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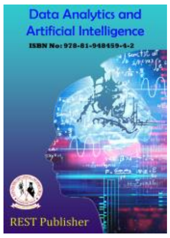


# Detection of Abnormal Activities in the Crowded Areas to Prevent Mobilization and Control using ANN

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**ABSTRACT-** *Suspicious behavior is hazardous in public places and can result in significant casualties. It is required to recognize scamper situations at real time from video surveillance for quick and immediate management before any casualties take place. Proposed system focuses on recognizing suspicious activities and targets to achieve a technique which is able to detect suspicious activity automatically using computer vision. Here the system uses the Artificial Neural Network for human detection models and techniques like YOLO for classifying different kinds of actions at real time. Manual surveillance and monitoring systems are ineffective, labor-intensive, and cumbersome in the complex and congested situations of today. Automated video monitoring has proven crucial for crowd management and disaster prevention. Additionally, robust feature extraction techniques, combined with potent and trustworthy decision-making classifiers, are needed by human crowd behavior (HCB) systems in order to effectively understand and interpret crowd behavior. As a whole the developed system has enhanced robust entropy classifiers for automated crowd behavior identification in intelligent surveillance systems which is completely enhanced with ANN.*

**Keywords**- *Human Crowd Behavior(HCB), tensor flow, keras ,media pipe, computer vision*.

## 1. INTRODUCTION

For the protection and safety of the public, crowd monitoring is crucial. Public events like concerts, political and religious meetings, and marathons are subject to crowd disasters due to the rapid population growth. During recent years, high-density crowd analysis has received much attention from the research community. For crowd monitoring, crowd managers and municipalities install multiple cameras in different locations to cover a wider picture of the event. The current practice of crowd monitoring is based on manual analysis, where an analyst monitors these events through the cameras. Such manual analysis of the crowd is a hectic job and usually results in errors due to human in-capabilities. Hence, a crowd analysis that is automatic is necessary. During recent years, a significant amount of work has been reported in the literature surveys to automate the crowd analysis task through computer vision. Finding and locating abnormal occurrences precisely is one of the key objectives in video surveillance. An anomaly in the crowd refers to any undesirable event that may pose threat to public safety and security. Generally, anomalous events occur very rarely compared to normal events. The current pressing requirement is for autonomous identification of abnormal occurrences in order to reduce human efforts and respond quickly to anomalous events. Anomaly detection's primary objective is to promptly respond to occurrences that have a tendency to vary from typical behavior. The goal of anomaly detection is to separate abnormal scenes from those that are normal.

## 2. RELATED WORK

Asma M, Dharini K M, Sheetal Shree P, Vennela C S, Prof. Geetha L S [1] The widespread use of object detection algorithms in security applications like crowd surveillance and facial recognition is because of their rapid development. However, it is extremely difficult to track an individual in real time, particularly in crowded areas where they may be partially or completely obscured for some time. The goal of this paper is to develop a people-only abnormal activity detection system in public places. This system not only detects a person in real time but it also uses the information that it has learned, to follow the person's path until they leave the camera's frame. For person detection, the system employs the YOLO algorithm. Thus, the system was able to successfully identify crowded clusters and abnormal activity in real time.

Ali M. Al-Sharey, Shrough S. Alshehri, Norah S. Farooqi & Mohamed O. Khozium[2] This paper presents a new and conclusive analysis of the concept of the crowd, examining it from a variety of angles in light of its defining characteristics, risks, and tragedies, which may occur as a result of difficulties encountered during crowd management.

These conclusions are based on a large number of recently published scholarly articles. In addition, a methodical discussion of the steps involved in managing a crowd, including crowd detection, is presented, along with examples of both direct and indirect approaches to crowd monitoring and tracking.

The primary objective of this review is to acquire a comprehensive grasp of processes related to crowds. In addition, it also aims to identify research gaps in order to overcome the drawbacks of employing stand-alone techniques in each step and support the work of subsequent researchers.

Jia Wan, Nikil Senthil Kumar, and Antoni B. Chan [3] The current and existing crowd counting algorithms only care about the number of people in an image rather they lack in low-level, fine-grained information about the crowd. The total number of people in an image isn't as useful for many practical applications. A semantic segmentation branch and a density map estimation branch are the two branches that have been proposed for this architecture. In order to enhance the predictions of these two branches, refinement strategies are also provided. First, we propose feature propagation guided by density map prediction, which eliminates the influence of background features during propagation, to encode contextual information. Secondly, in order to share information between the two branches, we propose a complementary attention model. The outcomes of our experiments show the effectiveness of our approach.

Arnav Sinha,Shriya Padhi,Sajeeda Shikalgar[4] Due to the recent surge in technological advancements in the modern era, crowd anomaly detection has developed into a field of critical importance. Surveillance, which is also required to identify anomalies in order to prevent unforeseen accidents, is required in an increasing number of situations or locations. Typically, crowd anomaly detection works by analyzing the surveillance scene in real time using AI, ML, optical flow analysis, streak flow analysis, and other concepts and methods. To find out what is abnormal within a group of people. The appropriate authorities are immediately notified in case of any anomaly being discovered. A few of these methods are examined in this survey paper by contrasting their advantages and disadvantages.

## 3. EXISTING SYSTEM

Researchers struggle to employ the recent computational models and automated technologies to obtain the highest possible accuracy and performance. Using streak flow analysis technique for analysis gives an accuracy of 93.37% which is comparatively less when compared to the ANN algorithm. A convolutional neural network recognizes an image as pixels arranged in distinct patterns. They do not understand them as components of an image.

