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Article *in* International Journal of Applied Engineering Research · April 2015

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International Journal of Applied Engineering Research ISSN 0973-4562 Volume 10, Number 9 (2015)

A survey on Real time Object Detection and Tracking Algorithms

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***Abstract*— Real time object detection and tracking are important and challenging tasks in many computer vision applications such as video surveillance, robot navigation and vehicle navigation. Object detection involves detecting the object in sequence of videos. Every tracking mechanism requires object detection mechanism either in each frame or when an object appears newly on the video sequence. Object tracking is the process of locating an object or multiple objects using either static or dynamic camera. The availability of high powered computers, high quality and inexpensive video cameras will increase need for automated video analysis. It has generated a great deal of interest in object detection and tracking algorithms. Even though high powered computers are used for object detection and tracking algorithm, most of the object detection algorithms such as background subtraction, temporal difference, foreground extraction and simple differencing requires long time to detect object ,requires more storage space and no robustness against illumination changes. Recently computer vision research has to address the Multiple object detection and tracking in dynamic environment. In this paper, we address the various object detection and tracking algorithms.**

***Keywords*— Object Detection, frame differencing, Object Tracking Algorithms**

I. INTRODUCTION

Today, most of the living vicinity viz parks, streets, metro stations, shopping centers, schools and houses are monitored by technologically varied surveillance systems. Consequently, the research community has been focusing more attention on object detection and tracking. These systems generally include an advanced component for motion detection, object recognition, tracking, behavior understanding, video indexing or video retrieval. The technological advancement of cameras and computers used for capturing and analyzing the video leads the need of automatic video analysis. But the fully automated surveillance systems are still inadequate [Keval & Sasse,2006]. Lots of research work has been done in this emerging field. The remaining of the paper is organized as follows: Section II describes the background of object detection and tracking algorithms. In section III, various object detection and tracking algorithms are studied and Web/Grid/ Cloud computing based image processing are learned in section IV. In Section V and VI, the merits and demerits of the various object detection and tracking algorithms are learned and concluded.

II. BACKGROUND

In computer vision field, object detection and tracking plays a vital role. Object detection means locating/identifying objects in frame of video sequence and whereas tracking is the process of locating moving object or multiple objects over a period of time using camera. Technically, tracking is estimating trajectory or path of an object in the image. The availability of high power computers, high quality and low cost camera will lead the great deal of interest in object tracking algorithms. Three main key steps for video analysis are : Detection of Interesting moving Objects, Tracking of such objects from frame to frame, Analysis of Object tracks to recognize their behaviour. The main application areas of object detection and tracking are: Motion based recognition, automated surveillance, video indexing, human-computer interaction, traffic monitoring, vehicle navigation and etc.

But object detection and tracking is multifaceted course of action when projecting 3D world on 2D image because of the loss of information, noise present in an image, complex object motion, articulated nature of object, complex object shapes and occlusion. Almost all tracking algorithms assume that the object motion is smooth with no abrupt changes. But practically it is impossible. Even though so many difficulties are exist in object detection and tracking, a number of object detection and tracking algorithms are proposed and implemented. Each and every algorithms are varied with respect to the object representation used, image features and the motion, appearance and shape of the object be modelled for detection and tracking. The shape representation should be combined with appearance representation. There are a various ways to represent the appearance feature of objects. Some of the common appearance representation in the case of object tracking is described in [1] which are as follows:

A. Object Representation

An entity of an interest is an object. Object can be represented by their shapes and features. There are various object representations available for tracking. The selection of object representation for tracking is based on application. Some of the object representation techniques are: Points

representation which is suitable for tracking an object which occupies small region in an image, Primitive geometric shape representation is suitable for tracking both rigid and non rigid objects, Object silhouette representation is suitable for tracking complex non rigid shapes, articulated shape model is suitable for tracking articulated object with torso, legs, hands and etc, skeletal model is suitable for tracking both articulated and rigid objects.

