



People Counting and Tracking Using Machine Learning

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ABSTRACT:

By the use of electronic device, we are measuring or counting the number of people that certain or entrance. To track and count people who are entering and exiting from a building, room or space. Provided it is positioned in the right place, people counting functionality that requires a highly accurate AI algorithm to process the video in order to detect and count people, can be added to existing CCTV setups. However, due to the nature of CCTV cameras, they are not often installed within the building because of privacy concerns and tend to be positioned at building entrances and exits for optimal security reasons, not necessarily for optimal counting functionality. Our work along with counting people also recognizes people who enter after closing time or working hours. In time entered people are counted and post time entered people are counted along with storing their data to send to the respected coordinators or heads. In this way an organization will have a solution for discipline and security. Also in case of emergency at any time count of people in the building can be known.

Key Words– Haar cascade, Dlib Convolutional Neural Network.

Introduction

Overview

The main proposal of this project is to count the people who are present in the building and detect the people who entering or leaving the people.

Objective

Our main proposal of this project to know how many people entering and leaving the building. This project will help us when emergency situations happened in the building at that time to save the people and also in another scenario we can detect the faces of the people to know who entering and leaving at the wrong time.

People counting is an important task in security surveillance applications. It can provide statistical information for shopping centres and other public buildings or knowledge of the current number of people in a building in a case of an emergency. Our project is mainly about vision-based people counting and detecting objects(people) system to count the number of persons entering or leaving the entrance of building. If we take our application is an educational institution our software can detect students who are entering to the institution and who are leaving at the wrong time then it can detects the students information and make an alert to head of the department with their details.

Proposed System:

- This approach involves these steps.
- Firstly we have to fix the CCTV or webcam to the entrance of the particular building.
- For counting people who are entering the building, it increase count automatically.
- And when people entering the building at the wrong time the CCTV will detect the face by using Haar cascade algorithm and identify the person face using CNN algorithm and information passed to head of department as an alert and also increase the count.
- And who are leaving at wrong time CCTV will detect the person face again by using Haar cascade and identify the person face using CNN algorithm and information passed to the head of department and decrease the count when person leaving the building to show how many people present in the building.

Advantages

- It helps stores determine the number of potential shoppers in their space with the help of a visitor counter.

- User-friendly.
- Emergency purpose.
- Cost efficient.
- To control the students in educational institutions.

