DETECTION OF OBJECTS USING YOLO ALGORITHM AND COMPARISON OF ACCURACY WITH ADABOOST ALGORITHM

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ABSTRACT :Aim: The objective of this research is to detect the objects in real time images or videos with high detection rate using the Novel You Only Look Once (YOLO) algorithm. To evaluate its performance, the Novel YOLO algorithm is compared with the Adaboost algorithm. **Materials and Methods:** To detect the objects, in this work two groups are taken with 20 as sample size for each group. A total of 40 samples includes the video dataset for object detection from kaggle repository. Simulation has been done with a pretest power of 0.8 and alpha 0.05. The performance metrics like accuracy values were calculated for evaluating the performance of the novel YOLO algorithm. **Results:** According to the results obtained by simulating using SPSS software the YOLO Algorithm has accuracy 92.9 % and Adaboost Algorithm has accuracy 80.8 %. Hence based on these results it is concluded that YOLO Algorithm has significant accuracy of 0.000 ($p < 0.05$, 2-tailed)**. Conclusion:** In this work, it is found that the novel YOLO algorithm performed significantly better than boosting algorithm in terms of accuracy and sensitivity.

KEYWORDS: Object Detection, Novel YOLO Algorithm, Image Processing, Adaboost Algorithm, Accuracy.

1. INTRODUCTION

Object detection is a technology related to computer vision and image processing that deals with detecting and locating objects of a certain class such as humans, buildings, or cars in digital images and videos (Treiber 2010). Two technologies have empowered major tasks such as object detection and tracking for traffic vigilance systems. As the features in image processing increases, demand for efficient algorithms to excavate hidden features also increases . A system is very important in detecting various materials easily without consuming a large amount of time. Hence a novel YOLO algorithm is used to improve the accuracy of object detection (Srazhdinova, Ahmetova, and Anvarov 2020). Object detection and recognition is applied in many areas of computer vision, including image retrieval, security, surveillance, automated vehicle systems and machine inspection(Jamtsho, Riyamongkol, and Waranusast 2021); (Corovic et al. 2018)).

In the last 5 years there have been 271 articles published in IEEE xplore based on object detection. A new framework to robustly and efficiently detect abandoned and removed objects in real-time video surveillance is built in this article. Without using any tracking or motion information, static objects are detected by using the two background models, and then are classified into abandoned or removed objects by comparing the color similarity of the two background images and the static object image. The core idea of detection is based on comparing the color similarity, which may fail in situations where the color of the object is very similar to the background (Lu et al. 2019). An algorithm proposed for object detection and tracking in an unknown environment was extensively tested to operate in complex, real world, non-plain and changing background This approach is best suited for applications where the requirement is to monitor the moving object rather than obtaining its path of motion (Prasad and Sinha 2011). A new method to detect both moving objects and new stationary objects in video sequences is analysed in this research. On the basis of temporal consideration, pixels are classified into three classes: background, midground and foreground to distinguish between long-term, medium-term and short term changes. It has some difficulty in camouflage cases (Presti, Lo Presti, and La Cascia 2008). Based on the spatial-temporal segmentation approach, a watershed transform is used to separate a frame into many homogeneous regions. It can obtain a good result of segmentation with high accurate

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boundaries, but it will suffer over-segmentation due to noise. Though this problem can be solved by smoothing the image, it will reduce the performance of the algorithm (Kim et al. 1999).Our team has extensive knowledge and research experience that has translate into high quality publications(Patturaja and Pradeep 2016; Ramesh Kumar et al. 2011; Krishnan, Pandian, and Kumar S 2015; Felicita 2017b, [a] 2017; Kumar 2017; Sivamurthy and Sundari 2016; Sathivel et al. 2008; Sekar et al. 2019)
From the survey it is observed that object prediction has poor accuracy. The aim of the research is to improve the accuracy for the detection of objects using Image Processing technique based novel YOLO algorithm and compare with the Adaboost algorithm.