In order to track the objects, shape representation can be combined with the appearance representation. There are a various ways to represents the appearance feature of objects. Some of the common appearance feature representations are described in [1] is as follows: Probability densities of object appearance which estimates the object's parameters, Templates which carries both spatial and appearance information of objects, Active appearance model which defines the object shape by set of landmarks (i.e., colour, texture or gradient magnitude) and multiview appearance model which encodes different views of an object.

B. Object Detection

The object detection is the process of locating objects in the frame of video sequence. Every tracking algorithm requires an object detection mechanism either in every frame or when an object occurs newly in a frame. Most of the object detection mechanism used information from single frame for detecting an object. But some of the object detection mechanism used temporal information which is computed from sequence of frames. It will reduce the false detection rate. There are several object detections mechanisms [1],[36] which are shown in figure 1.

The first step of real time object detection and tracking is to identify the region of interest of the video. Some of the object detection methods are: 1. Point Detector, 2. Background Modelling, 3. Segmentation, 4. Optical Flow and 5.Supervised Classifier.

1. Point Detector which are used to find the interesting points in an image. In the literature [1], commonly used point detectors are Moravec's detector, Harris detector, KLT detector, SIFT detector. 2. Background Subtraction which finds the digression from background model which are already built and incoming frames. Some of the background subtraction mechanisms are: Frame differencing Region-based or spatial information, Hidden Markov Model, Gaussian Mixture based Background Model,, Dynamic Texture based background model, Wall flower based background model and Eigen Space decomposition. As illustrated in [36] and [37], background modelling has two main approaches. One is Recursive algorithm and another one is Non-recursive algorithm. Recursive algorithm do not maintain buffer for background estimation. It recursively updates a background model based on the input frames. So it requires less storage. This technique includes the following methods: approximate median, adaptive background, Gaussian mixture. A non recursive algorithm uses sliding window approach for estimating background model. 3. Segmentation which partitions the images into perceptually similar regions. In [1], they have been discussed various segmentation techniques that are related to object tracking. They are: Mean shift Clustering, Image Segmentation using Graph-cuts, and Active contours. 4. Optical Flow method calculates the image optical flow field and perform clustering according to the optical flow distribution characteristics of images. 5. Supervised Classifier method an operator is trained to detect the feature of the objects. Some of the supervised classifier methods are: SVM, Neural Networks based detector and adaptive boosting techniques.

C. Object Tracking

An object tracker aims to generate trajectory of an object over time by locating its position in every frames of video [1]. Generally, object tracking has two main tasks. One is to detect the object and another one is to establish the correspondence between the object in every frames of video. These tasks can be performed either separately or jointly. The first case, the object in region has been detected by detector mechanism and later connection between objects in sequence of frame has been done by tracker. In the later case, the object region and correspondence is jointly estimated. It can be done by iteratively updating object location and region information obtained from previous frames [1].

