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Vehicle Vacant Seat Identification and Mask Detection using Image processing

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Abstract: ***This article describes the technique of real-time face detection, mask detection, and vacant seat available in the vehicle. There are so many technologies for finding seat availability in the vehicle. But image processing technology is very popular today. Face detection is part of image processing. It is used to find the face of a human being in a certain area. Face detection is used in many applications, such as facial recognition, people tracking or photography. In this paper, the face detection technique is used to detect the vacant seat availability in the vehicle and also to detect whether the passenger wear the mask on his face or not. The webcam is installed in the vehicle and connected with the Raspberry Pi 3 model B.***
When the vehicle leaves the station, the webcam will capture images of the passengers in the seating area. The webcam will be mounted on the vehicle. The images will be adjusted and enhanced to reduce noise made by the software application. The system obtains the maximum number of passengers in the vehicle that processes the images and then calculates the availability of seats in the vehicle. In covid-19 situation mask detection is necessary. so this system also used to detect the mask on face.
Keywords: Python OpenCV, webcam, Raspberry pi 3, USB connecting wires, face detection etc.

I. INTRODUCTION

Most face detection algorithm are designed in the software domain and high detection rate, but they often require several seconds to detect faces in a single image, a processing speed that is insufficient for real time application. A simple and easy hardware implementation of face detection system using Raspberry Pi, which itself is a minicomputer of a credit card size and is of a very low price.

In this section, here we are using Raspberry Pi board as our platform. Camera Pi is an excellent add-on for Raspberry Pi, to take pictures with the possibility to apply a considerable range of configurations and effects.

Both real time face detection and face detection from specific images, i.e. Object Recognition, is carried out and the proposed system is tested across various standard face databases, with and without noise and blurring effects. Efficiency of the system is analysed by calculating the Face detection rate for each of the database. The results reveal that the proposed system can be used for face detection even from poor quality images and shows excellent performance efficiency. Given an arbitrary image, the purpose of a face detection system is to determine if that image contains any faces.

Nowadays, most people use public vehicle instead of personal car due to the rising of gasoline prices and traffic jams. Public company has been developing the system for displaying the position of the passenger vehicle for convenience of customers. If customers know both of the position of the passenger vehicle and vacancy of seats, customers can use the time to other activities before the passenger vehicle arrives.

In this paper, the seat vacancy identification system is designed by using image processing technique. Webcam is connected with Raspberry Pi 3 in the vehicle for detecting the object on vehicle and sending the data to the server via 3G communication. This system used Open Source Computer Vision (Open CV) to analyse and process the data then calculated the vacancy of the vehicle by using the maximum face detection data.

Human face contains a variety of information for adaptive social interactions amongst people. In fact individuals are able to process a face in a variety of ways to categorize it by its identity, along with a number of other demographic characteristics, such as gender, ethnicity and age.

The advantages of this system are real time face detection and tracking is possible. The raspberry Pi system. The analysis revealed that the present system shows excellent performance efficiency and can be used for face detection even from poor quality images.

Coronavirus disease 2019 (COVID-19) is an emerging respiratory infectious disease caused by Severe Acute Respiratory Syndrome coronavirus 2 (SARS-CoV2).

As increase in covid-19 cases proper mask detection is must. This system is used to check mask is properly wear or not. With the help of that system device recognise that how many people are present their with mask.

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II. REVIEW AND RELATED WORK

"Real-Time Integrated CCTV Using Face and Pedestrian Detection Image Processing Algorithm for Automatic Traffic Light Transitions", this research studies the traffic light for pedestrian that wants to cross the street. If the pedestrian crossed the street they press the button and wait for traffic light. This system used CCTV instead the button and use image processing for detecting the face of pedestrian. If CCTV detects the face of pedestrian, the system will set the red light to show for 45 second. On the other hand if CCTV does not detect the face, the red light will show for only 30 second. [1] "Analysing Impact of Image Scaling Algorithms on Viola – Jones Face Detection Framework", this research studies the Viola – Jones algorithm about the problem from low quality of the image and find the optimize solution from Viola – Jones algorithm. The system uses two methods to scaled image that are window scaling and image scaling. The image scaling has 5 techniques that is Nearest Neighbour, Bi-Linear, Bi-Cubic, Extended Linear, and Piece-Wise Extended Linear. The system uses 5 difference face Database for comparing the performance of 5 different image scaling techniques. The system was developed by using C++, Visual studio 2010, and Open Source Computer Vision (OpenCV).[2]

