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# Implementation of Algorithm of People Counting and Blob Analysis Using OpenCv and Python

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**Abstract - For the last few months, the world is suffering from epidemic COVID-19. It is found that till all people are vaccinated, we all must take the precautionary measures of using hand sanitizers, face masks and the most important is following social distancing. Computer vision technology can play a vital role in this crucial scenario. The advanced video processing algorithms provide fast computational capability, provides a possibility to use video tracking and counting people in real-time. The adoption of this measure not only serves as a crisis plan for pandemic but also provides a range of benefits in long term. In this paper, we propose an algorithm that analyzes a video sequence detects people to yield frequency of people along the direction of path traversal which can be implemented in the open-access building such as malls, airports, shopping centers, etc. It can be easily integrated into already existing systems if there are already installed surveillance cameras. The result obtained can be used for purpose of statistics in the circumstances of any calamity occurrence for the rescue team to take relevant measures to rescue the people. This paper gives the solution using blob analysis using Open-CV and python.**

**Keywords:** Computer Vision, Social distancing, People Counter, OpenCV, Blob analysis, Video Analytics

## 1. INTRODUCTION

Traveling is restricted due to the covid-19 epidemic and people are advised to safely stay at home. At the time of de-confinement, the medical bodies have described distancing protocols. The idea of making a person counter at the entrance of open-access buildings [1] of essential services like grocery shopping, visiting doctor In this project we propose an algorithm to track down how many people enter and exit your premises and when they do it can help you make informed decisions and increase operational efficiency so, the person managing security can be sure that they meet the requested health standards. There are numerous studies on the subject of people counting, including various classic approaches including sensors. People detection approaches rely on a variety of sensors, including infrared beam sensors, thermal sensors, and footstep sensors, all of which use pressure-sensing methods all these methods were ineffective and unreliable and had a high probability of counting persons incorrectly. This system can count the number of times that people cross each line, separating the count by the direction of the crossing using blob (Binary Large object) analysis thus providing the count of the people entering and leaving a particular area, it can also be easily integrated into already existing systems. If there are already installed surveillance cameras, and the main purpose is to offer an accurate estimation while still keeping the anonymity of the visitors.

It is important to know the direction of the people [2] along with the count to make the implemented algorithm efficient. This person counting algorithm that is proposed in corresponding to this paper using blob analysis provides the count of the number of people entering and leaving a particular area along with the direction of the moving people which in addition overcomes the problem of occlusion in the case of more number of people move in the cameras field of view.


**Figure 1: Smart Features in Smart Buildings**

 

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## 2. LITERATURE REVIEW

The conventional methods include the usage of turnstiles, which may not be accurate and also makes the people feel difficult to go through that particular way. The traditional methods of detecting people, cannot identify whether the moving object is human. The conventional system which uses sensors have more chances of counting the number of people wrongly. The systems might assume the vehicles or any animal to be a human as they are also dynamic leading to the wrong count.

There are other people counting systems that include the footstep sensor or the sound sensor. These were no used so often as they need a very supportive environment and high maintenance. These did not even produce the result regarding the direction of movement of the people which determines the number of people who were entering and leaving that particular area. The most preferable method for counting people is using the image processing algorithms [5] based on computer-vision- based techniques. Research is still going on in this field and in recent days, the people count system is being widely used in many places including shopping malls, colleges, industries, tourist places, places that are occupied with denser crowds.

Geoffrey Gordon presented a paper on "Better Motion prediction for people tracking". In this work, the author proposed a movement demonstrate for individuals following that is roused by the objective arranged nature of individuals' development. This movement shows includes a learning segment that enables it to utilize data about individuals' normal directions in a particular domain to learn objective areas. Mingxiu Zhang presented the paper on "Real-time tracking passing people uses a single camera" In this approach, he examined the location and following of passing individuals by utilizing the bi-directional projection histogram of the histogram and utilized two casing contrasting techniques for different individual's division[13].

## 3. PROPOSED SYSTEM

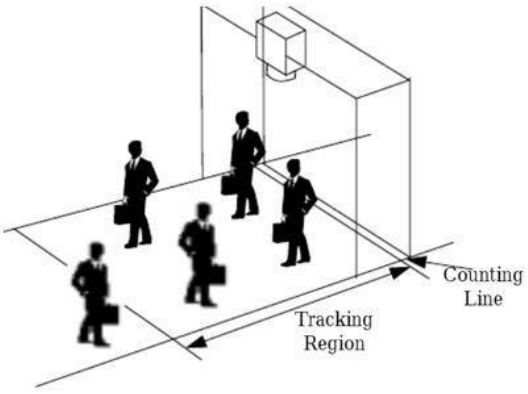


**Figure 2: Pictorial Representation of Proposed System**

The proposed system concerns counting persons who entered a gate. A camera must be mounted on the gate's ceiling. The monitoring area where photographs of pedestrians are captured to detect, track, and count them is represented by a scene provided by a camera. To track and count people, it takes the following steps:

1. Observing phase: this is the phase in which the moving objects are detected as they enter the scene.

2. Tracing phase: It tracks the motion of an object within the monitoring region during the tracing phase.

3. Counting phase: It is the most used method for counting persons according to their tracing phase. The proposed method makes use of data derived from a camera video that is made up of numerous frames. To obtain persons, each captured frame must be processed independently (blob). Following that, blob detection and tracking are addressed. After that, the blob is counted.