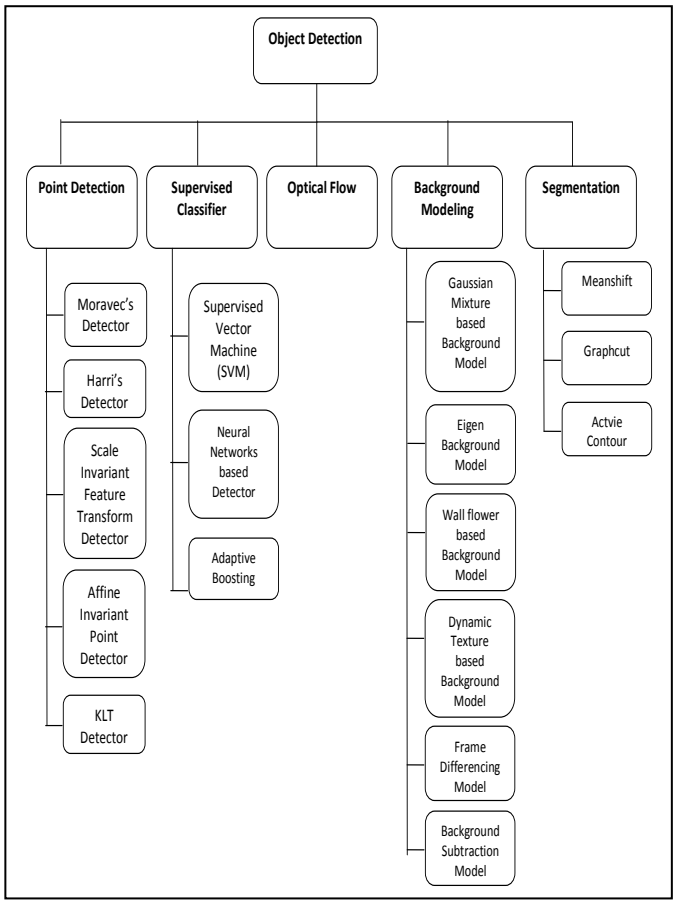

Fig. 1 Various Object Detection Techniques/Methods

There are different methods of tracking which are shown in fig 2: Point tracking, Kernel Tracking and Silhouette Tracking.

a. Point Tracking

Moving object can be represented by point in an image structure. An identification of point in a moving object is done by threshold value. Point tracking is difficult when occlusion will be appeared. Some of the points tracking algorithms described in [38] are: Kalman Filter, Particle Filter and Multiple Hypothesis tracking.

b. Kernel Tracking

Kernel tracking tracks the moving objects which are represented by growing object region from one frame to another. The geometric object representation is common in real time. But the restriction here is that, the part of the moving object defined may be left outside of the region or some background object may be covered by the region. The various kernel tracking methods are [39]: Simple template matching, Dual Tree Complex Wavelet Transform, Layering based tracking, Support Vector Machine and Color Histogram or Mean Shift Method.

a. Silhouette Tracking

Simple geometric based object representation is not suitable for complex objects representation such as hands, fingers, shoulders and etc. Silhouette based method gives an accurate shape description for the object which find the objects in each and every frame by means of an object model generated in previous frame. Silhouette based method is suitable for the variety of object shape; occlusion and object split & merge. In [39], the various silhouette tracking methods are described: Contour tracking and Shape matching.

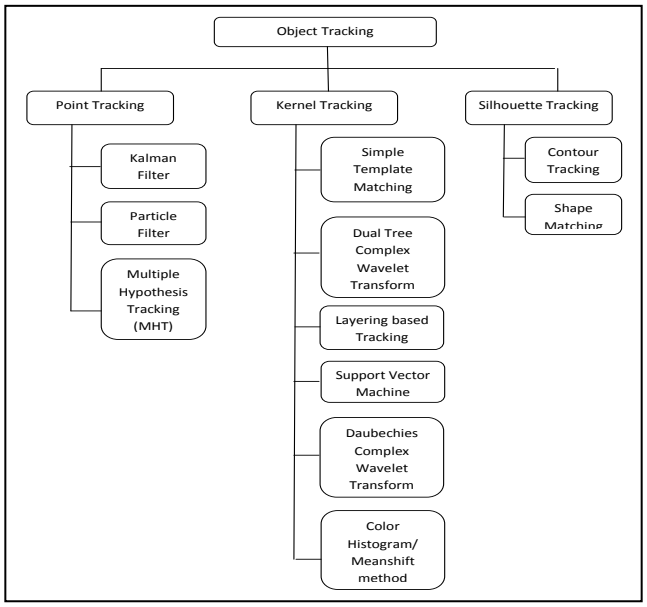

Fig. 2 Various Object Tracking Techniques/Methods

III. LITERATURE SURVEY OF OBJECT DETECTION AND TRACKING ALGORITHMS

In [3], Qiang Ling et.al, developed feedback based object detection algorithm. It adopts dual layer updating model to update the background and segment the foreground with an adaptive threshold method and object tracking is treated as a object matching algorithm. [BACKGROUND MODEL BASED DETECTION AND TRACKING]

