International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijiemr.org

COPY RIGHT

ELSEVIER
SSRN

IJIEMR Transactions, online available on 26th Apr 2022. Link
:http://www.ijiemr.org/downloads.php?vol=Volume-11&issue= Spl Issue 04

DOI: 10.48047/IJIEMR/V11/SPL ISSUE 04/08

Title **FORSEEING WORKER SAFETY AT CONSRTUCTION SITES**

Volume 11, SPL ISSUE 04, Pages: 77-85

Paper Authors
Mr. B. Hanumantha Rao, R. MOUNIKA, ARBAAZ KHAN, CH.BALAKOTI, k. Rohit

USE THIS BARCODE TO ACCESS YOUR ONLINE PAPER

To Secure Your Paper As Per UGC Guidelines We Are Providing A Electronic Bar Code

International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijie

FORSEEING WORKER SAFETY AT CONSRTUCTION SITES

Mr. B. Hanumantha Rao[1], R. MOUNIKA[2], ARBAAZ KHAN[3], CH.BALAKOTI[4], k. Rohit[5]

[1]Associate Professor CSE, PSCMR College of Engineering & Technology, Vijayawada, Andhra Pradesh

[2,3,4,5]Student, CSE, PSCMRCET, Vijayawada, Andhra Pradesh

bhr@pscmr.ac.in,mounikaravulakollu29@gmail.com,arbaazkhan778866@gmail.com,

ABSTRACT:

According to a recent study, construction workers, mining workers, and municipal workers, in particular area at risk of being seriously injured. The falling objects among construction workers are one of the most common incidents at construction sites. The PPE should be wear workers all the moment at building site. However , some staff are still not wearing the helmets. So previously to reducing this problem by using some machine learning techniques. But the accuracy and speed are low. So, then we are reduced that to implementing this project by using YOLO algorithm and we use the R-CNN algorithm for feature extraction and classification. For each sector, we will use the computer vision to identify the problem and give the best solution. In this project we are going to identify those who are wearing the helmet or not and follow the safety rules.

KEYWORDS:

Computer vision (CV), Personal Protective Equipment(PPE), You Only Look Once(YOLO), R-CNN for feature extraction and classification.

1. INTRODUCTION

According to a recent study, construction workers, mining workers, and municipal workers, in particular, are at risk of being killed or seriously injured. One of the most hazardous jobs in the country has been acknowledged by the Ministry of Urban Development. Every industry has developed its own set of safety guidelines and policies in order to avoid dangers. It is impossible to

follow every rule at all times because a minor issue can turn into a hazard if it is ignored. This can be avoided by paying attention to the little things and looking into the possibilities of what might happen in various industries. For each sector, we will use computer vision to identify the problem and the best solution**.**

A camera on a construction site collects images of PPE, which are then processed to identify the items. Images are a rich source of information that can be used to quickly, precisely, and comprehensively understand complex construction sites. 3D images are of particular interest to some researchers. The JVC 3D Everio camcorder, for example, was used by Han etal. to record videos of laboratory workers. Then, for the sake of safety analysis, actions were reconstructed from videos. The limitations of stereo cameras mean that they can only capture close-up shots.

Similarly, Cheng etal. used a laser scanner to accomplish a real time safety check on staff. In a different research area, computer vision techniques were used instead of 3D images to identify helmets from 2D images. A SVM algorithm was classify whether a staff was wearing a PPE by Zhu et al., HOG algorithm to extract head features. Rubaiyat et al. used histogram of oriented gradient and support vector machine to identify staff in their study, while circular hough transformation was used to identify PPE. Shrestha et al. also included frame recognition for the helmet in their system. When it comes to detecting objects, Du et al. used colors instead of shapes. Different objects, such as the face and helmet, have different color thresholds set. The system could generate Color-coded results. Automated and efficient PPE detection has been achieved by incorporating deep learning techniques into detection. When Nath et al. we're trying to identify the type and color of PPE in an unknown image, they compared it to a known image. Wu et al. used KNN to capture moving object from videos, then used in CNN to classify pedestrians, heads, and helmets. circumstances were classified using the CNN by co-workers, which included a PPE such as a helmet. There were only a handful of tests conducted in an indoor environment (not a real construction site), which may limit the use of the images outside. For safety noncompliance detection, Akbar Zadeh et al. used two Faster R-CNN models:

one for detecting human bodies on a construction site, and one for detecting helmets and protective vests. For Wu and colleagues, the Single Shot MultiBox Detector (SSD) was used for the detection of helmets and the colors associated with them. Chen and colleagues studied the workers' hand gestures to see if the helmets were being worn correctly.

