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Accurate Personal Identification by Hand Gesture Recognition

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Abstract
Gesture recognition is a topic in computer science and language technology with the goal of interpreting human gestures via mathematical algorithms. Gestures can originate from any bodily motion or state but commonly originate from the face or hand. Current focuses in the field include emotion recognition from face and hand gesture recognition. In this paper, we present an automatic hand gesture recognition approach from different images based on scale invariant feature transform and shape based features. We present an approach for identifying and recognizing different hand sign expression of the human. The objective of the proposed system is to design an approach which automatically detects the hand and identifies the different hand sign expression of the human. The proposed approach presents a very low degree of complexity, which makes it suitable for real-time applications, the feature points or key points detected and mapped along with the hand sign image. Depending upon the selected features and the measured region properties of the human hand sign, the different sign expression of the human was further classified using SVM. The proposed method is superior compared with other state-of-the-art approaches and that the analysis of the general image quality of the hand sign images reveals highly valuable information

INTRODUCTION

HANDGESTURE-INTRODUCTION

Gesture is a form of non-verbal announcement using various body parts, mostly hand and face. Gesture is the oldest method of communication in human. Primitive men used to communicate the information of food prey for hunting, source of water, information about their enemy, request for help etc. within themselves through gestures. Still gestures are used widely for different applications on different domains. This includes human-robot interaction, sign language recognition, interactive games, vision-based augmented reality etc. Another major application of gestures is found in the aviation industry for placing the aircraft in the defined bay after landing, for making the passengers aware about the safety features by the airhostess. For communication by the people at a visible, but not audible distance (surveyors) and by the physically challenged people (mainly the deaf and dumb) gesture is the only method.

POSTURE

Posture is another term often confused with gesture. Posture refers to only a single image corresponding to a single command (such as stop), where as a sequence of postures is called gesture (such as move the screen to left or right). Sometimes they are also called static (posture) and dynamic gesture (gesture). Posture is simple and needs less computational power, but gesture (i.e. dynamic) is complex and suitable for real environments.

Though sometimes face and other body parts are used along with single hand or double hands, hand gesture is most popular for different applications. A few of them are discussed below. With the advancement of human civilization, the difficulty of interpersonal communication, not only in terms of language, but also in terms of communication between common people and hearing impaired people is gradually being abolished. If development of sign language is the first step, then development of hand recognition system using computer vision is the second step. Several works have been carried out worldwide using Artificial Intelligence for different sign languages.

PALM PRINT-FINGERPRINT COMPARISON

Palm print recognition inherently implements many of the same matching characteristics that have allowed fingerprint recognition to be one of the most well-known and best publicized biometrics. Both palm and finger biometrics are represented by the information presented in a friction ridge impression. This information combines ridge flow, ridge characteristics, and ridge structure of the raised portion of the epidermis. The data represented by these friction ridge impressions allows a determination that corresponding areas of friction ridge impressions either originated from the same source or could not have been made by the same source. Because fingerprints and palms have both uniqueness and permanence, they have been used for over a century as a trusted form of identification. However, palm recognition has been slower in becoming automated due to some restraints in computing capabilities and live-scan technologies. This paper provides a brief overview of the historical progress of and future implications for palm print biometric recognition.

HAND MODELING-GESTURE RECOGNITION

Human hand is an articulated object with 27 bones and 5 fingers. Each of these fingers consists of three joints. The four fingers (little, ring, middle and index) are aligned together and connected to the wrist bones in one tie and at a distance there is the thumb. Thumb always stands on the other side of the four fingers for any operation, like capturing, grasping, holding etc. Human hand joints can be classified as flexion, twist, directive or spherical depending up on the type of movement or possible rotation axes. In total human hand has approximately 27 degrees of freedom. As a result, a large number of gestures can be generated. Therefore, for proper recognition of the hand, it should be modeled in a manner understandable as an interface in Human Computer Interaction (HCI). There are two types of gestures, Temporal (dynamic) and Spatial (shape).