A salient feature point based algorithm for multiple object tracking in the presence of partial object occlusion has been proposed in [4]. In this method, the extract the prominent feature points from each target object and then use a particle filter based approach to track the feature points in image sequences based on various attributes such as location, velocity and other descriptors. They used rectangular bounding box for object representation. But this algorithm may not successfully track feature points with different velocities. Hence this algorithm needs more flexible object representation and also they used static camera for capturing the video. [POINT DETECTION AND TRACKING].

A unified framework for both single and cross camera tracking with affinity constraints using graph matching was proposed in [5]. In this method, they mainly dealt with the problem of existence occlusion in single camera scenario & the occurrence of transition in cross camera scenario and also they consider the data association method in handling occlusion. They consider the tracklet association problem as graph matching with affinity constraints and leverage both person wise and part wise attribute for similarity measurement between tracklets to overcome the uncertainty and noise. The crucial problem caused by cross camera tracking lies in the drastically increasing the data. [SEGMENTATION BASED DETECTION & SILHOUETTE Tracking]

A structured labelling information in the partial least square analysis algorithm for simultaneous object tracking and segmentation was proposed in [6].This algorithm allows for novel structured labelling constraints to be placed directly on the tracked object to provide useful contour constraint to alleviate the drawback of the online-learning-based tracking method is their sensitivity to drift, i.e, they gradually adapt to non-targets. Also, this algorithm consider the challenges in the problem of detection and tracking include appearance changes of the object, illumination variations, occlusions, background clutters, non rigid shape changes etc. In order to avoid the gap between the detection and segmentation, this algorithm performed tracking and segmentation simultaneously. [Active Contour Segmentation based Object Detection and Silhoutte Tracking].

Video Surveillance cameras used in metro-stations are always short shot, low quality and nondirective downward view. So, accurately count the pedestrians in the case of not changing the position of the surveillance camera is the most challenging problem. Hence they proposed, novel method to count pedestrians in metro stations based on HAAR like detection and template matching in [7]. [POINT DETECTION AND KERNEL TRACKING]

In [10], Jianxin Wu et al proposed real time and accurate object detection framework called C^4 which detects object based on their contour information using a cascade classifier and the CENTRIST visual descriptor. A major contribution of their work is to fast object detection. It involves no image preprocessing or feature vector normalization, and only requires O (1) steps to test an image patch.[ACTIVE CONTOUR SEGMENTATION BASED OBJECT DETECTION]

In order to overcome the lack of conventional video surveillance system that is based on human perception, they proposed Cognitive Video Surveillance system (CVS) in [11]. It is based on Agent based object tracking. CVS offers some important people tracking attributes such as suspect object detection and smart camera cooperation. This Agent based tracking approach is suitable for distributed system. Background subtraction technique is used for detection of people motion. They have used C# for presenting image in binary form and used Waikato Environment for Knowledge Analysis to implement machine learning and data mining algorithm. And also, they used Exponential Moving Average (EMA) especially for human behavior prediction. [BACKGROUND SUBTRACTION BASED MOTION DETECTION AND AGENT BASED TRACKING].