Haar-like features are a popular technique for detecting the face of human in the present. They are a method that has fast processing and high accuracy. The method is proposed by Paul Viola and Michael Jones in 2001. Algorithms of Haar-like features are separating the image from input image to the sub window and scanning for detecting the face. They use integral image technique for finding the summation of the pixel inside the image, and then use the detector that can change the size and the position for finding the difference of white and black areas. When finish from integral image process, the next step is calling Adaptive Boosting or Ada boost. [4]

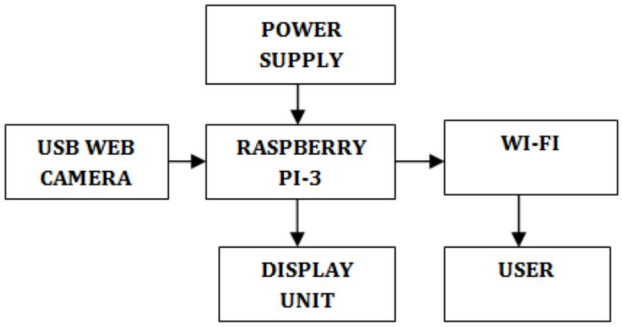

Fig. (1) Block Diagram of vacant seat detection system [9]

"Analysing Impact of Image Scaling Algorithms on Viola Jones Face detection Frame work", this research studies the Viola – Jones algorithm about the problem from low quality of the image and find the optimize solution from Viola – Jones algorithm. "Face Detection Using Combination of Skin Colour Pixel Detection and Viola-Jones Face Detector", this research studies the detection of the human skin. It uses a combination of two techniques that are a novel hybrid colour models and Viola Jones algorithms. Its purpose is to identify the object is human or not as shown in fig. (1)[3]

Rapid Object Detection using a Boosted Cascade of Simple Features this paper describes a machine learning approach for visual object detection which is capable of processing images extremely rapidly and achieving high detection rates. "Implementation of Attendance Management System using Smart Attendance using Real Time Face Recognition" this research studies Attendance Management System (AMS) is the easiest way to keep track of attendance for community organizations such as school clubs, scouting units, church groups, business organizations and volunteer groups. [12]

A. Proposed Work

The captured video is serialized, and then a frame by frame analysis of the video is done. The face detection and head shoulder detection algorithms are used to detect human presence in a seat. Image overlaying methodology is then used to classify the seats. If a human presence is detected, then the vacant seat count is not disturbed otherwise the count is incremented accordingly as shown in fig. (2).

This paper proposes the Ada boost algorithm to detect the human faces automatically and helps in effective facial feature detection. Ada boost is sensitive to noisy data and outliers. The challenges mainly lie in efficient hardware architecture design, since most published vision algorithms do not take into consideration hardware characteristics and parallel processing. Thereby, Ada boost is commonly used in conjunction with other tracking algorithms to improve their performance. Cam shift is based on the color, as

because the RGB is sensitive to light intensity changes, in order to reduce the effect of intensity of light changes, Cam shift converse the color space of the image from RGB to HSV. Cam shift can be divided into three parts reverse projection calculation, Mean shift, Cam shift implementation. The Cam shift algorithm is capable of real-time tracking of objects, not affected by noise, has good robustness and real-time performance is also good. But there are some weaknesses: Trace window must be manually selected, if the face is not appropriate, it will directly affect the results obtained, and may even lead to failures. Therefore, the combination of Ada boost face detection algorithm with the Cam shift is used to automatically detect the human faces in the video sequence, and then according to the probability distribution of color, effective human detection is achieved with Cam shift technique.