**DISADVANTAGES:**Training the images in CNN algorithm will require lots of training. CNN takes a relatively long time to train the model. In the world of computer problem solving, CNNs are somewhat slow. Detection process also takes too much time to detect, when people's scale level is high.CNN has difficulties in classifying images with different positions. They fail to encode the position and orientation of the objects.

## 4. PROPOSED SYSTEM

This section provides a comprehensive review of crowd studies, from detecting a person in the crowd, to monitoring a person in the crowd, and finally for managing the crowd to save human life from casualties that take place due to overcrowding. There are many existing approaches that are being employed for crowd management which lack in either of the ways in achieving accuracy.

**Input video:** Surveillance cameras play a vital role in collecting videos from different locations, based on their IP addresses which can uniquely identify the source camera. For managing the crowd all cameras in a particular location are connected to one main display through which the crowd and its behavior are monitored. Earlier in case of any abnormalities found in the input videos the further steps were processed manually, now in this paper efforts are made to fully automate the process of detecting any casualties in the crowd and also to manage the crowd by exclusively counting only the number of human beings present in the crowd which in turn helps in crowd management. Videos are a collection of images. The input videos are broken into frames, which results in individual images. Therefore an issue with video data is similar to an issue with image classification or object detection. Taking frames out of the video is only one more step that needs to be done.

**Video processing:** The Data Preprocessing module includes the cleaning of input images and reducing the noise from the images. The input images that are used to train the deep learning model are transformed into a standard format which fits to train and test the model easily. As each input image has different resolutions, the computation will become complex.So that input images are transformed into a standard fixed resolution which is achieved by image augmentation. The splitting of dataset for training and testing the model where 80% of data for training the model and 20% of data for testing the model. In the training and the testing dataset the images are batched, so that while building the model the input is trained batch wise.

**Edge detection:** One of the most effective deep learning object detectors was YOLO. It has a number of different versions, including YOLO v2, v3, and v4. Redmon et al was the one who initially proposed YOLO. This method utilized a single neural network to process the entire image. This network divides the image it receives into multiple partitions.

 

After that, a bounding box is used to encircle each region, and the probabilities for each one are calculated. Consequences be damned sweeps the full picture in a solitary time, and subsequently, the expectations are educated by the picture setting. After dividing the input image into SxS grids, each feature is taken from each one. Together with the labels that go with them, the bounding boxes are predicted. Their predicted confidence score is linked to these labels.


**FIGURE 1.** Edge detection with boundary boxes

**Object tracking:** We use the centroid tracking algorithm which is a combination of multiple-step processes for this. The center is calculated using bounding boxes. Then, using Euclidean geometry, the separation between the new and old centroids is calculated. Moreover, it unregisters items that have been taken out of the field.

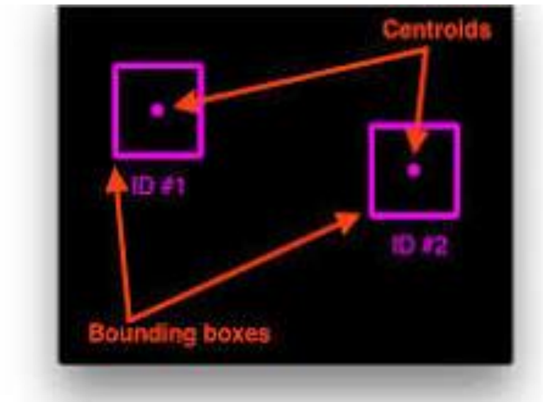


**FIGURE 2.** Object tracking with Euclidean distance

Euclidean distance is the actual measurement of the distance between two points, here the points are the selected centroids. The formula for Euclidean distance is given as,

$$d(\mathbf{p},\mathbf{q}) = \sqrt{\sum_{i=1}^{n}(q_i - p_i)^2}$$

p,q= two points in the euclidean space

$p_i$,$q_i$ = initial points

n= n-space

**ANN deployment model for Human detection:** In this module, the preprocessed data is used to build the ANN model. The input image will go through all the input and multiple hidden layers, where each layer will reduce the noises and extract the meaningful features from the input. The training dataset consists of different body parts of human beings like the head, face, legs, hands etc. Using these training datasets, the ANN model will be trained and tested with the test dataset in which this process will be repeated for several epochs, which results in increased accuracy.

**Fall detection:** Among all the casualties that take place in the crowded areas, falling down in the crowd is very dangerous because that might result in a trampling situation which in turn leads to loss of life. In the bounding boxes, the sides of the boxes are measured and calculated. On the basis of trigonometric factors, we can conclude whether the person is in stand or fall position.

 


**FIGURE 3.** Fall detection


**FIGURE 4.** Crowd count

**Alert system:** Apart from fall detection the other part of the paper is to manage the crowd. Counting the number of persons in the crowd is necessary for crowd management. We concise the crowd to handleable size as large crowds might result in uncontrollable situations which leads to casualties. Using this system, we alert the officials by both voice and mail. When the model encounters fall detection or overcrowding it immediately activates the alert system. Here we use SMTP protocol for sending the alert mail to specific crowd manager or officials stating the reason with attached image.

## 5. CONCLUSION

This proposed paper made efforts to provide better real-time crowd monitoring to crowd management and yielded insights to detect the anomaly in the crowd. By a well-trained model we were able to accurately detect the human in the environment via cameras than the existing systems. As this system doesn't require any high-end hardware and complicated software's, it actually benefits the user to achieve the proper results within the economical way. With the best alerting system, the officials could arrange the medical emergency team in a short span in case of fall detection and handle the large crowd by controlling the crowd count.

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