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Vehicle Speed Measurement on Urban Roadways

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Abstract
Worldwide, reckless driving is the root cause of numerous road accidents. In the past ten years, 4,73,084 traffic accidents have been reported in India. India has seen a significant increase in traffic because there is no way to control or monitor the speed of vehicles on the roads. The implementation of brand-new and cutting-edge speed enforcement technology is required to address this issue and reduce the number of fatalities caused by accidents. For the purpose of measuring vehicle speeds on urban roadways, we propose a video-based, non-intrusive system. To effectively locate vehicle license plates in motion-filled image regions, our system makes use of an innovative text detector and an improved motion detector. After that, distinct features on the license plate regions are chosen, tracked across multiple frames, and perspective distortion is corrected. The tracked features' trajectories are compared to known real-world measurements to determine vehicle speed. A data set with approximately five hours of videos recorded by a single inexpensive camera in a variety of weather conditions and ground truth speeds obtained by an inductive loop detector served as the test bed for the proposed system. Our data set can be used for research at no cost. Over 96.0 percent of the time, the measured speeds stay within the [-3,+2] km/h limit set by regulatory authorities in several nations, with an average error of -0.5 km/h. According to the authors, there are no other video-based systems that can match the results of an inductive loop detector. We also demonstrate that, with a precision of 0.93 and a recall of 0.87, our license plate detector outperforms both a well-known license plate detector and two other published state-of-the-art text detectors. The design of a device that estimates the speed of vehicles passing on highways from real-time video and keeps a log of the speed of vehicles tracked at a specific time is the goal of this project

1. Introduction

The technology aims in imparting a tremendous knowledge oriented technical innovation these days. Deep Learning is one among the interesting domain that enables the machine to train itself by providing some datasets as input and provides an appropriate output during testing by applying different learning algorithms. Nowadays Attendance is considered as an important factor for both the student as well as the teacher of an educational organization. With the advancement of the deep learning technology the machine automatically detects the attendance performance of the students and maintains a record of those collected data.
In general, the attendance system of the student can be maintained in two different forms namely,

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Volume 9 Issue 1, 2021
pp: 51 - 57

- Manual Attendance System (MAS),
- Automated Attendance System (AAS).

Manual Student Attendance Management system is a process where a teacher concerned with the particular subject need to call the students name and mark the attendance manually. Manual attendance may be considered as a time-consuming process or sometimes it happens for the teacher to miss someone or students may answer multiple times on the absence of their friends. So, the problem arises when we think about the traditional process of taking attendance in the classroom.

Every organization requires a robust and stable system to record the attendance of their students. and every organization have their own method to do so, some are taking attendance manually with a sheet of paper by calling their names during lecture hours and some have adopted biometrics system such as fingerprint, RFID card reader, Iris system to mark the attendance. The conventional method of calling the names of students manually is time consuming event. So, is much waste of time during the class hours which in turn lead to less learning rate. The RFID card system, each student assigns a card with their corresponding identity but there is chance of card loss or unauthorized person may misuse the card for fake attendance. So, there is no transparency. While in other biometrics such as finger print, iris or voice recognition, they all have their own flaws. Theseare also are not 100% accurate [1] [19].So, there is an urge for another method of taking attendance.

To solve these issues, we go with Automatic Attendance System(AAS).Use of face-recognition for the purpose of attendance marking is the smart way of attendance management system. Face recognition is more accurate and faster technique among other techniques and reduces chance of proxy attendance. Face recognition provide passive identification that is a person which is to be identified does not to need to take any action for its identity [2].

Automated Attendance System (AAS) is a process to automatically estimate the presence or the absence of the student in the classroom by using face recognition technology. It is also possible to recognize whether the student is sleeping or awake during the lecture and it can also be implemented in the exam sessions to ensure the presence of the student. The presence of the students can be determined by capturing their faces on to a high-definition monitor video streaming service, so it becomes highly reliable for the machine to understand the presence of all the students in the classroom.

The two common Human Face Recognition techniques are,

- Feature-based approach,
- Brightness-based approach.

The Feature-based approach also known as local face recognition system, used in pointing the key features of the face like eyes, ears, nose, mouth, edges, etc., whereas the brightness-based approach also termed as the global face recognition system, used in recognizing all the parts of the image.