When compared to SSD and faster R-CNN, YOLO has the best speed in detecting objects.A high-class dataset includes the site surroundings, a variety of gestures, has been created due to the knowledge gaps described above. PPE detector that can accurately and quickly forecast the color of various PPE classes, including helmets, is also presented; this outperforms both accuracy and speed.

2.RELATED WORK

Zhamgjin(et.al) [1], The current algorithms are YOLO algorithms. The proposed set of rules is YOLO algorithm. First use the K-means++ set of rules. To enhance the dimensions matching diploma of the priori anchor container secondly, that allows you to seize greater unique information, the Depth clever Coordinate Attention (DWCA) interest mechanism is blended with the spine network. According to the evaluation of the last experimental results, our version can achieve excessive detection accuracy, which may meet the detection accuracy of helmets in the present day complicated working environment. we're capable of have a look at that the operator who wears the helmet successfully is marked with a purple frame, and consequently the operator who does not put on the helmet is marked with a light weight inexperienced frame. the not unusual place accuracy of the helmet detection reached 93.5%. The demerits of this set of rules has ignored detection of long-distance small helmets.

Wenbo Wang (et.al) [2], The current algorithms are R-CNN set of rules and Fast R-CNN set of rules. The proposed set of rules is faster R-CNN set of rules additionally referred to as Improved Faster R-CNN set of rules. It are capable of do better accuracy in comparison with YOLO set of rules. in the real-time tracking device of production sites, employees who do not put on protection helmets need to be diagnosed efficaciously and efficiently. K-means++ and Retinex are delivered for you to decorate the detection accuracy on the idea of making sure the detection speed. K-means++ set of rules is delivered to investigate the size of protection helmets in our statistics set, that is some distance greater useful to get the ideal length of location proposals. the not unusual lplace accuracy is 90.87%. Faster R-CNN now no longer time and again extracts functions from every location proposal, however without delay from the whole

image, which considerably reduces computation time.

Joseph Redmon(et.al) [3], The present algorithms are R-CNN set of rules and YOLO set of rules. The proposed YOlOset of rules, which has no pooling layer and complete connection layer inside thewhole YOLO model. It combines out standing techniques like residual network, characteristic pyramid and multi-characteristic fusion network, with excessive overall performance of detection velocity and accuracy. The accuracy is 95%.

Huanming (et.al)[4], The proposed algorithms supported photograph processing and device studying in strength substations. Which are extracting HOG features, education SVM and additionally Feature reputation in RGB colour space. this approach extracts the movement items and trains a K-Nearest-Neighbor (KNN) classifier for detection. By counting the quantity of detection outcomes of people without or with protection helmet emerged in in line with body of in line with video, we're capable of reap the not unusual place accuracy of detection. The correct fee of detection and pace are80.7% and body fee is 7fps. Sometimes, prompted with the aid of using unique candlepower, the classifier can also additionally deliver in correct out comes. There nonetheless exist many tough problems, like telegraph poles maintaining protection helmet out of sight.

Ahmad shake (et.al)[5], The proposed set of rules Faster R-CNN set of rules supported photograph detection. at some point of this research, photos had been accrued from MIT dataset. Label photograph is written in python that allows you to label the photographs, together with Qt graphical interface. The power of Faster R-CNN relies on its capacity to reuse the CNN effects for the nearby process. It produces the classifications and bounding container co-ordinates of the desired instructions inside the photos The Accuracy is 70%. additionally, supported the test conducted, the formulations advanced suggest that the improvement people compliance with sporting PPE can without difficulty be recognized and measured.

Table : Existing System

SI. NO	Author	Algorithms	Advantages	Disadvantages
1	Zhamgjin (et.al)	• YOLO • K-means	• The biggest advantages of YOLO are superb speed and fast	• Struggles to detect the close object
2	Wenbo Wang (et. al)	• Faster R-CNN • K means • SVM	• It takes the less time to training and detect the network.	• No Longer repeatedly extracts features from each region proposal
3	Haikuan wang (et al)	• YOLO • CSP Net • SPP	• It is popular because of its very speed and more concurrency	• Struggle to detect the small object because each grid can propose only 2 bounding box
4	Haikuan wang (et. al)	• HOG • SVM • KNN	• It is used to detect small scaled images with less computation power	• Sometimes influenced by difference light intensity the classifier may given wrong results.

