Passenger Evaluation System In College Bus Using Machine Learning

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ABSTRACT

The majority of university students commute between locations using the bus that the administration of the university provides. In order to improve the quality of bus services, analysis is needed to determine factors like the number of passengers and personal information about students or unknown individuals. This research study aims to construct a face recognition system based on student faces using convolution neural networks and the opencv environment. Additionally, it tests and validates the built system's performance for face categorization and passenger evaluation. Additionally, this system can use the Internet of Things to store passenger information in a MySQL database. This system uses the camera on a mobile phone with the assistance of the Droid Cam application, which supports libraries used for face recognition and classification, like OpenCV and face recognition, which is enhanced by the Convolution neural network model. In order to record the data in the database, this project can recognize the faces of the passengers as soon as they board the bus and identify whether they are students or unidentified individuals.

Keyword: - *YC_BC_R Model, Convolution Neural Network, Decision Tree, Face Recognition, Passenger evaluation*.

1. INTRODUCTION

1.1 Introduction:

Attendance is a necessary parameter which is required is most of schools and colleges. On an average this attendance is carried out to have accurate count of people or students seating in a particular classroom or any practice area. Traditional method of taking this attendance carried out by humans where the lecturer or teacher manually counts each and every student with their required data like candidate's name, serial number, status etc. This process is very much time consuming and maintenance of collected data is difficult. Thus we can digitized the process of taking attendance and make it simple and accurate. Our project will digitize the process of attendance collection by using image processing technique and will automatically update real time data of faculty's data base via IOT. Since this project is software based we have few hardware components. Initially we use a stationary camera which is situated above classrooms entrance so that we can scan each and every student's face without any interruption.

Over the past few years, extensive research has been done on the field of face recognition which is one of the best ways to find the human identity. Face recognition from images is a popular research in biometrics. One of the most useful applications of face recognition is understanding the image analysis. Because of some specific problems in the face recognition, which not only dragged computer vision researchers interest but, also psychologists, and neuro-scientists since advancing the field of face recognition can provide an idea to know the how the human brain is functioning. Though there are many biometric methods like finger analysis and retinal scan for human identification, they need human cooperation. Whereas, human identification from facial images do not need it. Hence, the method of face recognition plays

a crucial role in finding the human being identity as it does not require the human cooperation which is the unique advantage of face recognition from other biometrics methods.

Though there exist many systems to detect the faces and to recognize them from images. Many research works are going to find better factors that increase the efficiency and accuracy. In general, the factors like pose, occlusion, and illumination and so on are influencing the efficiency and needs high processing capacity for retrieving from the large image dataset. It may lead to focus on large image dataset and also on new algorithms which reduce the computational issues and to increase the accuracy. Efficient face recognition of human being from image dataset is an ultimate goal. In the field of biometric face recognition, research has been done to identify the individuals from a picture of the group of people based on facial features. There are many Applications for the face recognition and are widely used in security based applications and biometric systems. In general, face recognition system has three important blocks namely face detection, training of detected faces, and face recognition.

1.2 PROBLEM DEFINITION

To enhance the process of passenger evaluation system in college bus, proposed model is using Convolution neural network and Image Segmentation process.

2. LITERATURE SURVEY

[1] A facial recognition attendance system based on deep learning is presented by Khawla Alhanaee et al. By employing three convolutional neural networks that have already been trained and fed data, system are able to use transfer learning. The system performed exceptionally well in terms of high prediction accuracy and manageable training time when compared to alternative methods. SqueezeNet, GoogleNet, and AlexNet are the three networks that attained validation accuracy of 98.33%, 93.33%, and 100%, in that order. The suggested method could be used to door access and attendance systems at numerous establishments, including airports, universities, schools, and the public and commercial sectors. By looking at more pre-trained CNN models and adding more data from human facial images, this work can be furthered. Examining how to use these models for masked face human identification tasks is intriguing.

[2] According to Nico Surantha et al., Facial recognition systems, particularly those lacking liveness detection, are susceptible to face spoofing attacks, in which malevolent actors attempt to obtain access by posing as another person. Liveness detection is used in face recognition-based attendance systems to stop the taking of individual attendance from people who are not actually there. Because they may be easily moved to any suitable area as needed, portable devices are more practical and efficient for running attendance systems. Implementing liveness detection will be difficult since portable devices have limited processing power. The liveness detection technology used must be lightweight in order for the attendance system to continue operating on portable devices. The processing time of every face that is submitted to the system will be affected by the addition of a liveness detection step. Several CNN models that have already been trained were employed in this study's tests. Pre-trained models with training for both object and face recognition were employed.

