

## Counting the number of people in High Density Crowd

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### Abstract

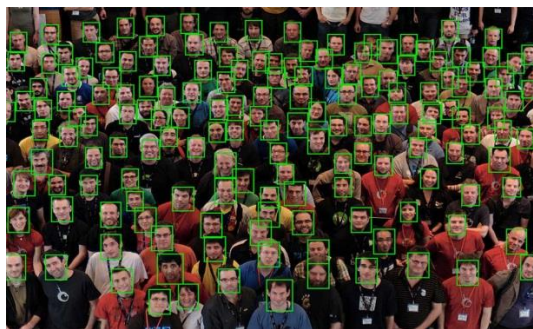
*To find total count of the people in the crowded area is challenging task for the any system over the years. Total count of people is very important for the management of the crowd. The proposed system addresses the issue of detection and counting of people in exceedingly swarmed video scenes. So, this people counting system aim at automatically estimating the number of people with some time interval in several scenarios at high density crowd based on Face Detection.*

**Keywords:** *Segmentation, Background estimation, Background subtraction, Frame separation, haar-cascade*

### INTRODUCTION

Human detection in crowd video scenes is getting more Importance due to the variety of applications in crowd monitoring. A huge loss of life and property has been recorded due to crowd disasters in the recent years. With the ever-increasing population, more such incidents are bound to happen without proper crowd management systems. These types of incidents can be controlled and Monitored by combining image processing techniques.

Counting people from videos draws a lot of attentions because of its wide range of applications, such as building security, room resources adjustment, market research, intelligent building, crowd monitoring, etc., as shown in Fig (a).



**Fig (a)**

### RELATED WORK

People counting systems aim at automatically estimating the number of people indoor and outdoor places by Zhao, Delleandrea and Chen in 2014[4]. There are many advantages of using people counting systems. For example, they are widely used in retail environment; determining conversion ratio, advertising and promotional evaluations and they can be used for transportation management system and video surveillance [3]. In brief, people counting system are very important in many real-time applications.

Various approaches for crowd counting have been proposed, which is broadly fall into three categories:- Counting by detection, Counting by clustering, Counting by regression.

For counting by detection: - Some whole pedestrians detection based method are not effective because features of whole pedestrian are not obvious in densely crowd scenes. This problem has been addressed by some approaches based on part-based detectors, especially head shoulder detector. Moreover, the counting accuracy can be further improved by post-processing methods, such as individual human in crowds as a model-based

Bayesian segmentation problem and presented an efficient Morkov Chain Monte Carlo (MCMC) method to get the solution Wank et al built a spatio-temporal group context model to model the spatio-temporal relationships between groups, formulating the problem of pedestrian counting as a joint posteriori maximum one.

## TECHNOLOGIES FOR COUNTING PEOPLE IN HIGH DENSITY CROWD

### a) *Tensor Object location API*

The TensorFlow Object Detection API is an open source system based over TensorFlow that makes it simple to develop, prepare and send protest discovery models .Creating exact machine learning models equipped for confining and distinguishing the various questions in a solitary picture remains a center test in the PC vision. At Google have unquestionably observed this codebase to be extremely helpful for the PC vision needs, and proposed system need to trust that you will also.

### b) *OpenCV*

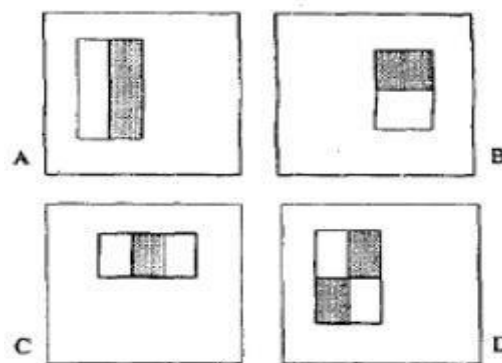
OpenCV (Open Source Computer Vision Library) is discharged under a BSD permit. It has C++, Python and Java interfaces and backings Windows, Linux, Mac OS, iOS and Android. OpenCV was intended for computational proficiency and with a solid spotlight on ongoing applications. Written in improved C/C++, the library can exploit multi-center preparing. Empowered with OpenCL, it can exploit the equipment quickening of the basic heterogeneous figure stage. Embraced all around the globe, OpenCV has in excess of 47 thousand individuals of client group and evaluated number of downloads surpassing 14 million. Use ranges from intuitive workmanship, to mines examination, sewing maps on the web or through cutting edge mechanical technology.

