Asian Journal of Convergence in Technology **Volume IV Issue II**
ISSN NO: 2350-1146 I.F-5.11

A Review on Various Techniques for Object Detection

Soumya kelur, department of CS & E, Nmamit nitte , Member of IEEE, Ranjan Kumar H S, department of CS & E, Nmamit nitte, Member of IEEE.

***Abstract*—Detection of object and recognition of objects in real world computing environment is one of the important tasks in computer vision. To solve this task there are many challenges in designing algorithm, we have to introduce different and innovative algorithms to detect objects in natural environments. Detection of object is a computer technology which is related to the computer vision and image processing. This paper provides a brief description of techniques, methods and algorithms used in object detection. At last it highlights the importance of selective image encryption.**

Keywords*— Support vector machine (SVM); Human visual system; object detection techniques; image processing; computer vision;

I. INTRODUCTION

Detection of object involves the technique of computer images which includes computer vision and processing of images. This technique deals with detecting instances of well formed objects of particular class. For example humans, buildings, cars etc. it has many applications like computer view, image improvement and video surveillance. Object class has some features which helps in classifying class of object. For example face identification method. Here eyes, nose, and lips were present in a face and features are skin color, distance between eyes etc.

We all know that human visual system is very fast and accurate which allows us to do complex tasks. When human identifies an image quickly know what objects are in image, how they are located and where they are present. Image processing is core part of the object detection. The traditional image encryption technique involves encryption of entire image where in large processing overhead is involved. Instead of encrypting entire image using an object detection algorithm only object of importance in the image can be encrypted to maintain the confidentiality. This method may be named as selective encryption. Having this in mind, this paper analysis various techniques, algorithms used in objet detection.
Detection means identifying anything from location and identifying the components of object class at different levels of details. For example, identifying faces in an image, finding ears, eyes, and mouth in the faces. And recognition means classify the objects or sub objects of a normal class of objects present in the particular scene of image. For example, after identifying a face, detecting a person, or divide images with digits. Both process have significant training.

In recent years, multi-media information security has become more popular encryption is the only way to provide security for multi-media and its privacy. To provide security encryption algorithms have been proposed. These algorithms have two types. First one is full encryption and second is selective encryption. Full encryption means encrypting whole bit stream data where as selective encryption is encrypting the selected information. Full encryption process takes more time where as selective encryption takes less time for encryption process.

II. LITERATURE SURVEY

Jianan Li et. al.[1] proposed Multi–stage object detection with group recursive learning. In this, they have used two strategies, first is group recursive learning for detection purpose. And second is Multi stage network cascade. Group

recursive learning technique is proposed to recursively set object proposals and degenerate their bounding boxes seeing the positions of the surrounding proposals of the same object. They have shown that groundwork is particularly effective in object localization and achieves results on PASCAL VOC 2007 and 2012.

Anusha Alexander et al. [2] reviewed object detection algorithm which is used for dividing similar coloured objects. They have used two object detection algorithms. First, Scanning and filtering and second, object detection algorithm. So these two algorithm were used to findout the objects surely from each and every one. This method of the object detection does not affect accuracy or accurate value of the system even when image background is so noisy or complex. These methods were commonly dependent on shape and size of the object.

Chi-chai sun et. al.[3] proposed fast motion object detection algorithm using depth image on RGB-D camera. So this object detection algorithm is used to detect the motion of the objects or images in scene without background noise and algorithm function blocks that are used based on RGB-D camera. First, the depth image and colour image will perform a position to fix overlap issues and next, depth image will be divided into pixels. Hence these pixels were used for the moving objects. They have shown that fast motion object detection speed up to 34.141 fast and computation speed up to 45 fps on an embedded platform.

Ye Xiufen et al. [4] illustrated small object detection algorithm for sonar image based on pixel hierarchy. They have used sonar image processing which includes gray scale correction and median filtering. Gray distribution is not uniform in sonar image because uneven distribution of energy and transmission distance is different from the sonar. They have shown different algorithm for sonar image based on pixels of image to differentiate gray values between object and the background.

Wei Zhu et. al [5] proposed the real time object detection based on real time object detection on pixel (ORBP) and cascade support vector machine (SVM) in order to resolve the detection problem of bad real time performance and robustness in complex scene. This method allowed for complex scene and change in illumination. Here the soft cascade SVM multi level classification is built for feature selection, which further improves speech detection robustness and performance of the particular system.

Ross Girshick et. al.[6] proposed Rich feature hierarchies for accurate object detection and segmentation. In this, they have used object with R-CNN which consists of three modules. 1) the first module produces the region proposals which consist of set of candidate detection. 2) second module consist of convolution neural network which extracts fixed length feature vector. 3) third module consists of set of linear SVMs. They have presented design decisions for each module and shown their result on PASCAL VOC 2010-12.

Anuj Mohan et. al.[7] reviewed example based object detection in images by components. They have used component based approach which handles variations in lighting and noise in an image. They have proposed a component-based person detection system that is able to detect frontal, rear and partially included people in cluttered scene without assuming any knowledge with image. Hence this is applicable to other domains beside people.

