



An Approach towards Face Counting System Using Image Processing Techniques

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Abstract

Face Counting System is becoming one of the most fascinating subjects in the pc imaginative and prescient literature. The survey is carried out to analyze the face focus methods and timeline view on distinct techniques to manage popular face cognizance problems. Image processing strategies focuses on two important tasks such as Improvement of pictorial records for human interpretation and processing of picture facts for storage, transmission and illustration for self reliant desktop perception. One of the frequent crucial techniques that facilitate natural human-computer interplay (HCI) is Face Counting System. In this paper, the survey is made based totally on a contrast of the current advances in Face Counting System the use of a number of photo processing methods such as Eigen faces, Hidden Markov Model(HMM), Geometric based totally algorithm and template matching algorithms. These methods enhance quality, eliminates noise, versatile in nature, and preserves authentic records precision of the image

Keywords: Face Counting System, human-computer interaction, photograph processing, Eigen faces, Hidden Markov Model (HMM), geometric based algorithm, template matching algorithm.

1. Introduction

With the speedy growth of computational powers and accessibility of contemporary intellect, evaluation and rendering tools and technologies, computer systems are turning into extra and greater intellectual. Face Counting System is the step stone to all facial evaluation algorithms, together with face alignment, face modeling, face relighting, face counting, face verification/authentication, head pose tracking, facial expression tracking/recognition, gender/age recognition, etc. Image processing strategies in face awareness are used to enhance uncooked snap shots obtained from cameras/sensors positioned on satellites, space probes and aircrafts or photos taken in regular day-to-day lifestyles for more than a few applications. Most of the picture processing strategies developed so a long way are ordinarily for enhancing photographs acquired from unmanned spacecrafts, area probes and army reconnaissance flights. Image Processing systems are becoming extra famous due to the effortless availability of powerful personnel computers, large size memory devices, photos software program etc. Given an arbitrary image, the aim of Face Counting System is to discover out whether or not or no longer there are any faces in the photo and, if present, return the picture location and scope of every face [2]. The obscurity related with Face Counting System can be attributed to many editions in scale, location, orientation (in-plane rotation), pose (out-of-plane rotation), facial expression, lighting fixtures conditions, and occlusions.

1. Review of Literature

The idea of using main factors to characterize human faces was developed by Sirovich and Kirby [4] (Sirovich and Kirby 1987) and used by means of Turk and Pentland [5] (Turk and Pentland 1991) for Face Counting System and recognition. Rectangular ratio is used to determine face region, mouth and eye map [6] is utilized for affirmation of face. Literature studies reveal that faces can be diagnosed in a limited surroundings with high accuracy [7, 8].

2. Overview of face counting techniques two

We talk about and compare the distinctive face focus methods such as Eigen faces (or Eigen features), Hidden Markov Model (HMM), geometric based and template matching algorithms. By evaluating their results, these algorithms are evaluated based on their performance.

Eigen Faces

Eigenfaces[3] are a set of eigenvectors used in the laptop vision trouble of human face recognition. Specifically, the Eigenfaces are the main aspects of a distribution of faces, or equivalently, the eigenvectors of the covariance matrix of the set of face images, where an image with $N \times N$ Pixels is regarded a point (or vector) in N^2 -dimensional space. Mathematically, it is surely discovering the fundamental components of the distribution of faces, or the eigenvectors of the covariance matrix of the set of face images, treating an photograph as a factor or a vector in a very excessive dimensional space. The eigenvectors are ordered, each one accounting for a exclusive amount of the variants amongst the face images. These eigenvectors can be imagined as a set of aspects that collectively signify the variation between face images. Each photo areas contribute extra or less to every eigenvector, so that we can show the eigenvector as a kind if “shadowy” face which we call an eigen face. Eigen face algorithm falls underneath two stages.

Eigen faces Initialization

Step 1: Acquire an preliminary set of face snap shots (the coaching set)

Step 2: Calculate the eigenfaces from the coaching set, retaining only the M photographs that correspond to the very best eigenvalues. These M pictures outline the face space. As fresh faces are experienced, the eigenfaces can be updated or recalculated

Step 3: Calculate the corresponding distribution in M -dimensional weight house for each recognized individual, with the aid of projecting their face pics onto the “face space.”

Eigen faces Recognition

Step 1: Calculate a set of weights primarily based on the enter photograph and the M eigenfaces with the aid of projecting the input photograph onto each of the eigenfaces.

Step 2: Determine if the photograph is a face at all by using checking to see if the photograph is sufficiently close to “face space.”

Step 3: If it is a face, classify the weight pattern as either a acknowledged person or as unknown.

