

Vehicle Seat Vacancy Identification Using Image Processing Technique

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Abstract - This paper describes the technique for real time human face detection and counting the number of passengers in vehicle and also gender of the passengers.

Image processing technology is very popular at present. It can be applied to various applications for detecting and processing the digital images. Face detection is a part of image processing. It is used for finding the face of human in a given area. Face detection is used in many applications such as face recognition, people tracking, or photography. In this research, face detection technique is used for detecting and counting the number of passengers in vehicle via webcam. The webcam is installed in vehicle and connected with Raspberry Pi 3 model B.

When vehicle leaves from the station, webcam will capture passenger images in the seating area. The images will be adjusted and improved to reduce the noise which is done by software application. The images are sent to the server via 3G communication. Then, the server process the images by using face detection technology and counting the number of passengers in vehicle. The system obtains the maximum number of passengers in vehicle that process through the images then calculates the seat vacancy of the vehicle.

Recognizing human gender is important since people respond differently according to gender. In addition, A effective gender classification procedure can improve the performance of many different applications, including person recognition and smart human-computer interfaces.

Key Words: Face detection, Raspberry Pi, Morphological image processing, Contrast limited adaptive histogram equalization.

1. 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 analyzed 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. Customers can plan their travel better

In this research, 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 use Open Source Computer Vision (Open CV) to analyze 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. Infact 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. In particular, recognizing human gender is important since people respond differently according to gender. In addition, a successful gender classification approach can boost the performance of many other application, Including person recognition and smart human computer interfaces. Hence, we propose a multimodal recognition approach that integrates the temporal and spatial information of the face through a probabilistic framework.

The advantages of this system is real time face detection and tracking is possible. The raspberry Pi processor which we are using is of low cost, execution speed is very fast More than one face also detected using this system .The analysis revealed that the present system shows excellent

performance efficiency and can be used for face detection even from poor quality images.

2. LITERATURE REVIEW

[1] “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 cross the street they press the button and wait for traffic light. This system use CCTV instead the button and use image processing for detecting the face of pedestrian.

[2] “Analyzing 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.

[3] “Face Detection Using Combination Of Skin Color 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 color models and Viola Jones algorithms. Its purpose is to identify the object is human or not.

[4] 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.

[5] “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.

[6] Vehicle Control Using Raspberrypi and Image Processing in this research studies to implement the available technique to detect the stop board and red traffic signal for an autonomous car that takes action according to traffic signal with the help of raspberrypi3 board.

[7] “Appearance based gender classification with Gaussian processes”,Gaussian process classifiers (GPCs) which are Bayesian kernel classifiers. The main advantage of GPCs over SVMs is that they determine the hyper parameters of the kernel based on Bayesian model selection criterion. The experimental results show that our methods outperformed SVMs with cross-validation in most of data sets. Moreover, the kernel hyperparameters found by GPCs using Bayesian methods can be used to improve SVM performance.

[8] Methodology for face recognition based on information theory approach of coding and decoding the face image is discussed in [Sarala A. Dabhade & Mrunal S. Bewoor, 2012] Proposed methodology is connection of two stages – Face

detection using Haar Based Cascade classifier and recognition using Principle Component analysis. Various face detection and recognition methods have been evaluated [Faizan Ahmad et al., 2013]

[9] “Raspberry Pi Based Security System for Automotive Theft Detection” in this research The proposed system is a face recognition based security system with face recognition module loaded in Raspberry Pi.

[10] “Enhancement Of Images Using Morphological Transformations”, this paper deals with enhancement of images with poor contrast and detection of background. proposes a frame work which is used to detect the background in images characterized by poor contrast.

3. PROPOSED WORK

A general block diagram of the system is as shown below :