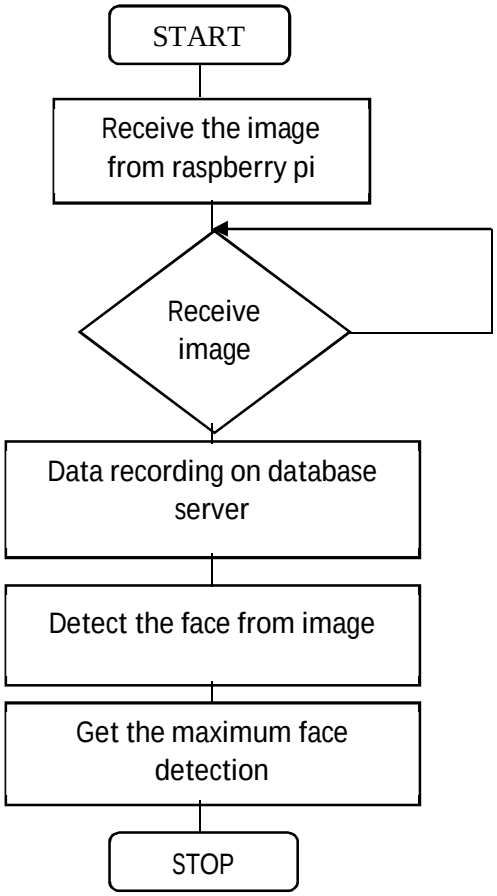

Fig. (2) Algorithm for the face detection

B. Adaptive head Shoulder Tracking Algorithm

In order to track the trajectory of the head, this paper presents Ada boost to detect the human faces first and then uses Cam shift technique for the human tracking. Combination of these two techniques ensures accuracy, speed and can effectively overcome the occlusion as well as interference of skin color.

Initially, the video is captured and serial to obtain individual frames. Then, detect the human faces, from the first frame, Ada boost may take the results as: (i) Detect multiple faces; (ii) detect the fault target (non-face).

C. Detection of the Human Presence

Ada boost is used to detect the target area through the three fitting functions to model the human body. First obtain the minimum vertical rectangle of the body and extract the human body from the rectangular area, we define the height of the rectangle as h; we use the horizontal line h to capture the body contour from the highest point of the body. As there are a group of people sitting in the hall, we adopt the approach which is based on the contour feature to locate the human head, since the human head is shown as an oval contour. There exists a certain ratio between the human head and shoulder in physical.

D. Detection of Mask on Human Face

The rapid worldwide spread of Coronavirus Disease 2019 (COVID-19) has resulted in a global pandemic. Correct facemask wearing is valuable for infectious disease control, but the effectiveness of facemasks has been diminished, mostly due to improper wearing. However, there have not been any published reports on the automatic identification of facemask-wearing conditions. In this study, we develop a new facemask-wearing condition identification method by combining image super-resolution and classification networks (SRC Net), which quantifies a three-category classification problem based on unconstrained 2D facial images. The proposed algorithm contains four main steps: Image pre-processing, facial detection and cropping, image super-resolution, and facemask-wearing condition identification. Our method was trained and evaluated on the public dataset Medical Masks Dataset containing 3835 images with 671 images of no facemask-wearing, 134 images of incorrect facemask-wearing, and 3030 images of correct facemask-wearing.

III. CONCLUSION

From the available literature it is concluded that this image processing technique is capable of identifying vacant seat and also for detection of mask on the face of the passangers. With the advancement the real time face detection in remote monitoring is help for building much efficient application. Real-time information on reservations and seat occupancy, Various sensor and display technologies tailored to individual requirements, Fully modular and scalable solutions, Integration in existing Ethernet infrastructure, Integration of data from third party systems etc. Further enhancement of this work can be extended with stereo depth analysis of face detection using two image sensor interfaced with High speed Processor. The future scope of this is to improve the database of public where the large public database is available.