Ian Fasel et. al[8] proposed framework for real time object detection and classification. They have formulated model of image generation for finding objects and features of objects in the framework. In this paper, they have developed most likelihood-ratio and models using learning method like supervised learning. They have focused on a system specialized on detection of eyes in a particular pose. They applied generative approach to the problem of finding faces and eyes on the image.

Ping ping Zhang et. al[9] focused on multi-level convolutional features for salient object detection . They have shown performance of fully convolutional neural networks (FCNs) for dense labelling problems. Prominent object detection is to find out the particular regions in an image. Here edge-aware maps and high-level prediction are included into the framework. Here framework can integrate multi-level features into resolutions, which is used to combine the feature maps and to integrate features.

Antonio Torralba et. al[10] proposed sharing features for multiclass object detection. They have presented multi class boosting procedures (joint boosting) which reduce the computational and complexity to find common features that can be shared across the classes. They have used the joint boosting algorithm to the problem of multi-class, multi-view object detection in clutter.

Yann Lecun et. al[11] proposed learning methods for generic object recognition with invariance to pose and lighting. In this, they have introduced the recognition of generic object categories with different pose, lighting, backgrounds, and presence of clutter. They have applied the SVM method with Gaussian kernels to the images of dataset. This method used to reduce the number of samples while classifying and they have also implemented portable system using USB cameras connected to the computer, laptop.

Kobi Levi et. al[12] focused on problem of learning object detection from a small number of examples. They have represented the objects with high performance and also local edge orientation histograms (EOH) to improve the performance compared to linear features. Here histogram improves performance as well as ability of the system to learn from small databases.

Li Hou et. al[13] reviewed some frameworks of human detection and systems carried over on camera networks withsome non-overlapping fields used in camera. They have used three modules, they are, first human detection for single camera, human tracking under single camera, and also with multiple camera.

Viola P et. al[14] illustrated learning algorithm which is used for speedy and active object detection and they have used

cascade of simple features. They have described machine learning method for detecting object which is having high detection rate. They have used some learning algorithm, based on AdaBoost which is used to select a small number of features taken from large dataset. From this they have achieved minimum computation time and high accuracy for the detection.

Wang Zhiqiang et. al[15] reviewed object detection based on convolutional neural network. They have shown that how to apply convolutional neural network (CNN) to object detection to get high performance. CNN has many advantages compared to conventional approaches on accuracy, adaptability and real time. Here CNN gives framework for object detection to improve performance.

Fig .1. original input image.

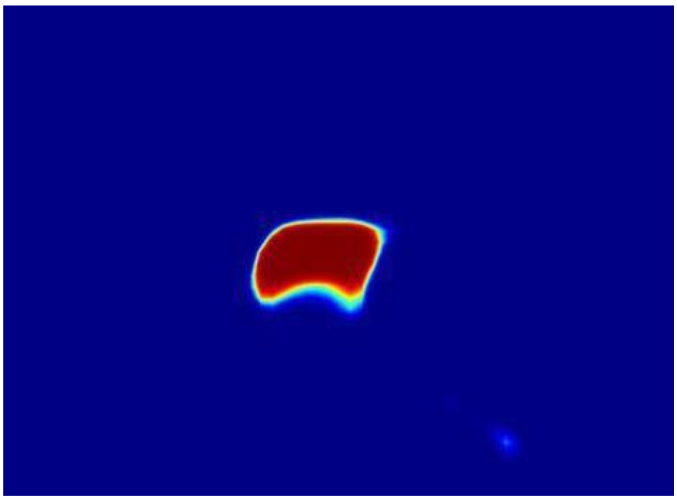

Fig .2. cutting edge probabilities estimated from semantic segmentation of CNN model.

TABLE I

Reference paper name	***Advantages***	***Disadvantages***
Jianan Li et. al.[1]-Multi-stage detection with group recursive learning.	Provide accurate object localization.	Confusion occurs between background or unlabelled objects
Anusha alexander et. al. [2]-Object detection algorithm which is used for dividing similar colored objects.	Relative speed of computation and resolution of object is high.	This method is only applicable for similar coloured objects.
Chi-chia sun et. al.[3]-Rapid motion object detection algorithm using depth image on RGB-D camera.	This method is used to detect the motion of the object without background noise.	Here RGB colour background modelling which detect the motion of object which consist of fragmentation and noise.
Ye xiufen et. al.[4]-Small object detection algorithm for sonar images.	This method reduces the target window screening.	This detection algorithm only applicable for small object which consist of small pixel.
Wei zhu et. al.[5]-Real time object detection algorithm based on cascade SVM.	This model have good robustness and real time performance, accuracy.	This method need large amount of calculation and execution time complexity is very high.
Ross girishick et. al.[6]-Rich feature hierarchy for accurate object detection and semantic segmentation.	This is used to get high performance which is achieved by applying high-capacity CNN and paradigm for large CNNs .	Segmentation process takes much time and using of CNN process is heavy for object detection.
Anuj mohan et. al.[7]-Example based object detection in images by components.	The system is very accurate and performs significantly better than full body person detection. This method provides high performance .	This method is applied for only static images.
Ian fasel et. al.[8]-Frame work for real time object detection and classification .	This method is used to find objects within frame.	Classification process of framework for object is very high, so this method have more computation work .
Ping ping z et. al.[9]-Multi-level convolution features for salient object detection .	The model provides accurate salient object labelling. And also provide high performance.	Here hard to combine the all hand-tuned factors in a particular way because large varieties are present in visual saliency .