A Scene feature based algorithm was proposed in [12] for detecting counter flow in security related surveillance in airport. They addressed the two main problems: 1. Most of the cameras deployed in security surveillance networks have poor resolution. It will create negative effects on tracking algorithm. 2. 24/7 basis operation of automatic video analytics algorithm some time will provide higher false positive rate in tracking. To avoid such problems they used novel classifier to identify scene feature in the image and KLT optical flow tracking algorithm.[KLT POINT DETECTION AND OPTICAL FLOW TRACKING]

The basic and starting step of the most complex applications such as video context analysis, multimedia indexing and etc is Object detection. Template matching algorithm is an essential object detection and tracking method, but it is simpler than other which is generally based on matching template. It requires some processing time for mapping and storage. In [13], Rajini Nema and et.al. proposed efficient algorithm for detecting moving object using canny edge operator and some morphological process. In this work, initially they convert frame image in to edge frame then frame difference between two consecutive input frame give the location of the moving object. [BACKGROUND SUBTRACTION BASED OBJECT DETECTION USING CANNY EDGE OPERATOR].

When the number of discretely moving object increases, the understanding of video scene becomes more difficult. Motion feature (viz location, scale, score (magnitude), direction and velocity) filtering based event detection was proposed in [14] to detect event in crowded area. This method is different than others in terms of choice and calculation of the motion feature, used rich set of motion feature and spatial & temporal precision is limited to relatively coarse quantization. [BACKGROUND MODEL BASED DETECTION].

In [15], B.Karasulu and et.al., discussed the issue of tracking moving object over time is challenging issue on video processing. They discussed the various object detection and tracking algorithms and its demerits. Background subtraction technique to detect the interesting object form video sequence. This technique's performance is worse when the scene involves dynamic elements or occluded fronts such as waving trees, flocks of birds, rippling water, fog, or smoke, etc. They discussed Mean Shift (MS) approach for image segmentation. It finds clusters in the joint spatial-colour space. But, MS based tracker is easily fail in tracking rapid moving objects. Hence, they discussed Continuous Adaptive Mean Shift (CAMShift/ CMS) tracking method which is modified from MS. It deals with dynamically changing colour probability distribution (CPDs) derived from video frame sequences. But it is not suitable when the colour of the object frequently changed. Consequently, they discussed an Optical flow technique which is based on the idea that the continuous brightness changes on most of the points in the image.

They also discussed Dense Optical flow technique viz Horn-Schunck Technique and Sparse Optical flow technique viz Lucas-Kanade Technique. They concluded survey that Optical flow based detection and tracking provides more accuracy than other techniques. [BACKGROUND SUBTRACTION BASED OBJECT DETECTION AND POINT TRACKING, SEGMENTATION BASED OBJECT DETECTION AND KERNEL TRACKING & OPTICAL FLOW TRACKING].

In computer vision systems, background construction is the base of object detection and tracking. Traditional backgrounds modelling method often requires complicated computations and are sensitive to illumination changes. Hence, a novel hierarchical coarse to fine texture based method for background modelling was proposed in [16]. It has the following advantages: (1) tolerance to illumination changes, (2) low computation, and (3) superior description for each block when the multimode method is applied. This method is quite efficient.[BACKGROUND MODELING BASED DETECTION].

In real time video processing, object tracking is still a challenging issue. It is a process that involves two steps: detection and tracking. First step is to detect the object in first frame and then track them continuously in forthcoming frames. But it overlooks the spatial information. So, a better approach is to pursue a continuous integration of spatial and temporal information. Hence Gustavo Moreira,et al., proposed an integrated detection and tracking method suitable for high-definition videos in [17] where the integral image of the background to discard the analysis of several parts of each frame and also it deals with multiple objects in parallel. Here the frames are segmented in an adaptive way. [INTEGRATED OBJECT DETECTION AND TRACKING USING SEGMENTATION AND BACKGROUND MODELING].

The main objective of video tracking is to detect target object in consecutive video frames. When the moving objects are relatively fast to frame rate, the detection can be especially difficult and also when the tracked object changes orientation over time, the shadowing problem will be raised. To overcome these problem, manisha chaple, et.al., proposed background subtraction based detection and optical flow algorithm for tracking in [18]. And also they used centorid in frame to detect the distance and velocity of the moving object. [BACKGROUND SUBTRACTION BASED DETECTION AND OPTICAL FLOW TRACKING].