Step 4: Modernize the eigenfaces and/or weight patterns. (Optional)

Hidden Markov Model (HMM)

In HMM-based face consciousness system[3], in which a scanning approach is employed to simulate a human-like saccadic sequence, computed on the groundwork of the idea of saliency. The method converts a face photograph into an attention primarily based “scan path,” that is, a sequence composed of two kinds of information: Where information, the coordinates of the salient area in the face, and What information, neighborhood points detected in there. At the heart of the scanning mechanism is the calculation of saliency. This calculation should be affordable enough that it can be utilized to the entire image without considerably increasing time and house requirements, and it should be informative. With this approach, a low priced and parallel search for salient points will power a serial and special analysis. The essential advantage of the HMMs is that the models for every individual are build independently. So each time we desire to add a new character to the series we simply have to add a new mannequin without editing the different models.

Geometric based totally Algorithm

This is the historic way to understand people. Geometric features can be generated with the aid of segments, perimeters and areas of some figures formed via two the points. In this algorithm, facial photograph is in the beginning analyzed and reduced to small set of parameters describing prominent facial elements such as eyes, nose, mouth and cheekbone curvature. These facets are then matched to a database. The attributed set is studied to compare the recognition result. Distances in the feature space from a template picture to each and every image in the database had been calculated. Following to the FERET protocol, 5 nearest face photos have been derived and if there were snap shots of the query character then the end result was once considered positive. Each picture was examined as a question and in contrast with others. The approach was robust, however it primary problem is automated factor location. Some trouble arises if picture is of awful great or several points are blanketed by means of hair. The fundamental benefit of the usage of this algorithm is that the consciousness assignment is no

longer very expensive. But, the image processing required right here is very high-priced and parameter selection must be unambiguous to in shape an individual's face, which becomes a principal disadvantage.

Template Matching Algorithm

It is a statistical approach that distills an photograph into values and compares the values with templates to eliminate variances. It depends on the input photo in the presence of mild and the geometric region of different angles. The photometric transformation is applied on the source image, does now not take into account photometric changes, i.e. adjustments in the pixel. The main restriction in this strategy is that more than one registered pics of the same person is required. Since it acknowledges the new photograph by using checking that it is spanned in a linear subspace of the a couple of gallery images, it can't handle the new snap shots of a exceptional person which is now not blanketed in the gallery set.

3. Factors affecting Face counting

Though all these face consciousness strategies solves the face consciousness problem, there are some elements that affect or degrade the performance of face counting. The cause behind these factors is in actual life situation where the person's face is not usually impartial (expression full). The elements affecting face attention encompass expressions, occlusion, pose, illumination, facial ageing, and others.

Facial expression:

Facial expression poses a nonlinear structure in face consciousness tasks. By nature each and every character has expressions on his/her face used for non verbal communication. Facial expression reasons a trade in each transient and intransient facial facets which is a form of local and international aspects of the face. To solve this issue, movement based, mannequin based totally and muscle groups based totally algorithms are used with the aid of more than a few researchers.

Partial occlusion:

Partial occlusion is basically a hindrance in the view of an object. Concerning face attention structures human beings cheat the implemented security systems by means of deliberately covering their face with hand, sun shades or scarf etc. A graphical representation of above factors is handled. To clear up this issue, part based, characteristic based totally and fractals based methods are used by means of more than a few researchers.

Pose variation:

Another greater challenging case is varying head orientation of situation that varies from 90 degree to 45 or even 60-degree rotation. Feature extraction looks to be a more difficult undertaking in this issue. When the faces are in depth rotated, geometrical normalization becomes virtually impossible. To deal with this issue, appearance based totally approaches, geometric mannequin based totally algorithms, and multi view based algorithms are used by way of extraordinary authors.

Illumination conditions:

Illumination noticeably affects the performance of face focus systems. Varying lighting fixtures factors forged a shadow on the face images for this reason making the attention method a challenging case. Many procedures are used to resolve this difficulty recommended with the aid of exceptional researchers is not realistic in real life situations.

Facial aging:

Facial ageing purpose texture and shape changes which sooner or later impact the performance of face consciousness systems. Physically facial growing older creates wrinkles which can also have an effect on 3D mannequin of the face for face counting. A lucrative solution to all these troubles can be acquired through more than a few Image processing techniques mentioned right here under.

4. Brief note on Image Processing

Image processing methods in face consciousness can be used to decorate raw images. Steps in photo processing. The various degrees in picture processing includes

- Image scanning
- Storing
- Enhancing
- Interpretation

Methods of Image Processing

There are two methods of photograph processing.

- ❖ Analog Image Processing
- ❖ Digital Image Processing

Analog Image Processing

Analog Image Processing refers to the adjustment of picture through electrical means. The most popular instance is the television image. The TV signal is a voltage degree which varies in amplitude to signify brightness via the image. By electrically varying the signal, the displayed photo appearance can be altered. The brightness and contrast controls on a TV set serve to alter the amplitude and reference of the video signal, ensuing in the brightening, darkening and alteration of the brightness vary of the displayed image.