A. Related Work

1) Online palmprint identification authors: David zhanga, senior member, ieee, wai-kina kong, member, IEEE, jane you, member, IEEE, and michael wong

Biometrics-based personal identification is regarded as an effective method for automatically recognizing, with a high confidence, a person's identity. This paper presents a new biometric approach to online personal identification using palmprint technology. In contrast to the existing methods, our online palmprint identification system employs low resolution palmprint images to achieve effective personal identification. The system consists of two parts: a novel device for online palmprint image acquisition and an efficient algorithm for fast palm print recognition. A robust image coordinate system is defined to facilitate image alignment for feature extraction. In addition, a 2D Gabor phase encoding scheme is proposed for palm print feature extraction and representation. The experimental results demonstrate the feasibility of the proposed system.

Automatic palm print identification systems can be classified into two categories: online and offline. An online system captures palm print images using a palm print capture sensor that is directly connected to a computer for real-time processing. An offline palm print identification system usually processes previously captured palm print images, which are often obtained from inked palm prints that were digitized by a digital scanner. In the past few years, some researchers have worked on offline palm print images and have obtained useful results. Recently, several researchers have started to work on online palm print images that are captured by CCD (charge coupled device) cameras or digital scanners. In contrast to the existing online approaches, we develop an online palm print identification system for civil and commercial applications, that uses low-resolution images.

There are three key issues to be considered in developing an online palm print identification system:

1. Palm print Acquisition: How do we obtain a good quality palm print image in a short time interval, such as 1 second? What kind of device is suitable for data acquisition?
2. Palm print Feature Representation: Which types of palm print features are suitable for identification? How to represent different palm print features?
3. Palm print Identification: How do we search for a queried palm print in a given database and obtain a response within a limited time?

So far, several companies have developed special scanners to capture high-resolution palm print images. These devices can extract many detailed features, including minutiae points and singular points, for special applications. Although these platform scanners can meet the requirements of online systems, they are difficult to use in real-time applications because a few seconds are needed to scan a palm. To achieve online palm print identification in real-time, a special device is required for fast palm print sampling. Previously, our research team has successfully developed a CCD camera based on a special device for online palm print acquisition. A brief description of this special device is presented Palm print feature representation depends on image resolution. In high-resolution palm print images (> 400 dpi), many features that are similar to singular points and minutiae points in a fingerprint can be obtained; however, these features cannot be observed in low-resolution images (< 100 dpi). Nevertheless, we can extract principal lines and wrinkles from low-resolution images. In fact, line features play an important role in palm print identification Unfortunately, it is difficult to obtain a high recognition rate using only principal lines because of their similarity among different people. It is noted that texture representation for coarse-level palm print classification provides an effective approach. In this paper, we explore the use of texture to represent low-resolution palm print images for online personal identification.

2. Eigenfaces vs. fisherfaces: recognition using class specific linear projection authors: peter a n. belhmeur, jo~ao p. hespaanha, and david j. krieagman.

We develop a face recognition algorithm which is insensitive to large variation in lighting direction and facial expression. Taking a pattern classification approach, we consider each pixel in an image as a coordinate in a high-dimensional space. We take advantage of the observation that the images of a particular face, under varying illumination but fixed pose, lie in a 3D linear subspace of the high dimensional image space—if the face is a Lambertian surface without shadowing. However, since faces are not truly Lambertian surfaces and do indeed produce self-shadowing, images will deviate from this linear subspace. Rather than explicitly modeling this deviation, we linearly project the image into a subspace in a manner which discounts those regions of the face with large deviation. Our projection method is based on Fisher's Linear Discriminant and produces well separated classes in a low-dimensional subspace, even under severe variation in lighting and facial expressions. The Eigenface technique, another method based on linearly projecting the image space to a low dimensional subspace, has similar computational requirements. Yet, extensive experimental results demonstrate that the proposed "Fisherface" method has error rates that are lower than those of the

Eigenface technique for tests on the Harvard and Yale Face Databases.

