WORKERS SAFETY TRACKING IN FACTORY/SITE

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Abstract

In construction area accidents have been rapidly growing throughout years in many countries. Due to various dangers and disasters, the construction site is becoming most endangered jobs. The helmet is the main safety equipment for workers but many workers do not use it. If a worker without helmet an accident can be fatal. This paper presented an automatic method for helmet detection, ANN classification on construction area and a system for automatic helmet detection of workers without helmet. For processing, in first step, we detect helmet that moving real-time by extracting back ground out from fore ground using back subtraction then enhancing it using threshold and mathematical morphology method. In the second step, we classify between wearing helmet, wearing clothes in head and other without wearing helmet. Area is applied for statistical feature extraction and artificial neural network is applied for classification. In the final step, Fuzzy C-means is applied for detecting a helmet. From the experimental results, the accuracy rates of the ANN classification and helmet detection were 96.12% and 85.23%, respectively.

Index Terms*— ANN, FCM, SVM, MATLAB, Fuzzyc-means clustering.*

I. INTRODUCTION

Advances in construction industry always depend on risk management and improvements in labour productivity. Which is realized that appropriate risk management can minimize the effort and pushes workers off to the edge of unsafe performance to increase productivity. So in order to prevent the construction injuries effectively, it is essential to fully understand the accident causation in construction. It is reported that 63% of accidents are actually caused by the unsafe behaviour of workers, while the remaining are caused by the unsafe condition. Specifically, workers safety that deviates from accepted safety procedure results in most of the accidents. Therefore, it is important to monitor work activities and analyse the workers internal factors. Yet traditional workers activity monitoring heavily relies on observation, survey, and interview conducted by an experienced supervisor from the construction site.

In addition, at the data analysis stage, the collected information also needs to be processed manually. These limitations has been more important in construction sites because labours environments are constantly unstable over time and experience observers are not regularly present at working environments. Thus, the traditional method is labour-intensive, time-consuming and potentially subjective. In recent years, with the development of computer vision and machine learning techniques, monitoring worker activity automatically and continuously using camera

has become possible.

II. LITERATURE SURVEY

It focuses on workers activity recognition problem and proposes an automated recognition system based on an unconstrained image dataset; in which both coarse-grained and fine-grained safety coexist. The system employs the FCM segmentation methods to segment video clips. Given a collection of segmented images, workers activities are automatically recognized with the recorded videos by using template matching and processed by ANN algorithm. Workers safety detection and recognition can be treated as the initial step of further worker productivity and risk factor analysis. The proposed system makes twofold contributions to the field of worker safety monitoring by MATLAB video processing. First, we proposed a pre-processing technique to recognize images. Second, different sessions are discussed including the effect of background (contextual information) and colour. The experimental results show that the average accuracy is better than the HOG.Yong YANg et al., [1] To overcome the noise sensitiveness of typical fuzzy c-means (FCM) agglomeration algorithmic program, a completely unique extended FCM algorithmic program for image segmentation is bestowed during this paper. . The algorithmic program is developed by modifying the target operate of the quality FCM algorithmic program with a penalty term that takes under consideration the influence of the neighboring pixels on the Centre pixels. The penalty term acts as a regularize during this algorithmic program that is galvanized from the neighborhood expectation maximization algorithmic program and is modified so as to satisfy the criterion of the FCM algorithmic program. The performance of our algorithmic program is mentioned and compared to those of the many derivatives of FCM algorithmic program. Experimental results on segmentation of artificial and real pictures demonstrate that the projected algorithmic program is effective and strong. Kang Li, Xiaoguang Zhao, Jiang Bian, and Min Tan et al., [2] the detection of whether or not sporting safety helmets or not for perambulatory employees is that the key element of overall intelligent closed-circuit television in power station. During this paper, a unique and sensible safety helmet detection framework supported laptop vision, machine learning and image process is pro- exhibit. So as to establish motion objects in power station, the ambience background modelling formula is used. Moreover, supported the results of motion objects segmentation, period human classification framework C4 is applied to find pedestrian in power station accurately and quickly. Finally, in step with the results of pedestrian detection, the security helmet sporting detection is enforced victimisation the pinnacle location, the colour area transformation and therefore the color feature discrimination. In depth compelling experimental leads to power station illustrate the potency and effectiveness of the projected framework. Jie Li, Huanming Liu, Tianzheng Wang, and Min Jiang et al., [3] this paper planned an innovative and sensible safety helmet sporting detection technique supported image processing and machine learning. At first, the atmosphere background modelling algorithmic rule is exploited to discover motion object beneath a read of fix surveillant camera in power station. When getting the motion region of interest, the bar chart of Histogram of Oriented Gradient (HOG) feature is extracted to explain inner human. And then, supported the results of HOG feature extraction, the Support Vector Machine (SVM) is trained to classify pedestrians. Finally, the protection helmet detection are going to be enforced by color feature recognition. Compelling experimental results incontestable the correctness and effectiveness of our planned technique. Kunal Dahiya, Dinesh Singh, C. Krishna Mohan et al., [4] in this paper, it tend to propose AN approach for automatic detection of bike-riders while not helmet exploitation police work videos in real time. The planned approach first detects bike riders from police work video exploitation background subtraction and object segmentation. Then it determines whether or not bike-rider is employing a helmet or not exploitation visual options and binary classifier. Also, it tend to gift a consolidation approach for violation reportage that helps in rising dependability of the planned approach. so as to judge our approach, we've provided a performance comparison of 3 wide used feature representations particularly bar graph of histogram of oriented gradients (HOG), scale-invariant feature transform (SIFT), local binary patterns (LBP) for classification. The experimental results show detection accuracy of 93% on the real world police work information or surveillance data. It's additionally been shown that planned approach is computationally more cost-effective and performs in period of time with a time interval of 11.58 ms per frame. Abu H. M. Rubaiyat et al., [5] in this paper, it tend to aim to mechanically notice the uses of construction helmets (e.g., whether or not the development employee wears the helmet or not) by analyzing the development police investigation pictures. Supported the collected pictures, we tend to initial notice the article of interest (i.e., construction employee) and additional analyze whether or not the worker wears the helmet or not, by mistreatment laptop vision and machine learning techniques. within the start, that tend to incorporate frequency domain data of the image with a well-liked human detection algorithm Histogram of Oriented Gradient (HOG) for hard hat