## 4. METHODOLOGY

The people counting algorithm, which provides information on the number of people arriving and departing the region, was included in the preliminary build of the program. A video is recorded for a specific period. The algorithm uses the collected video as input and produces People In and Out counts as output. Knowing the exact number of persons in an open-access building can be crucial to the rescue operation's effectiveness. Shopping centers are mandated to keep track of the exact number of people

 

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on their premises at all times. The number of people going through a gate is often estimated using a people counting technology that counts the number of times a virtual horizontal line is interrupted as a person passes underneath it This is the first phase of the project, and we are focusing on four complementary components, namely,

i. Background Estimation
ii. Segmentation
iii. Tracking and Counting.

## 5. DESIGN ALGORITHM

The proposed algorithm for people count in a video is implemented in OPEN CV3 using python. The implementation goes on with the process of background subtraction on the incoming frames followed by the blob analysis and by using virtual lines number of people can be detected, the count of the people entering and leaving a particular area can be evaluated. The current "people counting algorithm" is implemented using blob analysis, which is the basic theory of background subtraction, which is the first and foremost step to detect moving objects. In a video generally, background subtraction has to be done to separate the moving objects from the static objects.

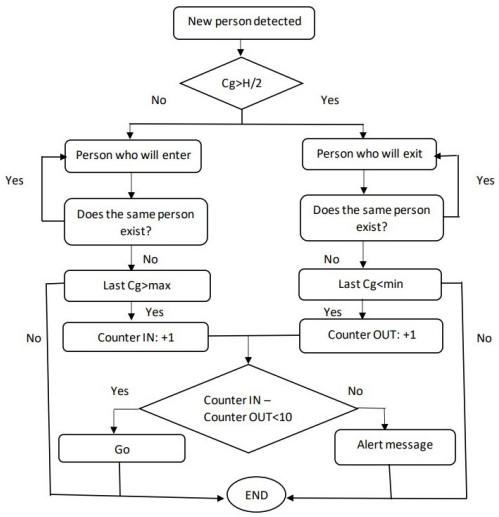


**Figure 3: Work flow of People Counter**

The blob is to be detected for the foreground extracted objects and based on the blobs detected, the heads of the people can be identified in each frame. The blob detection is possible by considering the blob parameters like circularity, convexity, inertia. The detected blobs return the diameter of the blob along with its centroid. The blob detection is used to identify the presence of humans based on the head part.

## 6. RESULT ANALYSIS

**Figure 4: Experimental Result 1**

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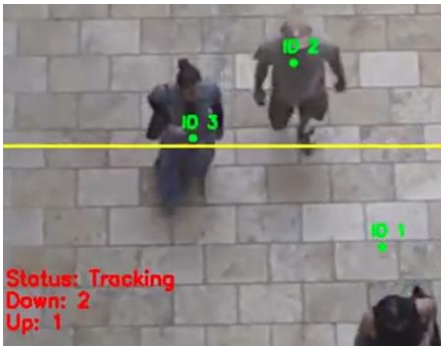


**Figure 5: Experimental Result 3**

In the consideration of the results obtained using the proposed algorithm, a graph is plotted in comparison to the true count and the resultant count. The results plotted are shown below in a graphical manner:

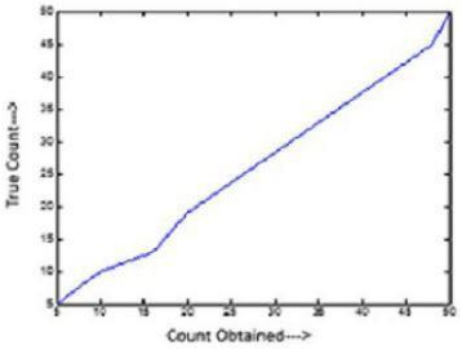


**Figure 6: ROC Curve for People Counter**

An Experimental Trail with different images with different number of individuals is completed and is checked individually. The following table gives the comparison between the number of frames analyzed and total number of frame in which asset is detected and corresponding accuracy is listed after that. Thus it provides the information about the total number of people counted in real time with average precision of 0.87.

## 7. CONCLUSION

The obtained results reflect the efficiency of the proposed algorithm. The algorithm implemented which can be practically used for the applications of people counting. The main objective of this project is to use this as a business perspective, ready-to-scale model. Automating features and optimizing the real-time stream for better performance (with threading). As the proposed work uses the blob analysis that identifies the person by his/her head; occlusion can be avoided that improves the efficiency of the algorithm to leading to the exact count of the people.

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