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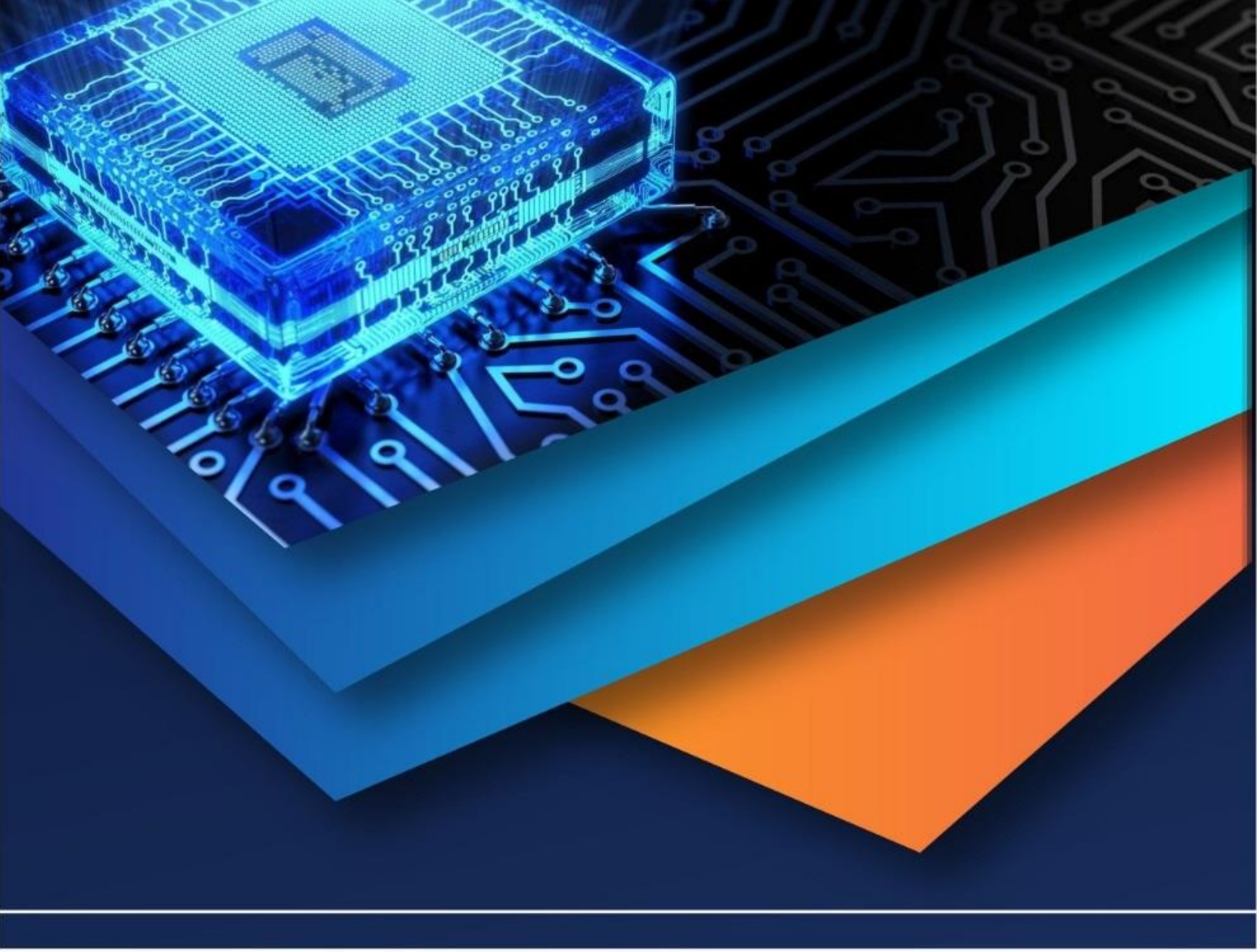

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