In [20], B.S.M.Madhavi, et.al., proposed a background subtraction based fast and reliable motion human detection and tracking. They established statistical based reliable background model and used dynamic optimization threshold method to detect moving object. In order to eliminate noise and eliminate the background disturbance problem, they applied dilation and erosion processing. They combined contour projection analysis with shape analysis to remove the effect of shadow and moving human body is accurately and reliably detected. Even this algorithm is working efficiently in occlusion. [BACKGROUND SUBTRACTION BASED DETECTION AND TRACKING].

Localized Graph Cuts and Maximal Similarity based Region Merging segmentation algorithms are more powerful to detect the object and its boundary. But it is not an automatic algorithm which has a problem. Hence Reza Oji proposed a combination of Affine Scale Invariant Feature Transform (AIFT) and a region merging algorithm for automatic object recognition and detection in [21].This algorithm used six affine parameters namely translation (2 parameters), zoom, rotation and two camera axis orientations. These features are very reliable and give us strong keypoints that can be used for matching between different images of an object. The author trained an object in several images with different aspects for finding best keypoints of it. Then, a robust region merging algorithm is used to recognize and detect the object with full boundary in the other images based on ASIFT keypoints and a similarity measure for merging regions in the image.[SEGMENTATION BASED OBJECT DETECTION].

Most of the Object detection and tracking algorithm require long time to detect object, not robust against illumination change. Pranab Kumar Dhar, et.al., proposed localization mechanism and gradient directional masking based object detection algorithm in [22] for stationary background video surveillance system. This algorithm used Gradient Map images which are generated from input and background image by using gradient operator. The gradient difference map is calculated from gradient map. This algorithm is suitable for indoor, outdoor, sunny and foggy cases. [BACKGROUND MODEL BASED DETECTION USING GRADIENT OPERATOR]

Pollard and Antone [19,24] proposed the Background Modeling approach, which provides a simple, fast and robust motion detection, which handles parallax. Gaussian Mixture model is used in pixel level motions for detection to handle misalignment and parallax. In order to avoid the false detection, this approach used spatial temporal filter. During the motion segmentation, the pixels are grouped into discrete blobs and then which are learned adaptively over multiple frames based on the detection blobs associated with that object.[BACKGROUND MODEL BASED OBJECT DETECTION AND PIXEL LEVEL MOTION TRACKING]

An unseen views of the objects which are not distracted by other object tracking is challenging task in object detection and tracking.S.Stalder, et.al., introduced dynamic objectness in discriminative tracking framework in [25] to periodically rediscover the tracked objects based on its motion. They used KLT point detection and tracking with forward-backward verification for providing robustness to track the object. Additionally their approach incrementally builds an appearance model of the object model for an eventual re-detection after partial or full occlusion.[POINT DETECTION AND TRACKING]

In order to efficiently extract the characterization of moving object in video sequences, there is a need of simple and robust low level feature extraction is needed. Alian Simac-Lejeune proposed STIP (Space- Time Interest Points) feature extraction based object detection in [19,26]. STIP

detection is relatively robust against shooting condition variation and impulsive noise. [BACKGROUND SUBTRACTION BASED DETECTION AND TRACKING].

In a ambulatory patient monitoring system , the patient's physiological data is obtained through the device attached on the body of the patient. This method can be uncomfortable for the patients during over long recording. To solve this problem, Ilya V. Mikhelson, et.al., attached a camera to the millimeter wave antenna and mounted this combined system on a pan/tilt base and they proposed Non-contact millimeter wave real time detection and tracking [27] of an ambulatory subject. With the proposed system, the patient is free to move around uninhibited by instrumentation. They adopted Viola Jones detectors and Haar like feature for detection and KLT and CAMSHIFT, KLT tracker.[POINT DETECTION AND TRACKING].