5	Ahmad shake(et. al)	• Faster R-CNN	• The strength is based on the ability to reuse the CNN result for the region process	• In single image may be co-related the network take a lot of time to convergence

3. Proposed System

In this we mainly use machine learning and Deep learning methods for worker safety,and we use Python and its libraries to do the coding. From the beginning we take the input from the camera with the help of computer vision.nextgenerate frames from the video and divide each frame into nxn grids. Then classification done through R-CNN algorithm , generate object matrix for every grid, combine all the grids where the object is present and high-light the object using bound boxes. After we perform feature extraction using R-CNN algorithm. Finally detect the helmet.

To develop the proposed system ,we need the following steps:

1. Capturing video
2. Preprocessing
3. Classification
4. Feature Extraction
5. Result evaluation

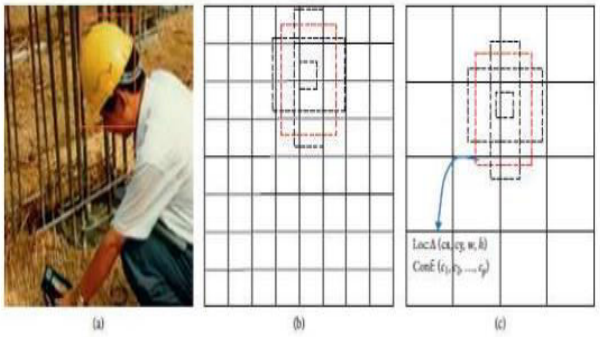
Capturing video:

Firstly, we capture the video of workers at construction sites then we divide the video in to number of frames. That frames are converted in to number of grids by using the matrix format.

Preprocessing:

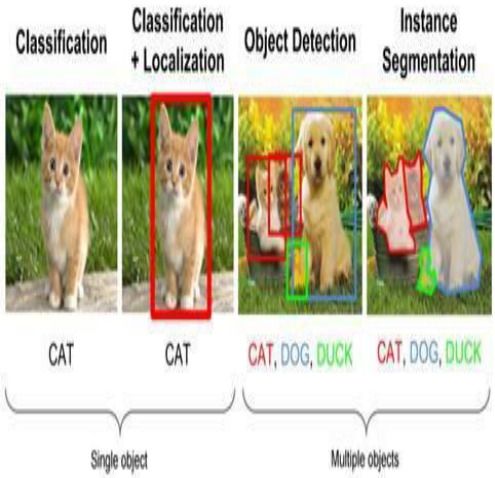
The fundamental goal of preprocessing is to improve an image's quality so that it can be better analyzed. The purpose of preprocessing is to increase the image quality so that we can analyses it more effectively. We can eliminate undesired irregularities and improve some attributes that are important for the applications we're working on by employing preprocessing. Depending on the use, these features may vary.

International Journal for Innovative Engineering and Management Research
A Peer Revieved Open Access International Journal
www.ijie



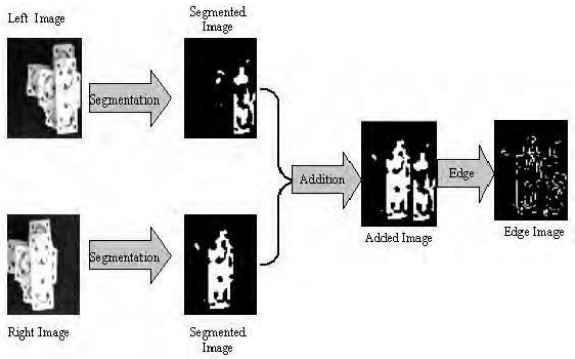
Classification:

The Classification version is a Supervised ML approach that makes use of education data to degree the class of observational records. A software learns from a data or observations after which classifies sparkling observations into some of lessons or agencies in classification. Machine getting to know algorithms are often used to understand matters and type them into categories. This one is called classifier, and it allows us to break up big quantities of records into values.



Feature Extraction:

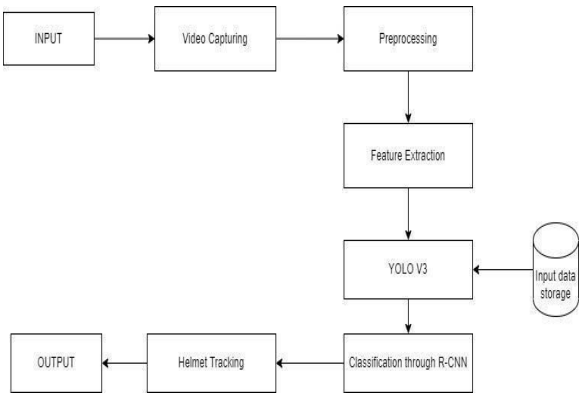
Machine getting to know and deep getting to know characteristic extraction The procedure of turning uncooked records into numerical functions that may be handled even as keeping the facts with inside the authentic records set is called characteristic extraction. It can provide higher outcomes than making use of system getting to know to uncooked records directly. Feature extraction is a kind of dimensionality discount in which a huge wide variety of pixels in an photo are effectively represented as a way to efficiently seize exciting regions of the photo. The additives or styles of an item in a photograph that assist to pick out it are known as functions.