detection; within the second step, the mixture of color-based and Circle Hough Transform (CHT) feature extraction techniques is applied to notice helmet uses for the development employee. Gaikwad Pragati R et al., [6] at first, the ViBe background modelling formula is employed to discover the moving object underneath a read of fix surveillant camera in power station. Subsequently getting the movement region of interest, the Histogram of Oriented Gradient (HOG) feature is employed to relate inner human. And then, supported the results of HOG quality choice, the Support Vector Machine (SVM) is developed to classify pedestrians. Finally, the security helmet detection are going to be executed by color feature identification. interesting experimental results indicated the accuracy and effectiveness of our projected methodology .The U.S. industry suffers from the big quantity of fatalities among all factories, that is, one amongst 5 working man expires in camera factories were in power station. Great amount of loss has occurred to the staff members of the family, the mill, and therefore the countries. Considering the best and increasing variety of station comes that are being handled within the U.S., there's a highest necessity of developing innovative ways to mechanically monitor the security for the staff at power station. Yi-ming Lei et al., [7] In this paper it have a tendency to proposes a brand new pc assisted Diagnosis(CAD) system for the cirrhosis of the liver recognition in liver ultrasound(US) pictures victimization uniform LBP(u-LBP) options. This method appeared appropriate for applying pc to acknowledge traditional or cirrhotic liver, then the cirrhotic nidus are going to be earlier detected. that have a tendency to extract u-LBP options for every sample on the restricted coaching and check datasets, and create a classification between the traditional liver and cirrhotic liver through SVM, and that we get a substantial recognition accuracy of eighty seven.00%. Moreover, we've additionally created a comparison among the results of u-LBP-SVM, PCA-SVM and GLCM-SVM. And that had the conclusion that the projected methodology that combined SVM and u-LBP options is comparatively effective. Liu Xingqiao, Geng Jiao, Ji Feng, Zhao Dean et al., [8] a particular and period image process application is projected to notice pathological changes to fish. Pictures are sporadically acquired from a video source mistreatment specialized management package. Then, analog signals are converted into digital signals by image assortment card. In keeping with the speculation of shrink and expand, binary image is employed to eliminate impurity. After that, use the conception of area-square to seek out the changes of pathological fish, that's the world of the white picture element. Thus, as long as tally out the quantity of white picture element and scrutiny with the applied mathematics information, the condition of the fish are going to be immediately pointed out. And therefore the processed results are often came back to regulate package and displayed in real time. Surbhi Saxena et al., [9] this paper introduces automatic people counting system which may count multiple those who move in the region of interest, by using just one camera. The formula uses Viola Jones methodology of biometric authentication to automatic detecting people by single overhead mounted camera, the system counts the variety of people getting into an associate in observed area. Tally is performed by analyzing the image to notice faces. We have got tested the performance of the system, achieving a correct people tally rate of 85%. R.Raj Bharath et al., [10] it is efficient for moving object detection, classification and valuate its parameter by alternating the algorithmic program in effective manner. The techniques like image subtraction, threshold and foreground detection are used for object detection and patterns are used for classification. Then frame by frame the objects are half-tracked and parameters like speed, velocity of motioned object are calculated. Finally the planned technique are established that object in dynamic texture scenes are analyzed and parameter of moving object are evaluated.