Different activities have been performed using image processing algorithms in the field of Motion detection and moving objects tracking. Some of the image processing algorithms to detect and track the objects are: Differential method, Frequency Method, Optical Flow tracking Method, Correspondence tracking method, Texture tracking method, Model based tracking method, Feature point tracking method and the combination of differential and active blobby method. Among these, one of the easiest and fastest method is differential method. It has the following disadvantage: (i) if the object moves in parallel with the camera, the differential method is not suitable,(ii) if the object color is more equivalent to background color, then the differential method cannot detect the object accurately and (iii) Differential method can't detect the object properly in open area such as wind, sun , shade and etc. Hence Hefzollah Mohammadian,et.al, presented the combination of differential method and active blob method [28] to detect and track the object in a optimized way. [DIFFERENTIAL METHOD BASED OBJECT DETECTION AND TRACKING]

The long term visual people detection in complex environment is too difficult and also tracking a varying number of objects entail the problem of associating detected objects to tracked targets. It will lead to data association problem. Tobias Klinger., et.al., proposed a tracking by detection strategy that uses randomized forests as a classifier with kalman filter. Randomized forest builds the strong classifier for multi class problem through aggregating simple decision tree [29]. [POINT DETECTION AND RANDOMIZED FOREST CLASSIFIER FOR TRACKING]

Due to the high computational cost, few of the object tracking method can be used for real time application even though plenty of object tracking methods are available. To achieve better real time tracking performance, an adaptive robust framework for object tracking based on Camshift approach has been proposed in [30]. This algorithm avoids the distracts from surrounding background and object region. In this algorithm, kalman filter is used for object prediction. [POINT DETECTION AND CAMSHIFT TRACKING].

The dealing of intra class variability among instance of an object class and being able to generalize to unseen instances are too difficult in machine vision. Hough Transform based detector is introduced by Nima Razavi, et.al., in [31]. It deals with this problem by dividing an object into a number of local patches aiming at less variation within patches. These patches are then combined using a shape model to ensure spatial consistency among them. In these models, the hope is that although the overall appearance of a new instance may have not been observed in the training data, at the local patch level, similar patches have been observed.[SEGMENTATION BASED DETECTION & TRACKING]

Due to occlusion, lightning changes and other factor, abandoned object detection in complex video surveillance is too difficult. Yingli Tian, et.al., modeled three Gaussian mixture based Background subtraction [32]. It handles complex situations, several improvements are implemented for shadow removal, quick-lighting change and etc. [BACKGROUND SUBTRACTION BASED DETECTION].

Classical tracking-by-detection approaches require a robust object detector. It needs to be executed in each frame. However the detector is typically the most computationally expensive component, especially if more than one object class needs to be detected. Dennis Mitzel and Bastian Leibe, proposed hybrid framework [33] for moving multi person detection. It can run only on some small region of interest. [BACGROUND SUBTRACTION + FEATURE EXTRACTION BASED OBJECT DETECTION AND TRACKING= HYBRID TRACKING].

An integration of vision system into mobile robot is very challenging and computational required one. High quality image data only provide precise information about environment. But it requires high computational requirement [34]. Hannes Bistry and Jianwei Zhang proposed SIFT based object detection algorithm. They created distributed SIFT vision algorithm and smart camera architecture can be used to integrate complex vision algorithm. [SEGMENTATION BASED OBJECT DETECTION].

Due to the variability of background and appearance model, monocular multi object detection with static camera is challenging one. Most of the current methods focus carefully on camera placement to avoid occlusion [35]. Severin Stalder,et. Al., proposed Cascaded Confidence Filter for Improved Tracking by detection. They combined Background and appearance model. Their approach significantly improve especially in case of partial occlusion, changing background, and similar distracter. [HYBRID APPROACH: BACKGROUND BASED AND APPEARENCE MODEL BASED DETECTION AND TRACKING].