Result Evaluation:

We take the input from the camera with the help of computer vision. Nextgenerate frames from the video and divide each frame into NxN grids. Then classification done through R-CNN algorithm , generate object matrix for every grid,combine all the grids

where the object is present and high-light the object using bound boxes. After we perform feature extraction using R-CNN algorithm. Finally detect the helmet.



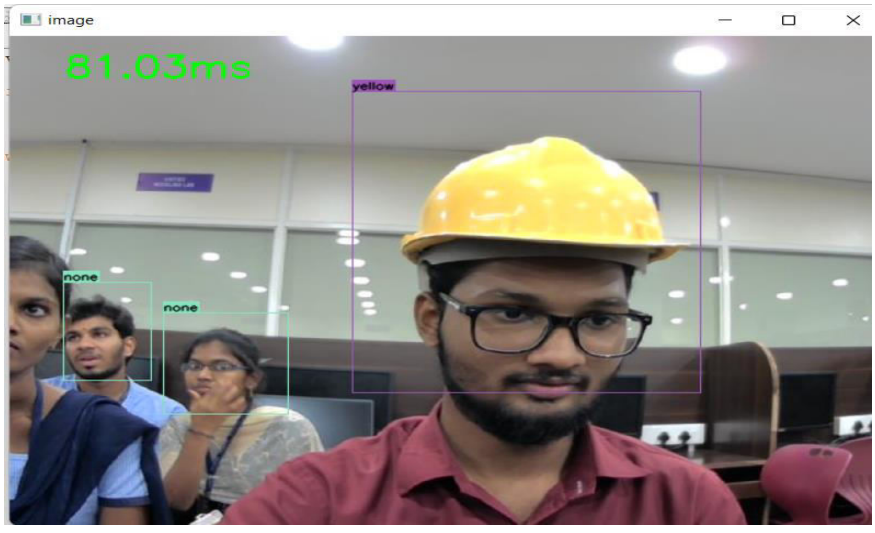
Process:

With the use of computer vision, we extract data from the camera. Next, take each frame from the video and divide it into NxN grids. The object is then classified using the R-CNN algorithm, an object matrix is generated for each grid, all grids where the object is present is combined, and the object is highlighted using bound boxes. After that we use the R-CNN algorithm to extract features. Detect the helmet at last.

4. Experimental Result:

If helmet detects in the frame it highlights with the anchor boxes and display the color of the helmet at the top-left of anchor box. If helmet does not detect in the frame it highlights with the anchor boxes and display none at the top-left of anchor box.

Result :



5. Conclusion:

This work introduces the yolo based worker safety detection system and develops an application that enables users to access cloud data while working. As a result, a worker safety detection method based on YOLO achieved exceptional test accuracy and speed. After implementing the pre-training weights, it is simple to implement with a lightweight web interface that requires less GPU processing power. Additionally, yolo requires less training time.

6. References:

1. Zhang Jin , 1,2,3 Peiqi Qu,1 Cheng Sun,4 Meng Luo,4 Yan Gui,2 Jianming Zhang , 2 and Hong Liu 1 "DWCA-YOLOv5: An Improve Single Shot Detector for Safety Helmet Detection" Received 24 July 2021; Accepted 9 September 2021; Published 7 October 2021.
2. SongboChen, WenboWang,YeOuyang,HuilingZhu ,TianyaoJi,WenhuTang "Detection of Safety Helmet Wearing Based onImproved Faster R-CNN ",October 24,2020.
3. Haikuan Wang 1, Zhaoyan Hu 1,2, Yuanjun Guo 2,* , Zhile Yang 2, Feixiang Zhou 3and Peng Xu 4 "A Real-Time Safety Helmet Wearing DetectionApproach Based on CSYOLOv3", 18 August 2020.
4. Jie Li, Huanming Liu, Tianzheng Wang, and Min Jiang,Kang Li and Xiaoguang--Zhao,Shuai Wang "Safety Helmet Wearing Detection Based on Image Processing and Machine Learning" , 04 Feb 2017.
5. MadihahMohdSaudi,AimanHakim,Azuan Ahmad and Ahmad Shaik "Image Detection Model for Construction Worker Safety Conditions using Faster R-CNN", January 2020