The objective of this paper is to present a novel and practical safety helmet wearing detection method based on video processing and machine learning in factory/site. In order to reduce detection range of surveillance video, the FCM background modelling algorithm is adopted to segment motion objects in foreground frame. After that, we extract statistical feature of pedestrians in corresponding range and using Artificial Neural Networks (ANN), K nearest neighbors (KNN) and Support Vector Machine (SVM) to classify the human. Then, the color feature is exploited to determine whether the human wearing safety helmet or not. And proposed method includes machine learning like extracting FCM features and training ANN, KNN and SVM, meanwhile includes Video processing like color feature recognition in RGB color space. Extensive experimental results in factory/site illustrate the effectiveness and efficient of our proposed method.

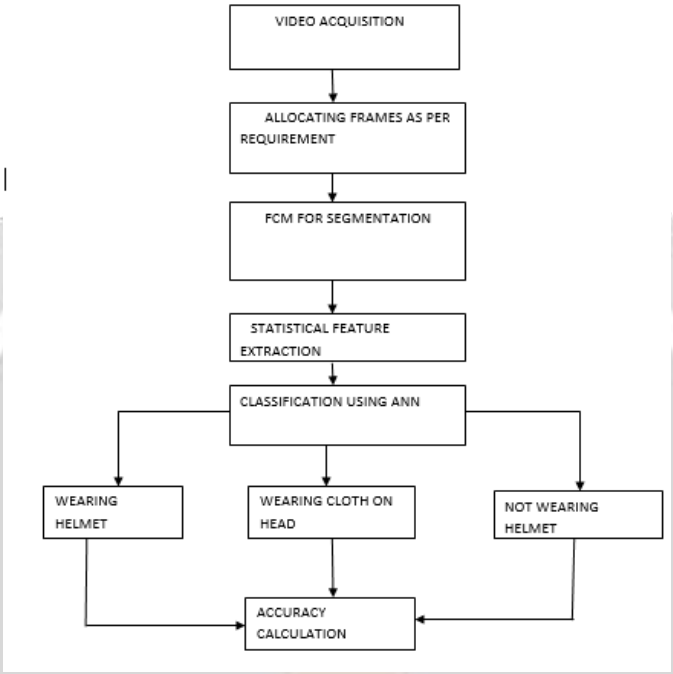
III. PROPOSED WORK

This section presents the proposed approach for real-time detection of workers without helmet which works in three phases. In the first phase, we detect a workers in the video frame. In the second phase, we locate the head of the workers and detect whether the employees is using a helmet or not. In order to reduce negative predictions, we consolidate the results from consecutive frames for final prediction. The various steps of

proposed frame work such as background subtraction, statistical feature extraction, object detection FCM (Fuzzy C-Means) for clustering, object classification ANN (Artificial Neural Networks) using sample frames.

As helmet is relevant only in case of moving workers, so processing full frame becomes computational overhead which does not add any value to detection rate. In order to proceed further, we apply background subtraction on gray-scale frames, with an intention to distinguish between moving and static objects. Next, we present steps involved in background modeling. For classification algorithm we are using three are ANN, SVM, KNN (Support Vector Machine,k-NearestNeighbours)

Helmet wearing identification in construction



VIDEO ACQUISITION

- Getting video as an input to the MATLAB

ALLOCATING FRAMES AS PER REQUIREMENT

- By this process the video is converted into frame as per need.

FUZZY C-MEANS SEGMENTATION

- Fuzzy c-means clustering (also referred to as soft clustering) is a form of clustering in which each data as a point and that can belong to more than one cluster.
- The cluster analysis is to partition an image data set into a number of disjoint groups or clusters.
- Image segmentation is an essential and demanding problem and a necessary first step in image analysis as well as in high-level image interpretation and understanding such as robot vision, object recognition, and medical imaging.

STATISTICAL FEATURE EXTRACTION

- It is a continuous looping process.
- Means it can process more than one image that the time.
- Statistical feature of image contains
  - ❖ Mean
  - ❖ Variance
  - ❖ Skewness
  - ❖ Standard deviation

- For (example: when the input data to an algorithm is too large to be processed and it is suspected to be redundant).