Face recognition involves two steps, first step involves the detection of faces and second step consist of identification of those detected face images with the existing database. There are

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Volume 9 Issue 1, 2021
pp: 51 - 57

number of face detection and recognition methods introduced. Face recognition works either in form of appearance based which covers the features of whole face or feature based which covers the geometric feature like eyes, nose, eye brows, and cheeks to recognize the face [3].
Our system uses face recognition approach to reduce the flaws of existing system with the help of machine learning, it requires a good quality camera to capture the images of students, the detection process is done by histogram of oriented gradients, and recognizing perform through deep learning. The frontend side (client side) which consist of GUI which is based on HTML and CSS and backend side consist of logic and python (server side), andflask is developed to communicate these two stacks. The images capture by the camera is sent to system for further analysis, the input image is then compared with a set of reference images of each of the student and mark their attendance

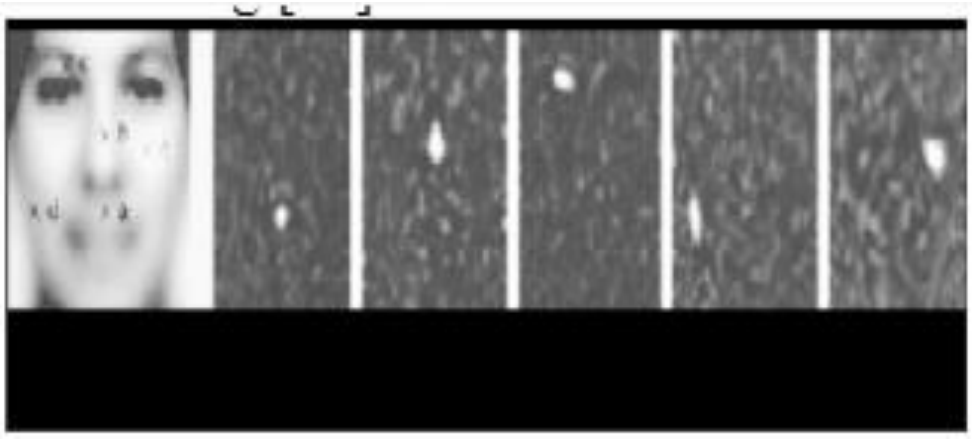

Fig.1 Architecture

2. Literature Review

A Counterpart Approach to Attendance and Feedback System using Machine Learning Techniques:In this paper, the idea of two technologies namely Student Attendance and Feedback system has been implemented with a machine learning approach. This system automatically detects the student performance and maintains the student's records like attendance and their feedback on the subjects like Science, English, etc. Therefore, the attendance of the student can be made available by recognizing the face. On recognizing, the attendance details and details about the marks of the student is obtained as feedback.

Automated Attendance System Using Face Recognition:Automated Attendance System using Face Recognition proposes that the system is based on face detection and recognition algorithms, which is used to automatically detects the student face when he/she enters the class and the system is capable to marks the attendance by recognizing him. Viola-Jones Algorithm has been used for face detection which detect human face using cascade classifier and PCA algorithm for feature selection and SVM for classification. When it is compared to traditional attendance marking this system saves the time and also helps to monitor the students.

Student Attendance System Using Iris Detection:In this proposed system the student is

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pp: 51 - 57

requested to stand in front of the camera to detect and recognize the iris, for the system to mark attendance for the student. Some algorithms like Gray Scale Conversion, Six Segment Rectangular Filter, Skin Pixel Detection is being used to detect the iris. It helps in preventing the proxy issues and it maintains the attendance of the student in an effective manner, but in one of the time-consuming process for a student or a staff to wait until the completion of the previous members.

Face Recognition-based Lecture Attendance System:This paper proposes that the system takes the attendance automatically recognition obtained by continuous observation. Continuous observation helps in estimating and improving the performance of the attendance. To obtain the attendance, positions and face images of the students present in the class room are captured. Through continuous observation and recording the system estimates seating position and location of each student for attendance marking. The work is focused on the method to obtain the different weights of each focused seat according to its location. The effectiveness of the picture is also being discussed to enable the faster recognition of the image. In recent years, a number of face-recognition based attendance management system have introduced in order to improve the performance of students in different organization. In [4] Jomon Joseph, K. P. Zacharia proposed a system using Image processing, PCA, Eigen faces, Microcontroller, based on MATLAB. Their system works only with front face images and there is need of a suitable method which works with the orientation of the system. Ajinkya Patil with their fellows in [5] proposed a face recognition approach for attendance marking using Viola Jones algorithm, Haar cascades are used to detect faces in Images and recognition performs through Eigen face method. Another approach of making attendance system easy and secure, in [6] the author proposed a system with the help of artificial neural networks, they used PCA to extract face images and testing and trainingwere achieved by neural networks, their system performs m various orientation.