Architecture

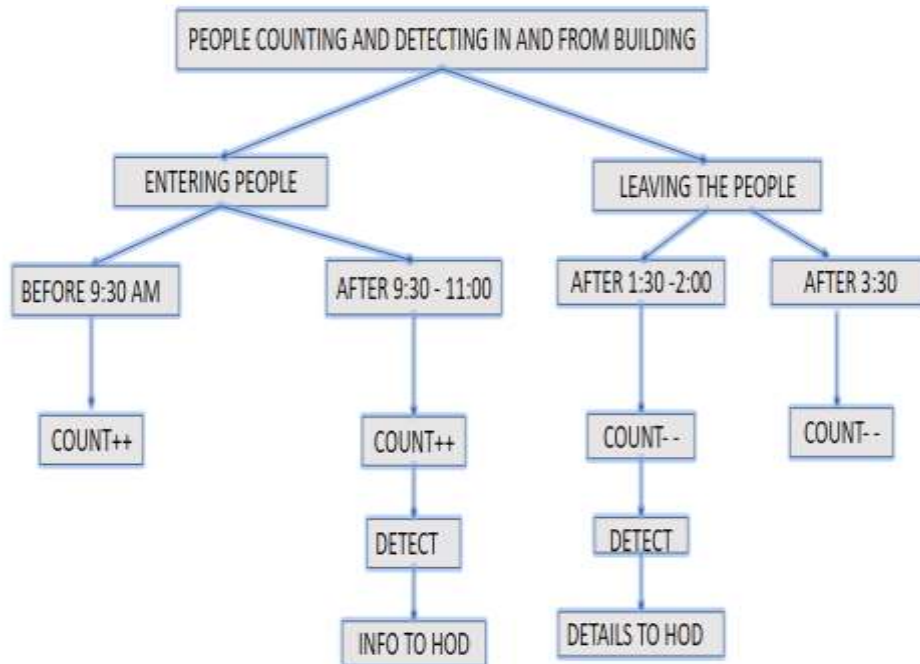


Fig.1 Architecture Diagram

Hardware Requirements

- Camera
- Computer

Software Requirements

- **Frontend :** Tkinter
- **Backend:** Python
- **Libraries :** Dlib, Tensorflow, Keras, and OpenCV
- **IDE:** VS Code

Modules

The modules are as follows

- People counting
- Object detection
- People verification
- Training

People Counting:

In this module the system will count the people who are in the building and When people enter the building the system will increase the count and when people leave the building the system will decrease the count and show how many people are present in the building.

Object Detection :

In this module the system will detect the person's face who are the entering the building at the wrong time .For the face detection the system uses the Haar cascade algorithm .Haar cascade algorithm divide into two parts in face Those parts are positive parts and negative parts.The positive part which can detect the face and the negative part which don't have contact in the object.

People Verification :

In this module the system will identify the people after the face detect .For identify people face we use dlib CNN algorithm .The dlib is library which use in python. The CNN full Convolutional Neural Network.The dlib used to identify the location of 68 coordinates in the face.The Convolutional Neural Network have different layers when user give different angels of face as a input. The system will train and identify the person faces.

Training:

In this module the system will train itself when a user gives a face pic for identification. First we need to create the folder with the name of the user and we should insert the pic of the user in that folder .And each folder should have only one person's pictures only. After creating the folder we should close the system for training itself . when the system starts counting or detecting a person it will show the person name what we create the folder name. and send information to head of department by the gmail .

Algorithms**Dlib CNN algorithm:**

The CNN full Convolutional Neural Network.The dlib used to identify the location of 68 coordinates in the face.The Convolutional Neural Network have different layers when user give different angels of face as a input. The system will train and identify the person faces.

Haar cascade algorithm :

For the face detection the system uses the Haar cascade algorithm .Haar cascade algorithm divide into two parts in face . Those parts are positive parts and negative parts.The positive part which can detect the face and the negative part which don't have contact in the object.

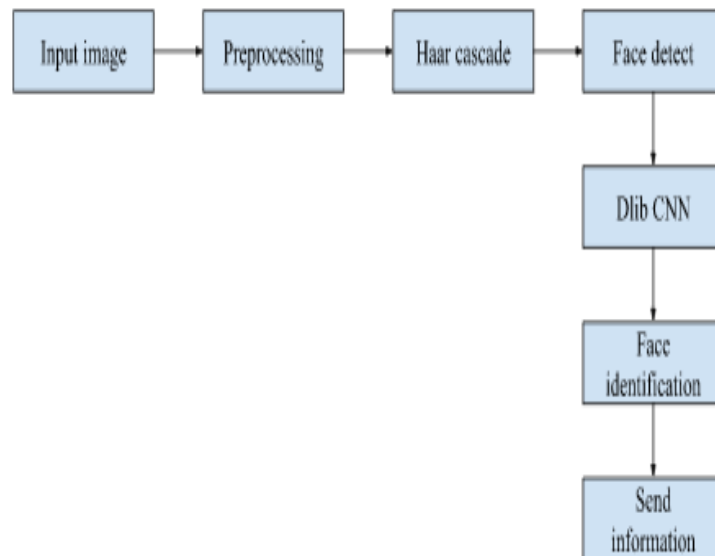
System Design**Data Flow Diagram:**

Fig.2 Data Flow Diagram

In the system design in three modules

1. Live module
2. Admin module
3. Training module

1. Live Module :

In this live module the system will do all things automatically. Means the system will count the people who are entering the building at the correct time and send the information to the head of department by email. And it will also detect people who are entering the building at the wrong time and identify the face and send the information to the head of department.