2. MATERIALS AND METHODS

The proposed work is conducted in the Department of Electronics and Communication Engineering at Saveetha School of Engineering, Saveetha Institute of Medical and Technical Sciences, Chennai, India. The number of groups identified for the study is 2. The YOLO Algorithm has been taken as group 1 and Adaboosting Algorithm as group 2. Total 40 samples were taken for group 1 and group 2. The minimum power required for the pre-test analysis is fixed at 0.8 to calculate the total sample size required (Faul et al. 2009).
For group 1, 20 images have been used in order to test the scheme for object detection. The samples were collected from https://www.kaggle.com/phylake video dataset. The artifacts are removed by filtering and the samples are further processed. YOLO algorithm is based on regression, instead of selecting interesting parts of an image, they predict classes and bounding boxes for the whole image in one run of the algorithm (Huang, Pedoeem, and Chen 2018)
For group 2, 20 samples have been collected from the kaggle,com. The dataset is accessible on a machine learning repository (online open-source). In the AdaBoost algorithm, the weights are re-assigned to each instance. It is an algorithm that combines many weak learners and turns it into one strong learner. Thus, the algorithm is a boosting method to develop an improved predictor (Zhang and He 2010).
The matlab software, as well as the necessary add-ons, are used for simulation. The tool is installed on a system with a Ryzen 7 processor and 8GB RAM memory. YOLO algorithm aims to predict a class of an object and the bounding box specifying object location.YOLO does not search for interested regions in the input image that could contain an object, instead it splits the image into cells, typically a 19x19 grid. Each cell is then responsible for predicting K bounding boxes.

Statistical Analysis

SPSS software is used for statistical analysis (Kouzekanani 2003). Features of images such as edges, contrast, size and resolution are independent variables, while accuracy is the dependent variable. To compare the performance of algorithms, an independent t-test is used. using novel YOLO and Adaboost image processing techniques.

3. RESULTS

Object detection using YOLO Algorithm is simulated and outputs are tabulated. The results show that the accuracy of the object has been increased by applying a novel YOLO algorithm. The accuracy values for the two groups are tabulated in Table 1. The average accuracy value for the YOLO algorithm is 92.9 % and for the Adaboost Algorithm it is 80.8 %.
In Table 2 the YOLO algorithm and adaboost algorithms are statistically analyzed. The mean, standard deviation and standard error mean are obtained for both the antennas. The significance of accuracy is 0.000 is observed from the independent samples test of two groups which is tabulated in Table 3.
Graphical form of representation is used in Fig. 1 to give the accuracy value for the different 20 images taken from the database for the image processing techniques. In Fig. 2 the bar graph represents the comparison of the novel YOLO algorithm and adaboost algorithm which is obtained for different 20 images. From the results, the YOLO algorithm produces better accuracy than the adaboost algorithm.

4. DISCUSSIONS

Based on the results obtained it is shown that YOLO Algorithm has accuracy better compared to adaboost in object detection. The SPSS result shows that there is a significant difference between the two algorithms, as the p-value is 0.000 ($p < 0.05$, 2- tailed).
The article presents an improved YOLO v3 for UAV detection, which is suitable to be applied in anti-UAV areas. In the prediction process, the last four scales feature maps are adopted to conduct multi-scale prediction, obtaining more texture and contour information to detect small objects. The precision evaluated for the system

proposed is 89 % (Hu et al. 2019). An improved YOLOv3-tiny for object detection based on the idea of feature fusion is proposed. YOLOv3-tiny is chosen as the basic network framework to ensure the identification speed. In order to improve the poor detection accuracy of YOLOv3-tiny network, feature fusion is carried out based on Feature Pyramid Network.The experimental results show that compared with YOLOv3-tiny, the accuracy of the improved network structure is increased by 6.3 %, (Xianbao et al. 2021). A simple and efficient network for small target detection is proposed. Small vehicle dataset based on VEDAI dataset and DOTA dataset is composed and also analyzed the distribution of the small targets in each dataset. After evaluating the performance of the proposed network, it is observed that the approach achieved 80.16 % average precision (AP) on VEDAI dataset and 88.63 % AP on DOTA dataset (Ju et al. 2019). Deep learning technique is the faster approach for detecting multiple objects from images based on algorithms like R-CNN, SPP-Net, Fast-RCNN and Faster RCNN. Faster R-CNN gives 73.2 % (K. and R. 2018).
YOLO algorithm is used in object detection with very high accuracy and with high detection speed but this algorithm cannot be used in the dark and night time. Night vision cameras can be used in order to detect the objects in the night time and detection rate can be increased subsequently.

