtraction, Kalman sifting and gait system. Video edges of observed camera are set to track the object by using Kalman channel. The movement of various objects as showed up in the figure 4. The outcomes are meant by bounding boxes as showed up in figure 4(a and b). The yellow hued bounding box implies the eventual outcome of background subtraction and then it demonstrates the object tracking by using Kalman sifting. The last system is to change over a video into outlines for object acknowledgment using gait procedure. Information outlines are showed up in figure 3(a&b). Their exactness is appeared table 1 and in Fig 5.

## VII. CONCLUSION

This paper centers on the synchronous of the distinctive object tracking. Amid the object recognizable proof, the amounts of pre-preparing strategy are associated with the video outline. Foundation subtraction strategy is the best calculated technique that diverged from various calculations. Foundation subtraction has perceived in moving objects that endures and steady.

# An Efficient Multiple Object Recognition using Gait Feature Extraction based on Gaussian Filter

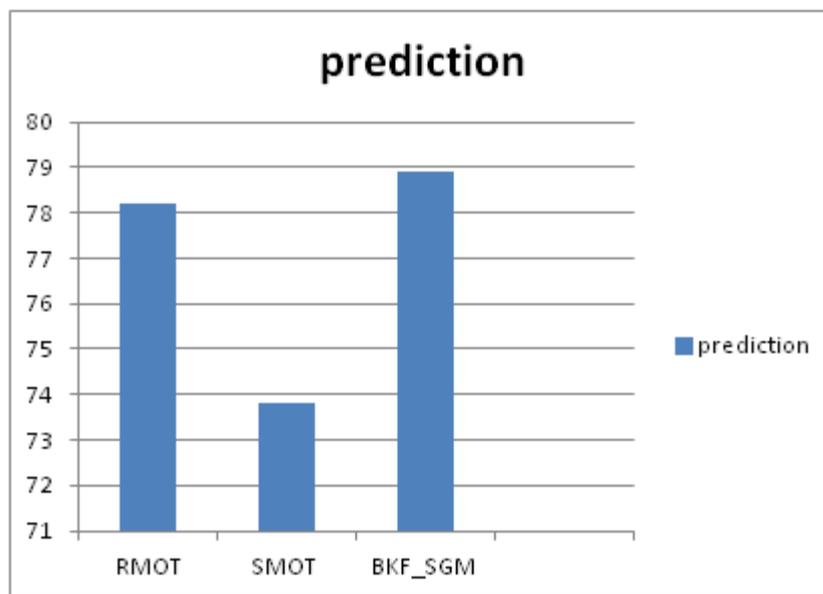
The object tracking is done by Kalman channel which is connected to consequence of outlines. It is then used to perform gait procedure which extensively classifies the observation behind speedy and perceiving of object tracking.

using different video set, which has well tracked outcomes by using camcorder. We can also used in various fields of view meanwhile using in Raspberry Pi.

DATASET	METHOD	MOTA	MOTP	FPF	TR	MT	PT	ML	FRAMES
Ethz	RMOT	78.2%	83.6%	1.16	164	61.6%	31.0%	7.3%	58
Jelmoli et al.	SMOT	73.8%	75.5%	1.82	164	51.8%	39.0%	9.1%	142
Videoset01	BKF_SGM	78.9%	84.1%	1.04	157	62.8%	30.7%	6.5 %	96
Videoset02	BKF_SGM	79.6%	84.8%	1.12	4	63.7%	28.4%	6.1%	561

The future degree is to realize the tracking of the object by

**TABLE 1: Comparison of Multiple Object Recognition with SKF\_SGM along with existing Methods using RMOT & SMOT.**



**Fig 5: The well tracked objects are predicted based on the accuracy of RMOT, SMOT and BKF\_SGM.**

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