This module can be use daily in building .When people enter the building the counting and detecting all will be automatic.

2. Admin Module :

In this manual module the system will do in manual. Means the system will give choices to users like counting the people ,face detecting.In this module all processes will be done with the help of the user.The information will be sent when the user will click the “Q button”.

This manual module for checking the system .Is the system working correctly or not .

3. Training Module :

In this training module the system will automatically train itself . And when we create one folder for each person with their names the system will start the training and can detect persons faces.

The folder should be there one person pictures only and pictures should be in different angle.

Result:

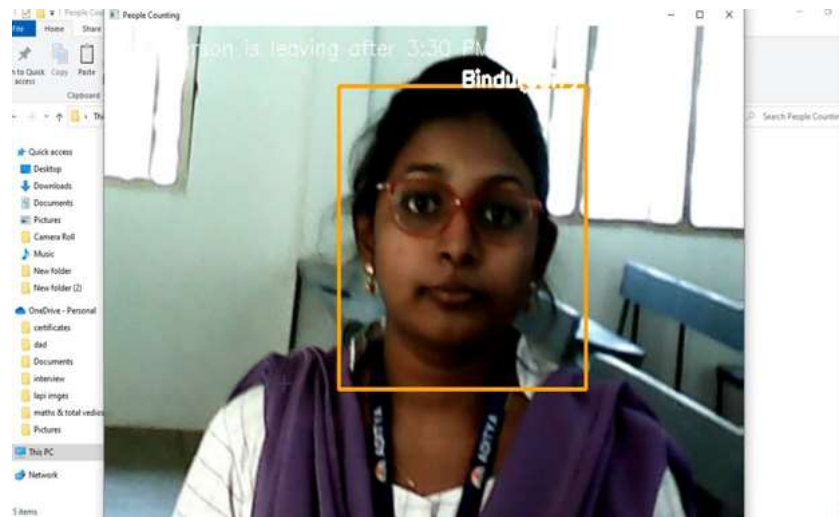


Fig.3 Detecting and Counting People

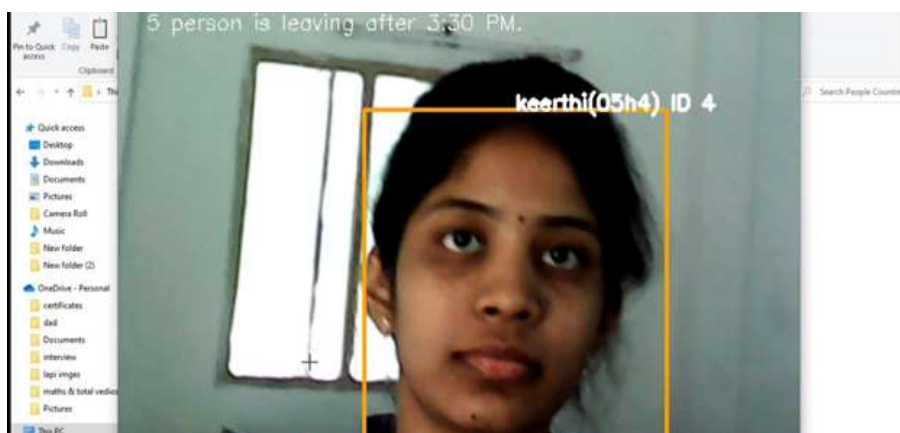


Fig.4 Identifying People

Conclusion:

People counting and tracking using machine learning is a powerful tool that has many practical applications. By following the steps outlined in this documentation, you can implement a people counting and tracking algorithm using machine learning. With this technology, you can obtain valuable insights into crowd behaviour, retail analytics, and security monitoring. In conclusion, implementing a people counting and detecting system using machine learning can be a complex task, but by following the steps outlined in this documentation, it is possible to create an accurate and reliable system that can count the number of people entering or leaving the entrance of a building and detect objects (people) in real-time video footage. With the help of

this system, building owners and managers can ensure the safety and security of their premises, and take appropriate measures to manage the flow of people entering and leaving the building.

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