METHODS

The problem can be simply stated: Given a set of face images labeled with the person's identity and an unlabeled set of face images from the same group of people , identify each person in the test images. In this section, we examine four pattern classification techniques for solving the face recognition problem, comparing methods that have become quite popular in the face recognition literature, namely correlation and Eigenface methods with alternative methods developed by the authors. We approach this problem within the pattern classification paradigm, considering each of the pixel values in a sample image as a coordinate in a highdimensional space

Correlation

Perhaps, the simplest classification scheme is a nearest neighbor classifier in the image space . Under this scheme, an image in the test set is recognized (classified) by assigning to it the label of the closest point in the learning set, where distances are measured in the image space. If all of the images are normalized to have zero mean and unit variance, then this procedure is equivalent to choosing the image in the learning set that best correlates with the test image. Because of the normalization process, the result is independent of light source intensity and the effects of a video camera's automatic gain control. This procedure, which subsequently is referred to as correlation, has several well-known disadvantages. First, if the images in the learning set and test set are gathered under varying lighting conditions, then the corresponding points in the image space may not be tightly clustered. So, in order for this method to work reliably under variations in lighting, we would need a learning set which densely sampled the continuum of possible lighting conditions. Second, correlation is computationally expensive. For recognition, we must correlate the image of the test face with each image in the learning set; in an effort to reduce the computation time, implementors [2of the algorithm described, and developed for special purpose VLSI hardware. Third, it requires large amounts of storage—the learning set must contain numerous images of each person.

Various hand-gesture identification methods, such as coding based methods and principle curve methods have been proposed in past decades.. For example, Eigenpalm and Fisher-palm are two well-known subspace based hand-gesture identification methods.

Most of the existing systems attempt to recognize the human prototypic emotions. In the past many years, there has been much research into recognizing emotion through facial expressions and hand sign expressions. However, challenges still remain.

B. Contribution

In this paper, we present an automatic hand-sign recognition system from different hand pose (image) of a single person. We present an approach for identifying and recognizing different hand sign expression of the human. The objective of the proposed system is to design an approach which automatically detects the hand and identifies the different hand-sign expression of the human. The proposed approach presents a very low degree of complexity, which makes it suitable for real-time applications. The feature points or key points detected and mapped along with the hand-sign image. Depending upon the selected features and the measured region properties of the hand sign, the different expression of the human was further classified using SVM. The proposed method is superior compared with other state-of-the-art approaches and that the analysis of the general image quality of the face images reveals highly valuable information. The different hand-sign expression images were classified based on the extracted features from shape based region properties. Finally the hand sign expressions can be classified into different directions: right, left, front, back and stop.

ARCHITECTURE

In thus section, we describe the Proposed Block Diagram

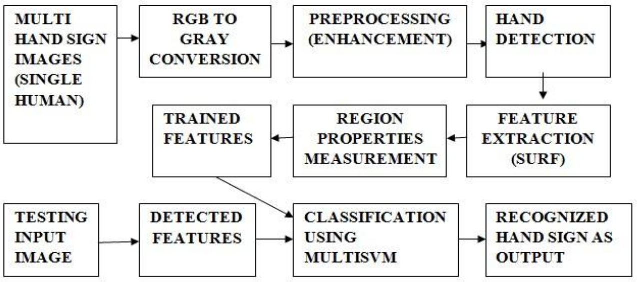

Fig.1. Architecture of Accurate personal identification by hand gesture recognition

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A. System Maintenance

Software maintenance is the last phase in the software Engineering process that eliminates errors in the working system during its work span and to tune the system to any variations in its working environment. The system requires maintenance as there may be changes and requirements in the organizational needs, government policies, hardware and software environment etc. often small system deficiencies are found as a system is brought into operation and changes are made to remove them. System requirements may be revised as a result of system usage or changing operational needs. Perhaps oversight that occurred during the development process needs to be corrected. Often the maintenance need arises to capture additional data for storage in a database or in transaction files or perhaps it may be necessary to add error detection features to prevent system users from in adversely taking an unwanted action.

Maintenance of the system after it is installed is hardware basis the system and there is a brief warranty period during which time the vendor is responsible for maintenance. This is the period of how many days the system and the project applications areperformed from the days from purchases. This is a typically a 90 day period after that time the purchaser has the option of acquiring maintenance from various sources. Maintenance source excepting vendor is also available from companies specializing in providing the service, called third party maintenance companies.