[a.] *ADVANTAGES AND DISADVANTAGES OF REVIEW PAPER*

III. APPLICATIONS

One of the main application in object detection is face detection for example facebook detects the faces when we upload photos. Here this is simple application of the object detection that we seen in everyday. The another application is counting of people. Here detection of object can be used in people counting. As we know that people are non rigid objects,it is little bit difficult when people move from frame. And another application is object detection applied for vehicle detection. For example bicycle, car etc. we can detect the

objects by tracking method which estimates the speed of the object based on shape and size. Object detection also have application in manufacturing industry to identify the products. Here we can use hough circle detection method to detect your machine for circular objects.

The main application of object detection is image processing and providing security for images or objects. Detection of objects are widely used for classify the images which are filtered using object detection. Image security has many applications like military, medical and etc. security provides privacy for our objects which is done by encrypting process. Using selective area encryption there is also a possibility of reducing overhead of encrypting an image by detecting the objects which are needed for encryption.

IV. CONCLUSION

This review paper describes the various techniques, methods and different algorithms used in object detection. In few surveyed papers group recursive learning, SVM (support vector machine) learning, scanning and filtering, object detection algorithms have been used to detect the objects. Particularly for colored objects selective object detection algorithm have been used. And almost all results have been shown on PASCAL VOC 2007 and 2012. Overall, most of the methods, techniques in this surveyed paper have demonstrated to be practical, robust, effective, accurate and gives high performance. Further, we will do the research based on encryption of the selective objects using some machine learning techniques.

References

[1] Jianan Li, Xiaodan L, Jianshu Li, Yunchao, Jiashi Feng, and Shuicheng Yan.. multi-stage object detection with group recursive learning. fellow member, IEEE, pp. 1520-9210

[2] Anusha Alexander, Meher Madhu Dharmana. object detection algorithm for segregating similar coloured objects and database formation." 2017 international conference on circuits power and computing technologies [ICCPCT]

[3] Chi-chi Sun, Yi-Hua Wang, and Ming-Hwa Sheu. Fast motion object detection algorithm. In IEEE sensor journal vol. 17. No. 17. September 2017

[4] Ye Xiufen, Wang Sheng. Small object detection algorithm for sonar image based on pixel hierarchy. Proceedings of the 34th chinese control conference july 28-30, 2015.

[5] Wei Zhu, Quian-Liang Fu. The 28th research institute of china electronics technology group corporation in IEEE 2016.

[6] Ross Girshick, Jeff Donahue, Trevor Darrell Jitendra Malik. Rich features for accurate object detection and semantic segmentation. In CVPR 2014.

[7] Anuj Mohan, Constantine Papageorgiou, and Tomaso Poggio. Example based object detection in images. In IEEE transactions on pattern analysis and machine intelligence, vol. 23, no. 4, April 2001.

[8] Ian Fasel, Bret Fortenberry, Javier Movellan. A generative frame work for real time object detection and classification. In conference on computer vision and image understanding 98 (2005) 182-210.

[9] Pingping Zhang, Dong Wang, Huchuan Lu, Hongyu Wang. Aggreagating multi level convolutional features for salient object detection. In 2017 IEEE international conference on computer vision.

[10] J. Clerk Maxwell, A Treatise on Electricity and Magnetism, 3rd ed., vol. 2. Oxford: Clarendon, 1892, pp.68-73.

[11] Antonio Torralba, Kein P. Murthy, William t. Freeman. Efficient boosting procedures for multiclass object detection. In computer science and artificial intelligence lab, MIT, Cambridge, MA 2139.

[12] Yann Le Cun, Fu Jie Hung, Leon Bottu. Learning methods for generic object recognition with invariance to pose and lighting. In IEEE computer vision and pattern recognition in 2004 (CVPR'04).

[13] Kobi Levi, Yair Weiss. Learning object detection from small number of examples. Proceedings of the 2004 IEEE conference on computer vision and pattern recognition.

[14] Li Hou, Wanggen Wan, Kang Han, Rizwan Muhammad, Mingyang Yang. Human detection and tracking over camera networks. In IEEE 2016 conference on computer vision and pattern recognition (ICALP 2016).

[15] Viola P, Jones M. rapid object detection using boosted cascade of simple feature. IEEE conference on computer vision and pattern recognition.

[16] Wang Zhiqiang, Liu Jun. a review of object detection based on convolutional neural network. In proceedings of 36th Chinese control conference July 26-28, 2017, dalian, china.