A 3D face recognition approach for attendance management system was proposed by MuthuKalyani.K, VeeraMuthu. A [7] has proposed, they marked attendance with monthly progress of each student. There is need for an alternative algorithm which can enhance the recognition on oriented faces. Efficient Attendance Management system is designed with the help of PCA algorithm the have achieved accuracy up to 83% but their system performance decreases due to slightly changes in light condition. An eigen face approach along with PCA algorithm for marking face recognition attendance system have Introduced by author in they mention comparison of different face recognition algorithm in their paper. Overall, it was good approach to maintain record of attendance.

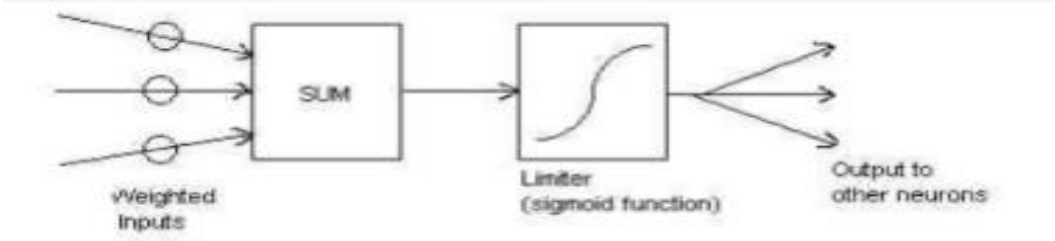

Fig.2 Generalized Back Propagation Neural Networks.

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3. Proposed System

The most obvious and significant aspect of human faces is their skin color. The intensity of a person's skin color, not their chromatic features, distinguish human skin colors from those of various ethnic groups [22]. Skin color-based processing is one way to process facial features. The skin color algorithm is one of the simplest algorithms for detecting skin pixels, as stated by Crowley and Coutaz [23]. There are skin color and non-skin color categories for each pixel. The colorcomponent, which is modeled using Gaussian probability density [24], serves as the foundation for this classification. This method uses the skin region's color space as the classification for an input image. The skin area is covered with threshold. In order to extract the face from the input image, a bounding box is drawn at the end.

As stated by Sanjay Kr. Singh and other, The skin color processing method is orientation invariant and faster than other facial feature processing methods [13]. But Yeong Nam Chaeet and co. has a different opinion that the skin color method takes a long time because it scans the target image linearly, which takes up a lot of space [25]. As a result, they've come up with a novel approach that uses sub-windows scanning rather than linear scanning. By determining the horizontal and vertical intervals, the proposed method scans the image sparingly to determine the facial color density. The experiment's findings demonstrate that, in comparison to the conventional approach, the proposed method successfully detected faces in a shorter amount of time. Because it skips sub-windows that do not contain possible faces, the sub-windows scanning method reduces computational time. The RGB [26][27], YCbCr [24] and HSI [28] color spaces are the three most widely used color spaces. consumes a lot of time because it scans the target image linearly, which takes up a lot of space [25]. As a result, they've come up with a novel approach that uses sub-windows scanning rather than linear scanning. The proposed approach works by scanning the image sparsely and determining the horizontal and vertical intervals of facial color density. The experiment's findings demonstrate that, in comparison to the conventional approach, the proposed method successfully detected faces in a shorter amount of time. Because it skips sub-windows that do not contain possible faces, the sub-windows scanning method reduces computational time. The RGB [26][27], YCbCr [24] and HSI [28] color spaces are the three most widely used color spaces.

5.3.1RGB: Red, Green, and Blue

A normalized color histogram can be further normalized for changes in intensity by dividing by luminance in RGB color space to identify skin-colored pixels in an image. The face is detected and localized by this. However, compared to YCbCr or HIS, this color space is not ideal for color-based detection techniques. a study that was carried out by Vezhnevetset et al. demonstrates that RGB color space has a propensity to mix luminance and chrominance data, has a strong correlation between channels, and exhibits significant perceptual non-uniformity [29]. RGB is less favorable because of these factors.

5.3.2 Luminance-Chrominance of YCbCr:

The various human races are well represented in this color space. The luminance (Y) and chrominance (C) values are to blame. Separation of luminance and chrominance is required.