[3] Serign Modou Bah et al. discuss preprocessing the input face images using advanced image processing techniques like Histogram Equalization, Bilateral Filter, and Contrast Adjustment to improve the image features. The training/template face images will also be subjected to these advanced techniques along with an image blending method to guarantee high-quality training/template face images. The input face image that has been preprocessed will be split up into k2 regions. Each pixel inside a region will have its LBP code determined by comparing its center to its surrounding pixel. Binary 1 is indicated when the surrounding pixel is greater than or equal to the center pixel; binary 0 is indicated otherwise. The aforementioned procedure will be iterated for every pixel in every other region in order to obtain the binary pattern required to build the input facial picture feature vector. A histogram with every conceivable label is created for each region. These created histograms, complete with all of their bins, show a pattern and the frequency of occurrence in the area. Concatenating the regional histograms into a single, unique big histogram is the next step in creating the feature vector, which is then used to compare the generated feature vector with the template face photos in order to identify faces.

[4] The implementation of two distinct algorithms for facial recognition is the main emphasis of C. Ranjeeth Kumar et al. The two approaches yielded the best outcomes after being successfully tested. Both techniques took the info out of the pictures and made amazing predictions with it. In the beginning, the models were trained on the faces

of 25 individuals. The performance of these methods may change accordingly when a wide variety of face photographs are used. Thus, the future focus of this research will be on using more diverse data for training and analyzing the behavior of these models.

[5] Ayyad Maafir and colleagues present a novel facial recognition model that has been suggested. utilizing the WTPCA-L1 norm as a technique for feature extraction, and using these features as the input for the suggested architecture of a deep neural network. Face detection and categorization are done using the suggested deep learning model. Rather than utilizing PCA or PCA-L1, system have employed the WTPCA-L1 technique to achieve a more accurate data representation in a low-dimensional environment. In order to increase face recognition performance, Author's strategy not only leverages the strong robustness of the L1-norm optimization method to outliers and disturbances, but also effectively combines CNN-LSTM networks. Numerous tests conducted on the ORL, GTFD, and FERET datasets demonstrate that, in terms of recognition accuracy in both noisy and noise-free environments, the suggested method outperforms a number of sophisticated face recognition algorithms.

[6] According to Ahmed Rimaz Faizabadi et al., retraining or fine-tuning of FR models causes unwelcome downtime for Face Recognition (FR) applications in the open world or adapted domain. Using lowcost O(1) threshold setting techniques, such as σ values, might not provide the best results. An FR application's security is likewise jeopardized by the use of such predefined threshold values. Thus, a dynamic ROI-based threshold adaptor algorithm was used in this paper to suggest an adjustable threshold. The optimal threshold's search space is reduced by the suggested strategy, which also speeds it up by 12 times over using traditional techniques. enabling the setting of thresholds in real-time.

[7] Perez Juan et al. employed neuro evolution with GAs to form three CNNs that are specialized in a specific face pose orientation range (small, medium, and large face rotations), emulating the concept of face patches observed in the brain. system evaluated author's suggested method's performance on multiple datasets (VGGFace2_FP, CPFLW, and CFP) whose use was documented in SOTA articles on FR with different poses. There are a lot of faces with a lot of pose variation in these datasets. New, specialized CNNs adjusted to three face orientation ranges were produced by the GAs. On the testing partition of the VGGFace2 dataset, the best individuals from each generation of the GAs were evaluated for FR accuracy.

[8] Modern human and face detectors are assessed by Peggy Joy Lu et al., who also publish the results of their work on an established multi-intensity IR illumination dataset that includes comprehensive annotations. In order to do this, a baseline method based on previously developed CNN detectors, a recently suggested tracker, and a straightforward fusion technique is presented in order to benefit from the complimentary effect amid varying levels of illumination. While this paper shows satisfactory detection and tracking results for some basic scenes, more work is currently being done to improve the system for more complex datasets, develop better fusion techniques, and find a systematic way to determine relevant parameters like batch size or learning rate for training a particular CNN model.

[9] Hwang Chih-Lyang et al. A novel design of SRCN is built for dynamic mapping of various machine learning problems, such as wireless speech command recognition and dynamic facial emotion identification. In order to obtain the matching feature vector of face emotion, static photos are used to train the CNN with fully connected and softmax layers from the beginning. Then, using the shared weight, SRCN-DFER is trained on 280 batches of dynamic face emotion photos using a stack of 10 LSTMs. It obtains an average 98% recognition rate for many people with position variation and slightly varying surroundings, which is akin to the few-shot approach.

