

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. 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. 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 applications, 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 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.

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 raspberry pi3 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 processor which we are using is of low cost, execution speed is very fast More than one face also detected using this

Results show that our methods outperformed SVMs with cross-validation in most of data sets. Moreover, the kernel hyper parameters 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.

[11] Gender recognition system on a Gaussian Process Classifier (GPC). Facial images are first normalized to a standard dimensions and background and hair information was removed. Parameters for the GPC are learned using Expectation Maximization (EM) - Expectation Propagation (EP) algorithm. Finally GPC is used for classification. Zhiguang et al. [12] have focused on improving gender classification results by texture normalization. After scale normalization, affine fitting and Delaunay triangulation warping is employed to get a shape free texture. Lastly SVM, FLD and Adaboost are used for classification. Rowley and Baluja

3. System Architecture:

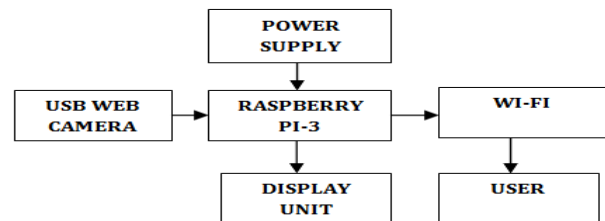


FIGURE- Basic Block Diagram

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

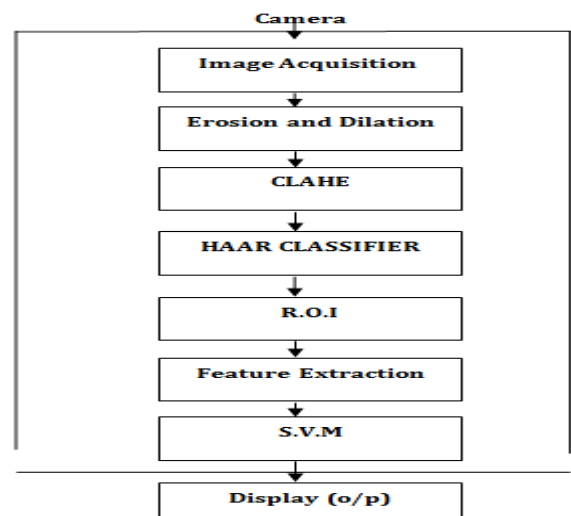


Figure: Block Diagram of Proposed System Working

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).

3.1. 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: Robust - very high detection rate (true-positive rate) & very low false-positive rate always.

[1]Real time - For practical applications at least 2 frames per second must be processed.

[2]Face detection only (not recognition) - The goal is to distinguish faces from non-faces (Detection is the first step in the recognition process).

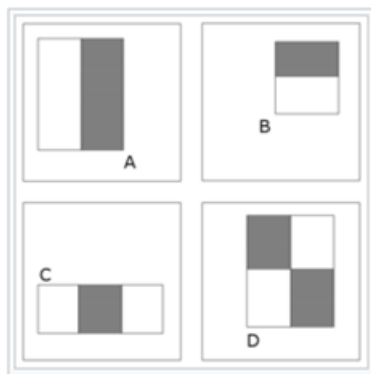


Fig.3. Feature Types used by Viola and Jones

3.2. Histogram of oriented gradients (HOG) Algorithm:

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. This method is similar to that of edge orientation histograms, scale-invariant feature transform descriptors, and shape contexts, but differs in that it is computed on a dense grid of uniformly spaced cells and uses overlapping local contrast normalization for better accuracy. It use for gender

estimation procedure. The HOG descriptor maintains a few key advantages over other descriptor methods.

3.3. Local binary patterns (LBP):

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. LBP is used because there are micro patterns which are invariant of monotonic grey scale transformation. Combining all this gives the face image. LBP is widely used in many applications due to its high tolerance against object recognition texture analysis and high discriminative power.

3.4. Support vector machines:

In machine learning, support vector machines (SVMs) are supervised learning models with associated learning algorithms that analyze data used for classification and regression analysis. In support vector machine is used to analyze the complex data and gives the result. SVM is very useful in finding patterns which are very useful and not complex. Classification of images can also be performed using SVMs. Experimental results show that SVMs achieve significantly higher search accuracy than traditional query refinement schemes after just three to four rounds of relevance feedback. This is also true of image segmentation systems, including those using a modified version SVM that uses the privileged approach as suggested by Vapnik.

3.5. Convolution Neural Network:

In machine learning, a convolution neural network (CNN) is a type of feed-forward artificial neural network in which the connectivity pattern between its neurons is inspired by the organization of the animal visual cortex. Individual cortical neurons respond to stimuli in a restricted region of space known as the receptive field. The receptive fields of different neurons partially overlap such that they tile the visual field. The response of an individual neuron to stimuli within its receptive field can be approximated mathematically by a convolution operation. Convolution networks were inspired by biological processes and are variations of multilayer perceptrons designed to use minimal amounts of preprocessing. They have wide applications in image and video recognition, recommender systems and natural language processing.

4. RESULT AND DISCUSSION

Python codes were developed for real time face detection, tracking and gender estimation. Photo view of project is the whole setup of project. For Real time face detection, webcam was connected to the Raspberry Pi Processor to capture the real time images of people in front of it. Output window was set to defined size and the output is displayed in it. The system is efficient to detect multiple faces and a blue box was drawn across each of the detected face. And there is red color text on it displaying the gender.



Figure: - Photo View of Project



Figure: Output of Project

5. CONCLUSIONS

This project proposed a system for face detection, tracking, 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. On the basis of this approx gender estimation will be done using the algorithms mentioned above.

Face detection and tracking is being challenging for many researchers with real time Image sensor. With the advancement the real time face detection in remote monitoring is help for building much efficient application. Moreover such technology can be useful in tracking the lost object under dynamic environment. 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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