ARTIFICIAL NEURAL NETWORKS

- There are 6 Types of Artificial Neural Networks Currently Being Used in Machine Learning:

1. Feedforward Neural Network
2. Radial basis function Neural Network
3. Kohonen Self Organizing Neural Network
4. Recurrent Neural Network(RNN)
5. Convolutional Neural Network
6. Modular Neural Network

- ANN methodology in all the steps of the image processing chain, starting from data pre-processing and reduction, image segmentation, up to object recognition and scene understanding.

WHY WE USING: FEEDFORWARD NEURAL NETWORK

- The feedforward neural network is an artificial neural network commonly used neural network wherein connections between the nodes do not form a cycle.
- It such as different from recurrent neural networks.
- The FNN was the first and simplest type of artificial neural network devised.

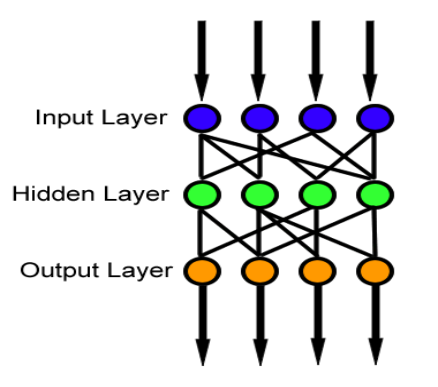


Fig 3.1. Feedforward neural network

In order for ANN to be able to learn, it is necessary to determine the examples and to teach the network according to the desired output by showing these examples to the network. These neural network's success if its directly proportional to the selected instances, and if the event cannot be shown to the network in all its aspects,the network can produce false output .Information such as in **traditional programming** is stored on the entire network, not on a database. And the disappearance of a few pieces of information are in one place does not prevent the network from functioning.

IV. RESULT

In the experiments, we used YouTube dataset for collecting videos. The frames are extracted from videos and set the database. The sample features are shown in table1

Examples for input frames

Figure 4.1 Input frames

Figure 4.2 Input frames

Figure 4.3 Input frames

Examples for Output frames

Figure 4.4 Output frames

Figure 4.5 Output frames

Figure 4.6 Output frames

Table.1 Feature set for some of Wearing Helmet/ Wearing cloth on Head/Not wearing Helmet

NO.OF VIDEOS	FEATURES	SUPPORT VECTOR MACHINE			ARTIFICIAL NEURAL NETWORK			K-NEAREST NEIGHBORS		
		Accuracy	Sensitivity	Specificity	Accuracy	Sensitivity	Specificity	Accuracy	Sensitivity	Specificity
1	WEARING HELMET	60	53.3333	82.1429	93.2560	95.3478	96	62.4321	56	75.2003
	WEARING CLOTH ON HEAD	58.1261	51.3320	79.6211	92.4762	94.0243	94.5670	54.8736	58.3620	60.2212
	NOT WEARING HELMET	63.9982	65	74.6145	95	96.4634	94.5835	56.0134	57.2331	57
2	WEARING HELMET	64.2107	60.1468	60.1237	90	88.5290	89.1672	66	67.5810	67
	WEARING CLOTH ON HEAD	65.0310	64.5497	66	91.5015	90.8861	87	71.2700	69.1992	70
	NOT WEARING HELMET	71	69.8088	68.0025	89.0567	88.6390	86.9061	66.0055	67	65.5576
3	WEARING HELMET	69.0087	68	70.3720	92.1201	93	92.5910	77	72.2751	71.4165
	WEARING CLOTH ON HEAD	70.3151	68.4310	67.1256	89.0516	89.7251	89.7252	84.3651	84.6840	77.2211
	NOT WEARING HELMET	70.3151	64.8168	68	91	94.6104	94.5612	68.4390	71.7641	73.0015
4	WEARING HELMET	63.0333	86	88.1245	96	96.7835	60.0231	68.7708	72.1840	72
	WEARING CLOTH ON HEAD	64.1028	68.1361	79.2540	95.5465	94.1793	94.1793	68.1793	71.8526	70.6764
	NOT WEARING HELMET	63.0578	86.1788	88.4374	96.4031	97.2852	61	69.1450	72.1855	71.0871

V. CONCLUSION AND FUTURE WORKS

The proposed framework for automatic detection of workers in the sites without helmets makes use of adaptive background subtraction which is invariant to various challenges such as illumination, poor quality of video, etc. The use of the MATLAB for automatic learning of discriminative representations for classification tasks improves the detection rate and reduces the false alarms resulting into more reliable system. The experiments on real videos successfully detect ≈ 96%. Future works by using deep learning techniques for improving the overall accuracy of the system.

VI. REFERENCES

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