[10] A real-time instructors' expression recognition network based on YOLOv5 and AMs was proposed by Hongmei Zhong et al. [9]. system examined the effects of various AMs on the CSP1_X module and CAs on various modules within the YOLOv5 Backbone architecture. The findings demonstrated that the network in which CA was added after each CBS module of the CSP1_X module (CSPA) obtained the greatest accuracy of 77.1% and mAP@0.5 of 83.4% on the RAFDB dataset, respectively, increasing by 3.5% and 1.6% in comparison to YOLOv5. The detection time, meanwhile, was 25 ms. The suggested model performed better than R-FCN, Faster-RCNN, ResNext-101, DETR, SwinTransformer, YOLOv3, and YOLOX, among other detecting techniques.

[11] Ismail Kayadibi and colleagues explain Applications for eye state identification are numerous and include computer vision syndrome, dry eyes, driver tiredness, and HMI systems. These conditions are linked to prolonged usage of digital screens. The ability to recognize an eye's status, whether it is sensitively on or off, can open up

countless technological possibilities in this field. This paper provided a DCNN-based eye state recognition approach using the ZJU and CEW datasets. After comparing the performances of pre-trained CNN architectures trained on the ZJU dataset in light of the findings, it was determined that AlexNet produced the best results.

3. SCOPE OF THE PROJECT

Scope of Passenger evaluation system in college bus machine learning is explained below

3.1 CREWS

CREWS is a CUPPS system (ensuring CUTE compatibility) for sharing airport resources in accordance with the requirements of IATA recommendation PSCRM-RP1797. It enables flexible sharing of resources for check-in and boarding (workstations and associated peripherals) between all airlines and handling agents present at the airport. Physical sharing of check-in desks and boarding gates. Workstations secured in the public zone. Multiple and simultaneous access platform to the applications of all airlines. Ideal solution for front-office and back-office positions. Reduced operating costs of check-in and boarding positions. An open and modular architecture

CREWS is a software platform that can integrate any Windows compatible application with an optimised certification process.

Reference: https://www.aeroexpo.online/prod/resa-airport-data-systems/product-172212-18199.html

3.2 Frontiers:

There is ample research on assistance systems for drivers in conventional and automated vehicles. In the past, those systems were developed to increase safety but also to increase driver comfort. Since many common risks have by now been mitigated through such systems, the research and development focus expanded to also include comfort-related assistance. However, the passenger has rarely been taken into account explicitly, although it has been shown that passenger discomfort is a relevant problem. Therefore, this work investigated the potential of passenger assistance systems to reduce such discomfort. Three different passenger assistant system prototypes were tested in a driving study on public highway with N = 19 participants. The systems provided information about parameters related to the performance of the driver and one additionally provided a communicative means of influence. For two passenger assistant systems, it could be shown that they significantly reduced passenger discomfort in at least a subset of the evaluated situations. The majority of participants rated one or multiple of the assistant systems as more comfortable than a ride without assistance. The system providing information about the attentiveness of the driver was most effective in reducing discomfort and was rated as the most helpful system. The results show that explicitly considering the situation of passengers in the design of assistance systems can positively impact their comfort. This can be achieved using information from common systems targeting driver assistance available to the passenger.

Reference:https://www.frontiersin.org/journals/psychology/articles/10.3389/fpsyg.2021.725808/full

3.3 Classplus blog

One of the most important and major tasks for teachers is to conduct an analysis of students' performance for which they need to keep a track of student's work and performance. As the digitization of education is happening, it has become easier for teachers to track their students' performance with the help of student tracking systems in the LMS. Using performance tracking software helps to track students' performance and helps the teacher understand what is better for the students and which strategies can be used to improve student's performance and help them grow and achieve their desired goals. As with the student tracking system, teachers and students can access the progress, it becomes easy for students and teachers to see if any of the work is pending, and how is the grading going and helps them to understand how their efforts will lead them to their larger goals. -tracking-system/?session=ondemand

Reference:https://classplusapp.com/growth/the-benefits-of-using-student-tracking-system/?session=ondemand

4. METHODOLOGY

The methodology for Passenger evaluation system in college bus using machine learning is developed under waterfall model architecture as shown in the below figure 1.