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The chrominance component is required for the execution of this algorithm. By selecting the Cb-Cr plane from the YCbCr color space, it will minimize the luminance. The skin tone of a pixel is established when the values [Cr, Cb] fall within the thresholds.

5.3.3 HSI (Hue-Saturation-Intensity):

Based on the studies done by Zaritet al. HIS deems to be yield the best performance for skin colour approach [28]. According to Kjeldson and Kender [30], a skin region can be separated from the background by using a colour predicate in HSV colour space. Skin colour classification in HSI colour space is similar to YCbCrcolor space but the responsible values are hue (H) and saturation (S).Unfortunately, all of these algorithms fail when there are regions other than face such as arms, legs and other objects in background that have the same colour value. In wavelet-based algorithm, each face image is described by a subset of band filtered images containing wavelet coefficients [31]. Wavelet transform offers a likelihood of providing a robust multi scale way analysis of an image. Wavelets are also very flexible, whereby several bases exist and the most suitable basis can be chosen for an application. The most widely used wavelet method is the Gabor wavelet method especially in image texture analysis [32][33].

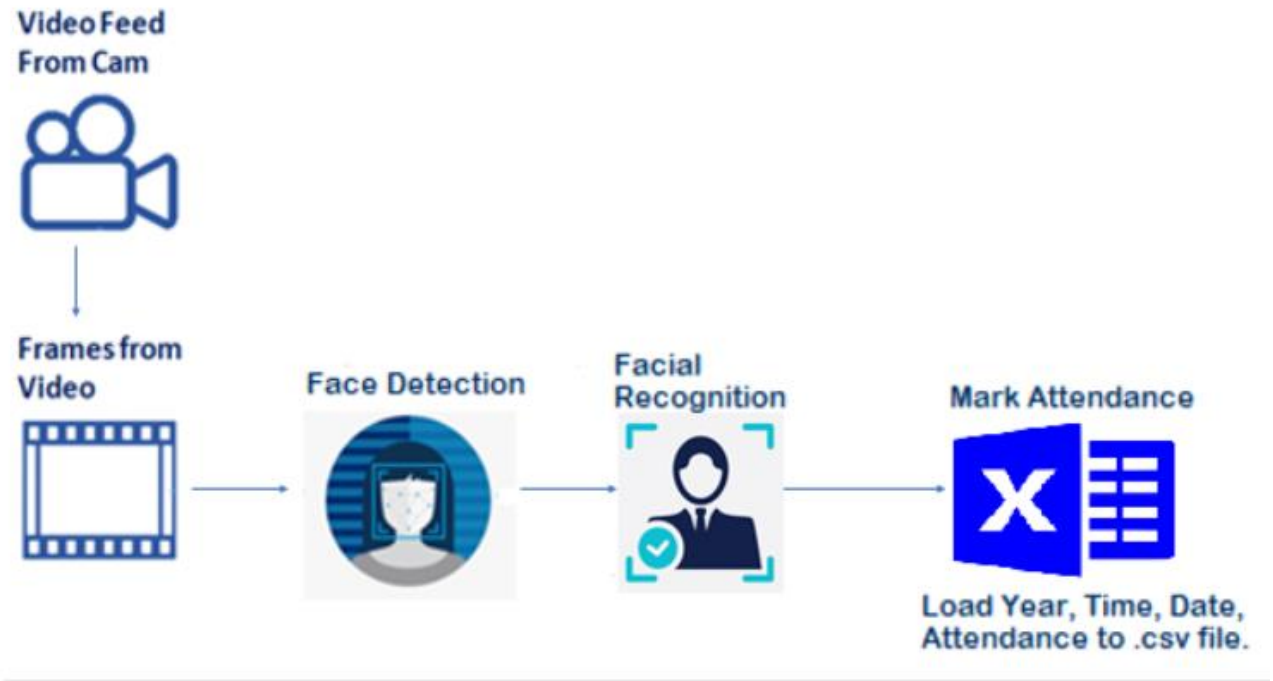

Fig.3 Proposed Method

4. Conclusion

Smart attendance management system is designed to solve the issues of existing manual systems. We have used face recognition concept to mark the attendance of student and make the system better. The system performs satisfactory in different poses and variations. In future this system needs, be improved because this system sometimes falls to recognize students from some distance: also, we have some processing limitation: working with a system of high processing may result even better performance of this system.

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