IV. REVIEW OF WEB/CLOUD/GRID BASED IMAGE ANALYSIS

In [2], J.Jimenez et.al, developed a web based solution for computing and analysing the 3D fractal dimension by using box-counting computation method and skeleton generation algorithm in WebGL. It is an alternative solution for desktop computer based fractal image analysis.

In [8], Diego Fustes et.al, developed a Sentinazos tool for detecting and localizing the marine spills. Radar scenes are used to cover the largest possible areas; they have to be processed in a short period of time, due to the temporal requirements. They used grid technologies such as Map reduced which uses to upscale the algorithm and reduce the computational time. They tested and implemented a significant amount of segmentation algorithms in a scalable fashion, with the aim of isolating dark spot in SAR images that are possible oil spills.

The novel framework for distributed Simultaneous Localization and Mapping by an autonomous mobile robot was proposed in [9]. They addressed the SLAM is a computationally demanding process for medium and large scale scenario and it has strong real time constraints. So it requires the possibility of massive storage and computation in Internet server-known as Cloud computing and cloud storage. The authors' main contribution is to partition a real time SLAM algorithm that allows part of computation to be moved to cloud without the loss of performance. Hence the computation load on robot is reduced considerably.

Most of the image processing algorithms for remote sensing application will produce and process large & complex satellite datasets which require high performance computing model. Mohamed .H.Almeer parallelized the following remote sensing image processing algorithms in Hadoop Map reduce and tested their performance in terms of their image file size and processing time[23]: sobel filter, Image Resizing, Image format conversion, Auto Contrasting, Image Sharpening, Text Embedding and Image quality inspection.

V. COMPARISION OF REAL TIME OBJECT DETECTION AND TRACKING ALGORITHMS

a. Object Detection Algorithms:

An accuracy of detecting object in background subtraction [40] based object detection algorithms are low to moderate and it requires moderate computational time.

An optical flow [40] based object detection algorithms require high computational power and the detection of object is moderate. This algorithm produces the complete movement information about the object. But it requires complex calculation.

Frame differencing [40] based object detection algorithm detect the object with high accuracy. The computational requirement for this algorithm is low to moderate. It is very easiest method. It will support only for static background and not for moving background.

b. Object Tracking Algorithms:

Some of the point tracking algorithms viz kalman filtering algorithm can track single objects and it cannot handle occlusion. But the response time of detecting and tracking an object is good. Some other point tracking algorithms viz Multiple Hypothesis Tracking (MHT) and particle filter based on code book background can track multiple objects and handle occlusion. But it needs high computation and memory requirements.

Most of the kernel tracking algorithm can track single object and partial occlusion handling. Histogram based kernel tracking algorithm runs very fast which is suitable for the models which are having dominant color. Once the spatial information of target is lost, this algorithm will not give good performance. Daub CxWT kernel tracking algorithm reduces the false tracking of object and this algorithm could not detect and track the object in which shapes undergo change from one frame to another.

Silhouette tracking can handle variety of object shapes and they have the capability to deal with object split and merge

VI. CONCLUSION

In this paper, we did the widespread literature survey on both object detection and tracking algorithms and its various requirements. Based on the survey, we observed the following issues on real time object detection and tracking: 1. Most of the existing algorithms work on gray scale image/video. It losses some information when it is converted from colour image/video to gray scale. Hence the detection and tracking is complex. 2. All tracking algorithm assumes that the object motion is smooth with no abrupt changes. 3. Object detection and tracking algorithms requires more computational and memory requirements when increase the amount of data contained in the video. 4. Some of the detection and tracking algorithms can detect and track multiple objects and handle occlusion. But it needs more computational and memory requirement. A different object tracking algorithm can handle the varying illumination, background clutter, camouflage, bootstrapping and handling occlusion separately. It is hard to implement all these in one algorithm.

Based on the observation made, we concluded that real time object detection and tracking algorithms require parallel programming platform viz either CUDA or WebGL or WebCL or Grid or Cloud computing platform for satisfying its computational requirements.

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