5. CONCLUSION

YOLO Algorithm has accuracy 92.9 % and Adaboost algorithm has accuracy 80.8 % respectively. Based on these results it is clear that YOLO Algorithm has produced significant accuracy and sensitivity compared to Boosting Algorithm for object detection. Detection rate of YOLO Algorithm is improved in terms of accuracy.

DECLARATION

Conflict of interest
No conflict of interest in this manuscript.

Authors contribution
Author MHR was involved in image collection, analysis of image, simulation and manuscript writing. Author SP was involved in conceptualization, image validation, and critical review of manuscript.

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TABLES AND FIGURES

Table 1. The accuracy for the object detection using YOLO Algorithm and Adaboost Algorithms are given below.

S.No	YOLO Algorithm	Adaboost Algorithm
	Accuracy	Accuracy
1	89	80
2	92	84
3	93	82
4	91	81
5	95	80
6	90	79
7	88	78
8	96	79
9	95	80
10	96	80
11	94	79
12	96	82
13	94	83
14	93	84
15	93	81
16	92	81
17	94	84
18	92	81
19	92	80
20	93	78

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Table 2: Mean values of accuracy and standard deviation obtained for 20 samples using SPSS software.

Group		No of samples	mean	Std.deviation	Std.mean error
accuracy	YOLO	20	92.9000	2.24546	.50210
	Adaboost	20	80.8000	1.88065	.42053

Table 3: The table shows themean difference, standard error difference and significance of the YOLO Algorithm and AdaBoost Algorithm.

Levene's test for equality of variances				T- test for equality of means						
		F	Sig	t	df	sig(2-tailed)	Mean difference	Std. error diff	95% confidence interval of the difference	
									lower	upper
accuracy	Equal variances assumed	.313	.579	18.475	38	.000	12.1000	.56494	10.7741	13.4258
	Equal variances not assumed			18.475	36.865	.000	12.1000	.56494	10.7728	13.4272

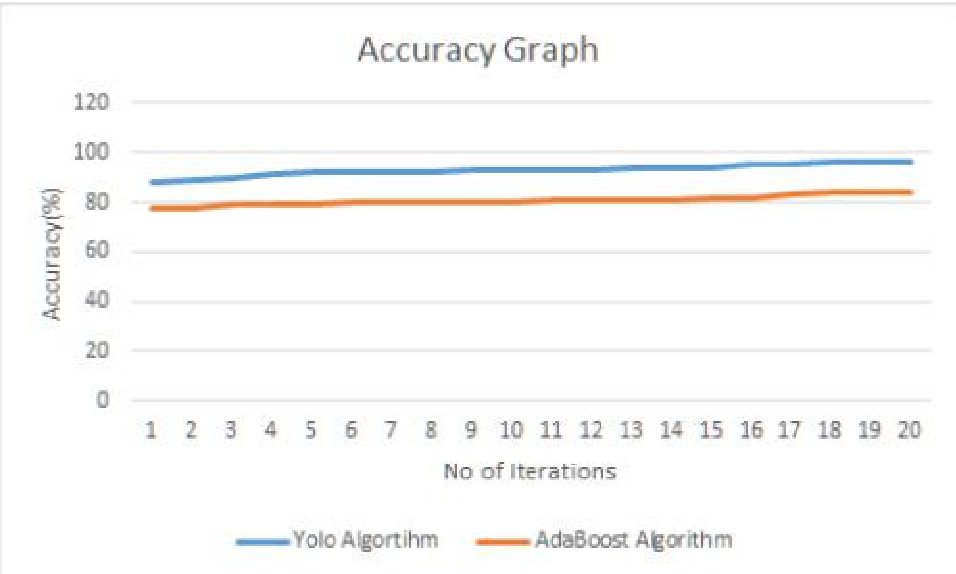

Fig. 1. The linear graph in which the Accuracy of YOLO Algorithm and Adaboost algorithms are compared with each other for 20 samples