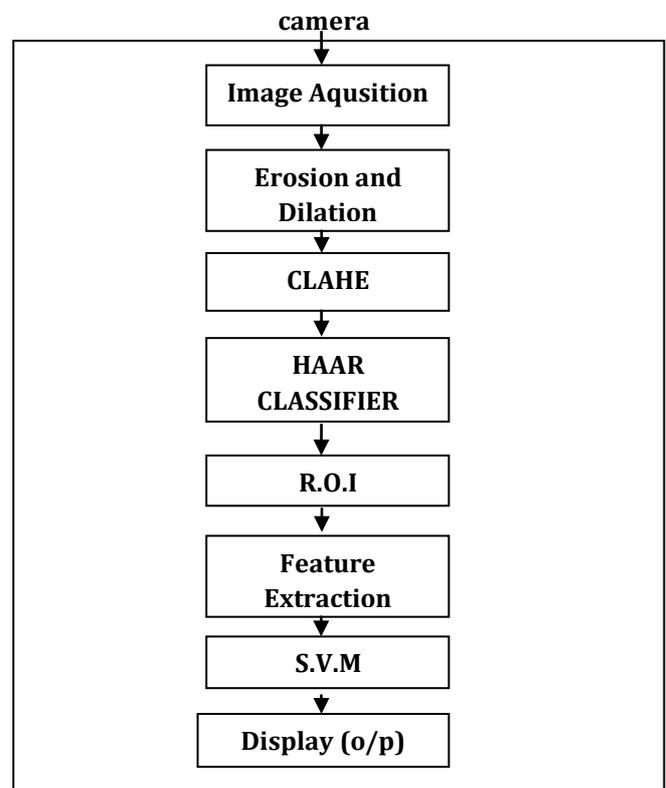


Fig 1: Block Diagram of Proposed System

Working:

The devices that include webcam, Raspberry Pi 3 model B, and 3G module are installed in vehicle at the top-front of the vehicle. When the vehicle leaves from the station, the system will capture the image in the passenger seat area (1 image per 1 second) and send to the user by using 3G communication. The server processes the images that receive from Raspberry Pi in electric vehicle by using Open Source Computer Vision (Open CV). Hardware installed and worked on the vehicle. The program has processes to reduce

the image noise. It uses method from Open Source Computer Vision (Open CV).

Morphological process is the process for changing shape or structure of the image. The process use matrix data that comprise the binary values 0 and 1 for calculation. It is called structuring element. Morphological process has 2 methods that are dilation and erosion. Dilation is a technique for adding the edge pixel of object. Erosion is a technique that is different from dilation technique. It reduces the edge pixel of object by using structuring element.

Contrast limited adaptive histogram equalization or CLAHE is the process for increasing the image quality. This process is developed from adaptive histogram equalization. This method considers the data of histogram equalization in each of pixel of gray scale format. In the first step, this method finds average histogram value of the image. The method uses the histogram value that has higher than the average value to share to all pixels inside the image for equal histogram. the system will use Haar-like feature algorithm for finding the passengers faces. The system will detect only the face .

Now face detection and feature extraction algorithm will work i.e. viola Jones algorithm which uses Haar feature based cascade classifiers algorithm for face detection. As long as a face is detected, a red bounding box is drawn on the face in the image. Local binary pattern method which is most successful for face recognition is used for feature gender detect estimation. After that extracted features which is pre-trained model will find out whether the features extraction of an image in testing set is matching to the feature extracted from the training set and gives the estimated according to that Histogram of oriented gradients (HOG) algorithm is used for gender estimation. HOG algorithm is used for feature extraction for face textures purpose.

Now SVM (support vector machine) will find out whether the feature extraction of an image in testing set is matching to the feature extracted from the training set. Finally output will be displayed on screen.

Proposed system uses different techniques for face detection, gender estimation, age estimation namely Viola Jones Algorithm The basic principal of algorithm is to detect the faces from the given input image. Before this there were so many images processing approach but all of them were time consuming due to making the entire image to the fix size and then run the image in the detector. Opposite of this is the viola Jones algorithm were the detector is rescale and whatever the size of image would be. The characteristics of Viola-Jones algorithm which make it a good detection algorithm are very high detection rate (true-positive rate) & very low false-positive rate always.

LBP is one of the binary patterns which is used for feature extraction. In this the face image is firstly divided into small regions from which LBP features are extracted gives the output in histogram.

The histogram of oriented gradients (HOG) is a feature descriptor used in computer vision and image processing for object detection. The method counts occurrences of gradient orientation in localized portions of an image. It use for gender estimation procedure. The support vector machine will find out whether the feature extraction of an image in testing set is matching to the feature extracted from the training set. Finally output will be displayed on screen

3. CONCLUSIONS

This paper proposed a system for face detection and gender estimation technique. Also, some popular well-known face detection technique is described. Face detection techniques have been employed in different applications such as face recognition, facial feature extraction.

Webcam and Raspberry Pi were installed in electric vehicle. When the electric vehicle leave from the station, webcam captured the images and send to the server by using Raspberry Pi and 3Gcommunication. The images were sent completely. From experimental result (Table I), the number of images have a direct impact to the face detection result. If the number of images increases, the accuracy of face detection is increase as well. Because the system will has more chance to detect the passengers face from many images.

The noises in images occur from environment inside and outside the vehicle such as the light and face blur. The system improve quality of images by using contrast limited adaptive histogram equalization and morphological process.

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