### c) *Haar-Cascade*

Haar-course is a protest discovery calculation used to find faces, people on foot, articles and outward appearances in a picture and predominantly utilized for confront location.

In Haar-course, the framework is given a few quantities of constructive pictures (like countenances of various people at various foundations) and antagonistic (pictures that are may not be faces but rather they ever can be whatever else like seat, table, divider, and so on.)

As a rule, three sorts of highlights are utilized as a part of which the estimation of a two rectangular highlights is the distinction total of the pixels inside two rectangular districts. These areas are having same shape and measure and are on the level plane or may be vertically neighboring as appeared in given Fig. Where as in the three rectangular highlights are processed by taking the total of two outsided given rectangles and after that subtracted with the total in an inside rectangle. Besides, in the four rectangles highlight registers the contrast between inclining sets of rectangles.



**Fig b:** Example rectangle features use in Haar-cascade. The sum of pixels in the white rectangles is subtracted for the sum of the pixels in the grey rectangles. Here A and B are two rectangle feature, and C and D are three and four rectangle feature.

**PROPOSED SYSTEM**

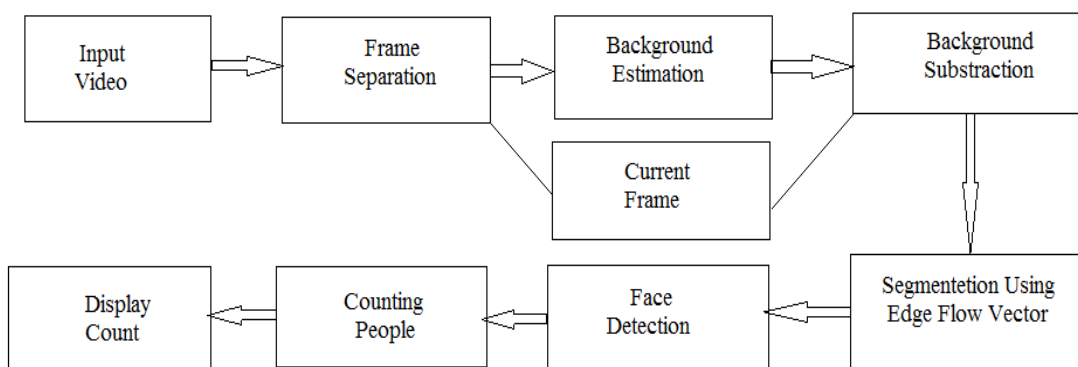
This section explains the proposed system in detail. The several

Components of the system are-

- (1) Input video,
- (2) Frame Separation,
- (3) Background Estimation,
- (4) Background Substraction,
- (5) Segmentation,

- (6) Face Detection,
- (7) Current Frame,
- (8) Counting People, and
- (9) Display Count

Methods to form the final model. The block diagram of Proposed system is shown in Fig (c).



**Fig (c)**

The brief description of each component of proposed system is Described as follows:

**A. Frame Separation**

Video Segmentation decomposes a video into many frames throughout the sequence. Video segmentation is a technique used for detecting changing frame in video. Video segmentation applications are used in the field of robotics, video surveillance, traffic monitoring, crowd monitoring, video indexing etc.

Video is a collection of frames and in the proposed system are using appropriate frame from those frames to get the desired count of people.

**B. Background Estimation**

The background estimation must be dynamic such that background image must be updated. This is important for a good people counting algorithm. Let's take an

example. In fact, the sun's light intensity changes throughout the day, or some objects if the people counting system is placed in the entrance of a building, some little and slow modifications are occur during the day can affect the people counting algorithm could be removed from or added to the work scene.

If the background estimation is always detects variations. Before propelling the foundation estimation, the calculation must be acquire beginning 20 outline as foundation show . In this technique, there is no movement in the field of the camcorder amid this minute. On the off chance that it distinguishes no movement, the reference picture (foundation picture) is refreshed; if there is movement, the foundation picture isn't refreshed and tries to be refreshed in the following foundation estimation.