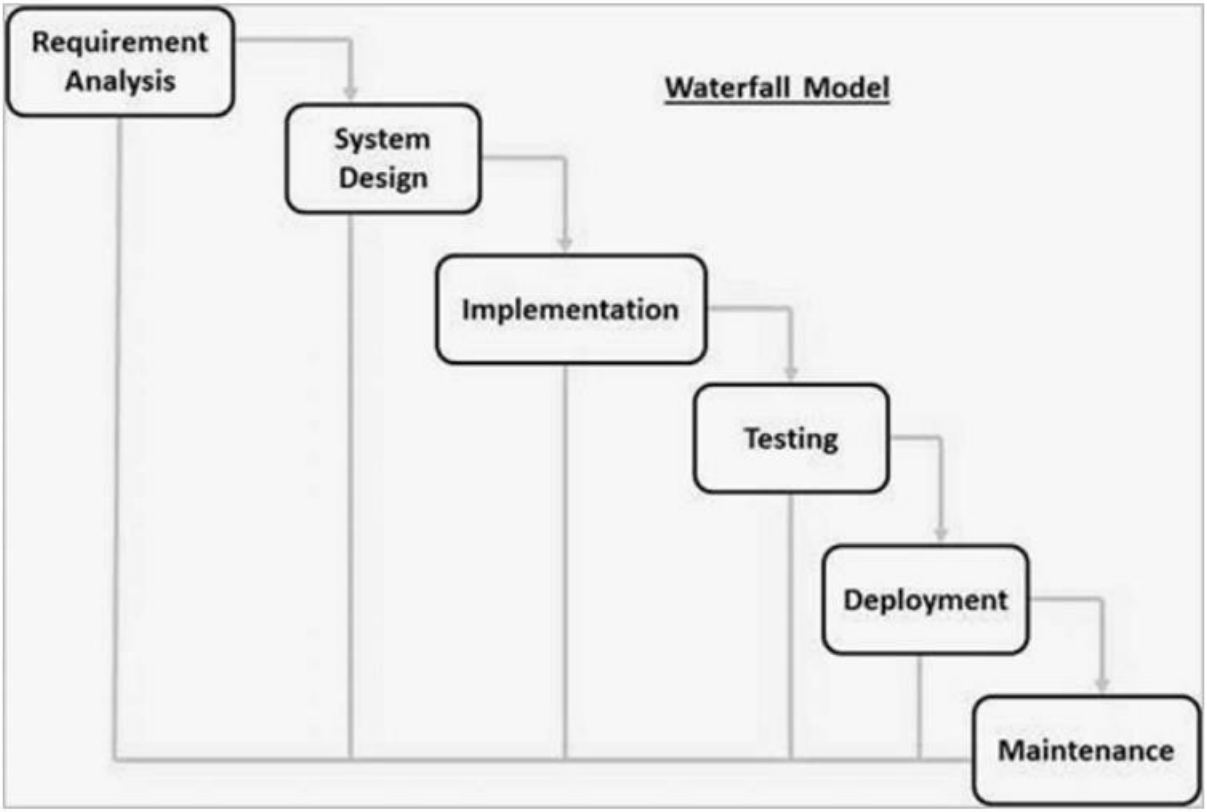

Fig 1 : Water fall model Architecture

The sequence phases in water fall model according to our project are mentioned below.

4.1 Requirement Analysis – Here requirement analysis are done based on following points

- ✓ Base paper for Passenger Evaluation System in college bus using machine learning

4.2 System Design: The System of passenger evaluation system in college bus using machine learning is designed by using the following hardware and software
Minimum Hardware Specification:

- CPU : Core i5
- RAM : 8 GB
- HDD : 500 GB

Software Specification:

- Coding Language : Java
- Development Kit : JDK
- Development IDE : Netbeans 8.2

4.3 Implementation:

Proposed system is designed by using the following modules

4.3.1 Module A: Camera, Live Capture

- Instant Frame Collection
- Frame Processing
- Frame normalization
- Extracted Frame

4.3.2 Module B: Preprocessing & Image Segmentation

- Image Resizing
- Image Segmentation
- Image Conversion
- Normalized and Preprocessed image output

4.3.3 Module C: Convolution Neural Network

- Input Layer Initialization
- Hidden Layer Evaluation
- Output Layer Estimation
- Trained Data

4.3.3 Module D: Decision Making

- Test Image Data
- Model initialization
- If-Then Rules
- Report Generation for Passenger Evaluation

4.5 Deployment of the system:

The developed software is deployed in the laptop of above mentioned configuration with the help of the mentioned software.

4.6 Maintenance of the system:

As this software is tested for the quick recovery, so maintenance of the system is not a challenging task. This is because the tools and the software used are open source, so there is no question of licensing the required software.

5. CONCLUSIONS

It can identify human faces in real-time, register passengers, and find bus services by using a webcam for real-time video detection and the Haar cascade classifier along with the Convolution neural network. It also verifies and checks the built-in system's performance in terms of passenger evaluation and face classification. Furthermore, this system has the ability to save passenger data in a MySQL database via the Internet of Things. With the help of the Droid Cam program, which includes face recognition and classification libraries like OpenCV and facere cognition, which is improved by the Convolution neural network model, this system makes use of a mobile phone's camera. This project can detect the faces of the passengers as soon as they board the bus and determine if they are students or unidentified individuals in order to enter the data in the database. The designed model yields a RMSE of 1.702, this is a good result for the first attempt of deployment of the model in real time face detection for passenger evaluation in college bus.

Future Work

The Proposed model can be deployed in real time cloud using the RDS services and raspberry pie model in the buses to evaluate the passenger in real time.

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