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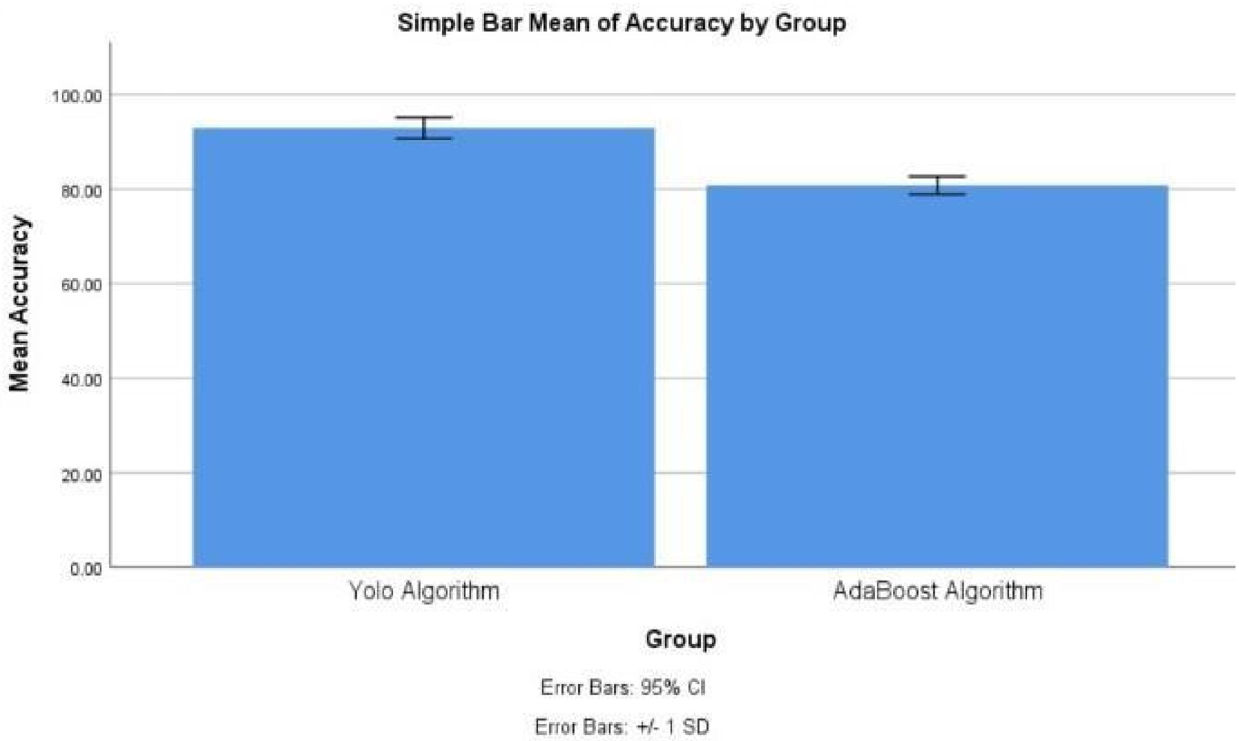

Fig. 2. Comparison of mean accuracy of YOLO and Adaboost Algorithms. X axis: YOLO and Adaboost algorithm and Y axis: Mean value for accuracy. Independent t-test is used for comparing both the algorithms and a statistically significant difference is noted. The error bars display the 95% CI and the +/-1 SD.

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