The system propose a novel background extraction algorithm based on an improved mode algorithm to obtain the static background regions. Employing these approaches seeks to obtain a clean static background reference image and apply it to background subtraction. To eliminate deficiencies of the mode algorithm, this paper improves the mode algorithm after locating its source of inaccuracy. The casing contrasts technique isolates pixels into two arrangements, perpetual foundation and moving items, and ascertains the unaltered foundation pixels utilizing the mode calculation. This strategy can dispose of the inadequacy in the mode technique. The computing formula of the new method is the following:

$$BG(x, y) = mode(B_{t-N}(x, y) * \alpha_{t-N}, B_{t-N+1}(x, y) * \alpha_{t-N+1}, B_{t-N+2}(x, y) * \alpha_{t-N+2}, \dots, B_{t-2}(x, y) * \alpha_{t-2}, B_{t-1}(x, y) * \alpha_{t-1})$$

$$If \alpha_n = \begin{cases} 1, & \text{if } BW_n(x, y) = 0 \\ 0, & \text{otherwise} \end{cases}$$

Here constant Alpha  $\alpha$  can be identify by using binaryzation of an image ( $BW_n(x, y)$ ). To get double picture, First ascertain remove between current edge and past edge that can contrast and edge esteem. In the event that it is not as much as stamp as foundation or else check as moving item

$$BW_n(x, y) = \begin{cases} 0 \equiv \text{background}, & \text{if } D(x, y) < T \\ 1 \equiv \text{moving object}, & \text{otherwise} \end{cases}$$

After binaryzation of image, if the pixel value BW is 0 then alpha value is 1 or otherwise alpha value is 0. Based on this condition values substitute in improved mode algorithms to get better background estimation.

### C. Background Subtraction

It is a technology that uses the difference of the current image. The key of this method lies sin the initialization and update of the background image. The background image to detect the motion

region, and it is generally able to provide data included object information.

### D. Segmentation

People segmentation is a difficult problem in image analysis. The segmentation of people based solely on appearance is difficult because of the variability of their shapes. Image segmentation in general remains an unsolved problem; however, the problem becomes more tractable when system have a sequence of images with moving objects. Moving objects can be separated from the background and each other more easily using their motion information. The main idea presented in this section is an effective segmentation technique based on an edge field computed directly from the images. The flow field can be computed from various images and it may include colour, texture with intensity edges. This method first identifies a flow direction at each pixel location that points to the closest boundary. It then detects locations that encounter two opposite directions of the edge flow. Since any picture qualities, including shading, surface, or their mix, can be utilized to process the edge vitality and stream bearing, this plan gives a general system to incorporating diverse picture highlights for limit recognition. The Edge Flow technique uses a prescient coding model to distinguish and incorporate the bearing of progress in picture traits, including shading, surface, and stage discontinuities, at each picture area.

Toward the end, a locale consolidating calculation blends comparable districts in view of an estimation that assesses the area shading and surface element separations, area sizes, and the level of the first limit between two neighboring areas

This algorithm sequentially reduces the total number of regions each time by checking whether the user's preferred number has been approached to the best



extent.

**E. Face Detection**

Face detection also refers to the psychological process by which humans locate and attend to faces in the given visual scene. Face detection is a computer technology used in a many of applications that identifies human faces in digital images. Following technologies are using for Face Detection:

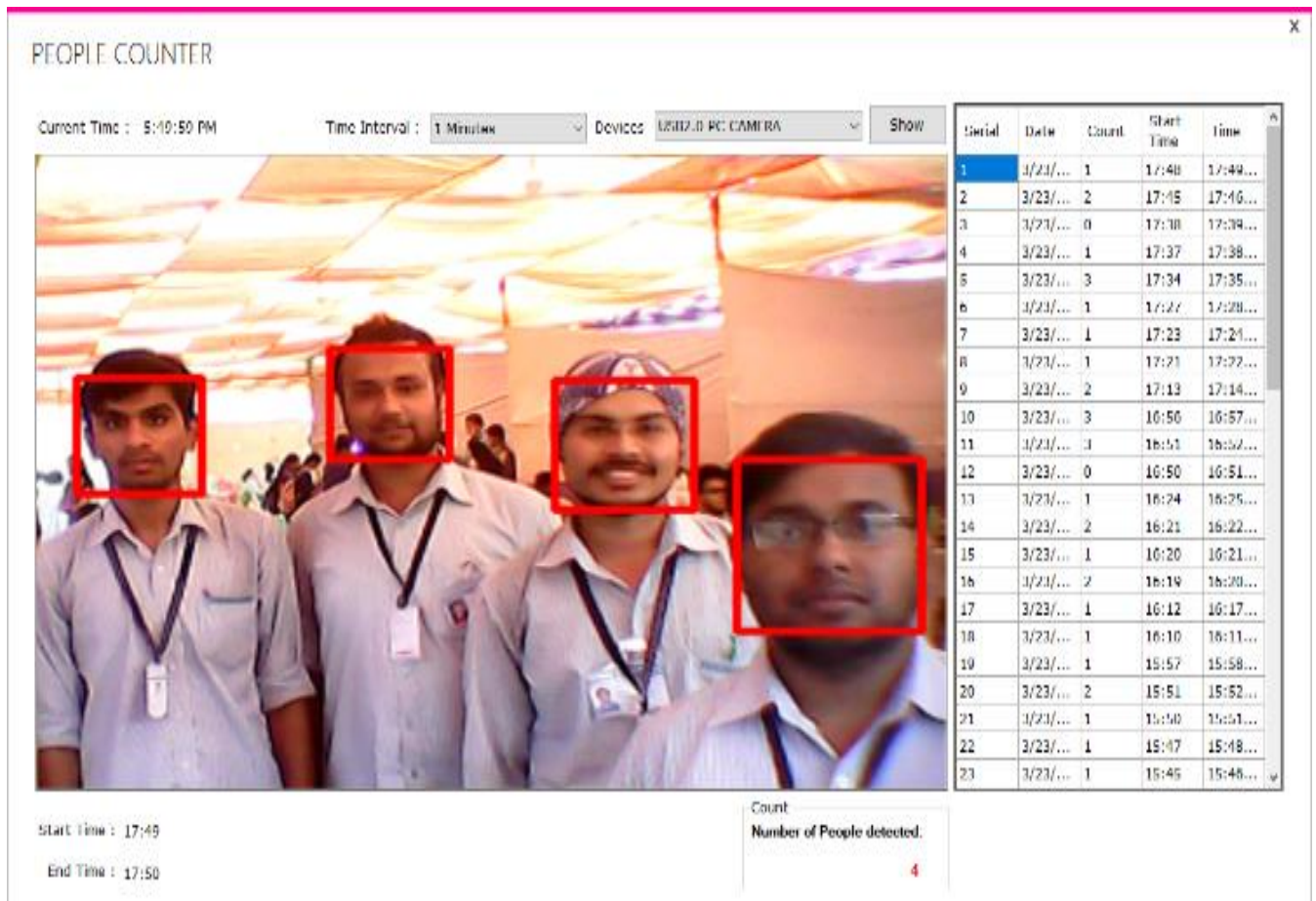
- OpenCV
- Haar-Cascade
- TensorFlow

**F. Display Count**

The proposed system displays the count after detecting the faces after some time interval. E.g. 1min, 15min, 30min, 1hour, etc

**PROPOSED SYSTEM GUI**

The given Fig. (d) shows GUI screenshot of the proposed system.



**Fig. (d)**

## CHALLENGES IN COUNTING PEOPLE

### 1) Low Light:-

For getting the appropriate count of the people using CCTV requires sufficient amount of light, So that system can easily identify object or humans. So that system can able to get appropriate count of the amount of people. Low light is the biggest challenge in counting people using CCTV. In low light there is problem of identifying the object or human, so system cannot detect human clearly. So proposed system cannot able to get the appropriate count of the amount people.



### CCTV Camera Angle

CCTV Camera angle plays an important role in the counting of people in crowd. For counting of people in this system all faces of the people should be get detected by the system so that it will give the appropriate count of the people.

If the CCTV camera is placed at an angle where the faces are not get detected properly so there will be problem in counting of people, So that the CCTV camera angle plays an important role in counting the people in high density crowd.

CCTV camera should be from front side of peoples so that it will detect faces of the peoples and get the appropriate count. If the CCTV camera will be at back side of

peoples so that it cannot easily get identify the faces so that it will not give the appropriate count.

## CONCLUSION AND FUTURE WORK

This paper presents a people counting system based on human face detection method. The counter can count the people, even more than one person at a time. This paper presents a novel method for people segmentation, tracking and counting. The calculation utilizes foundation subtraction and depends entirely on the edge stream based frontal area squares to accomplish human division. In the proposed method, background subtraction is used for segmentation.

For foundation subtraction, proposed framework has utilized the foundation display utilizing Parzen thickness estimation. Since this model depends on pixel esteems saw in a succession of the most recent N outlines, people on foot remaining at a similar place are fused out of spotlight model and they can't be accurately separated.

The system used at the highly crowded area or video for detecting and counting people. The better performance and the consistency in counting the people in crowded area which is present in video is shown by the system.

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