Digital Image Processing

In this method, digital computer systems are used to manner the image. The photograph will be converted to digital form the usage of a scanner – digitizer [6] and then method it. It is described as the subjecting numerical representations of objects to a collection of operations in order to gain a desired result. It begins with one picture and produces a modified version of the same. It is therefore a process that takes a photo into another.

Applications of Image Processing

Image processing software areas include remote sensing, scientific imaging, Non-destructive evaluation, forensic studies, textiles, fabric science, military, film industry, document processing, graphic arts, printing industry.

- Image Processing Techniques
- Image Acquisition
- Image enhancement
- Image restoration
- Morphological Processing
- Segmentation
- Object Recognition
- Representation & Description
- Image Compression
- Color Image Processing

Image Acquisition

Image Acquisition is the motion of retrieving a photograph from hardware primarily based source, so that it can be exceeded thru the strategies in future. In this step, an image that is received is definitely unprocessed and is the end result of the respective hardware that used to be used to generate it. Here, the enter operates inside managed and measured guidelines.

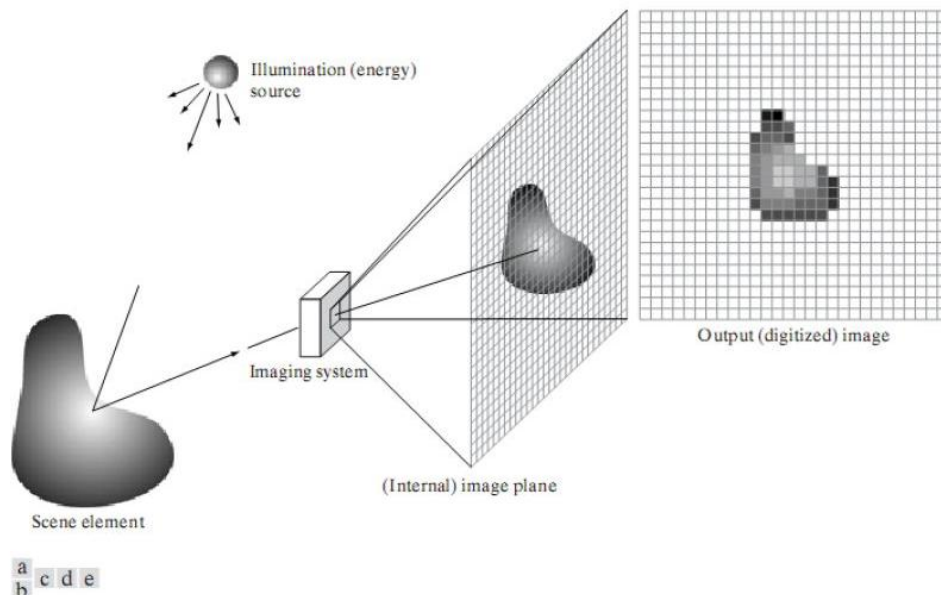


Image Enhancement

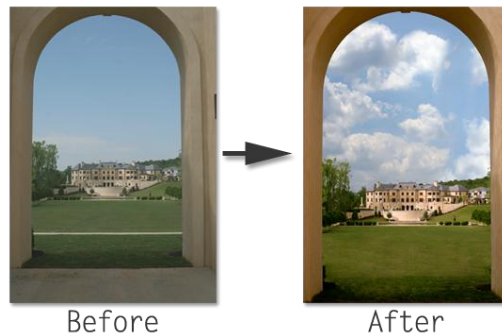
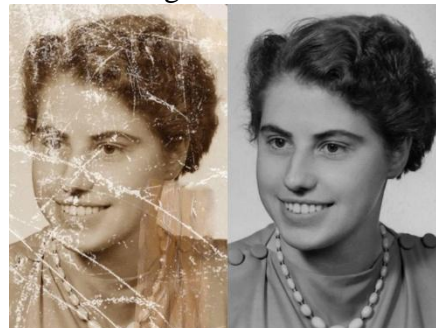


Image restoration



5. Conclusion

In this paper, we surveyed the a number face focus strategies and troubles confronted in actual lifestyles and how to overcome these issues that can be solved the usage of a variety of picture processing strategies and their advantages. To cope with problems such as facial ageing, pose, occlusion, etc. special strategies are used independently. In order to develop a high performing face counting system, integrated method appears to be a better choice.

6. Scope for future Enhancement

Face Counting System in definitely unconstrained settings stays a very challenging task, specially due to the significant pose and lighting variations. Enhancement in learning algorithms and points can be made in the function to bring out the great possible outcome.

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