Implementation

A. Shape based feature extraction

Features are the crucial elements for hand gesture recognition. Large number of features, such as, shape, orientation, textures, contour, motion, distance, centre of gravity etc. can be used for hand gesture recognition. Hand gesture can be recognized using geometric features, like, hand contour, fingertips, finger detections. But these features may neither be always available nor reliable due to occlusions and illuminations. Some non-geometric features (such as colour, silhouette, texture) are also available for recognition. But they are inadequate for the purpose. Therefore, the image or the processed image can be fed to the recognizer to select the features automatically and implicitly, rather than using single type of feature alone.

Morphology erosion Morphological operations are mathematical operations designed in the context of set theory. Presently, this is used for noise reduction in image processing through two basic morphological operators, erosion and dilation. An erosion filter tends to reduce the sizes of bright image features by correlation with adjacent dark areas, where as the dilation filter does the opposite that means t constrains dark features with pixels from surrounding brighter areas. The opening of an image is defined as the erosion of the image followed by subsequent dilation using the same structural element.

B. Histogram Equalization (HE)

Histogram equalization is used to expand the pixel value distribution of an image so as to increase the perceptional information. The histogram after the histogram equalization occupies all the range from 0 to 255 and the visualization effect is enhanced.

C. Contrast limited adaptive histogram equalization (clahe)

Contrast limited adaptive histogram equalization (CLAHE) is a popular technique in biomedical image processing, since it is very effective in making the usually interesting salient parts more visible. The image is split into disjoint regions, and in each region local histogram equalization is applied. Then, the boundaries between the regions are eliminated with a bilinear interpolation.

The main objective of this method is to define a point transformation within a local fairly large window with the assumption that the intensity value within it is a stoical representation of local distribution of intensity value of the whole image. The local window is assumed to be unaffected by the gradual variation of intensity between the image centres and edges. The point transformation distribution is localised around the mean intensity of the window and it covers the entire intensity range of the image.

Consider a running sub image W of N X N pixels centred on a pixel P (i,j) , the image is filtered to produced another sub image P of (N X N) pixels according to the equation below

$$p_n = 255 . \left(\frac{[\emptyset_w(p) - \emptyset_w(Min)]}{[\emptyset_w\ (Max) - \emptyset_w\ (Min)]} \right)$$

Where

$$\emptyset_w(p) = \left[1 + exp \left(\frac{\mu_w - p}{\sigma_w} \right) \right]^{-1}$$

and *Max* and *Min* are the maximum and minimum intensity values in the whole image, while μ_w and σ_w indicate the local window mean and standard deviation which are defined as:

$$\mu_w = \frac{1}{N^2} \sum_{(i,j)\in(k,l)} p(i,j)$$

$$\sigma_w = \sqrt{\frac{1}{N^2} \sum_{(i,j)\in(k,l)} (p(i,j) - \mu_w)^2}$$

As a result of this adaptive histogram equalization, the dark area in the input image that was badly illuminated has become brighter in the output image while the side that was highly illuminated remains or reduces so that the whole illumination of the image is same.

D. Binarization: (conversion of grayscale to binary)

Binarization is a process where each pixel in an image is converted into one bit and you assign the value as '1' or '0' depending upon the mean value of all the pixel. If greater then mean value then its '1' otherwise its '0'.

Image binarization converts an image of up to 256 gray levels to a black and white image.

The simplest way to use image binarization is to choose a threshold value, and classify all pixels with values above this threshold as white, and all other pixels as black. The problem then is how to select the correct threshold. In many cases, finding one threshold compatible to the entire image is very difficult, and in many cases even impossible. Therefore, adaptive image binarization is needed where an optimal threshold is chosen for each image area.

E.Canny edge map for edge detection:

The Canny edge detector is an edge detection operator that uses a multi-stage algorithm to detect a wide range of edges in images.

Canny edge detector has a good localization property that it can mark the edges close to real edge locations in the detecting image. In addition, canny edge detector uses two adaptive thresholds and is more tolerant to different imaging artifacts such as shading.

The Canny Edge detection algorithm runs in 4 separate steps:

Smoothing:

Blurring of the image to remove noise.

Finding gradients:

The edges should be marked where the gradients of the image has large magnitudes.

Non-maximum suppression:

Only local maxima should be marked as edges.

Double thresholding:

Potential edges are determined by thresholding. Final edges are determined by suppressing all edges that are not connected to a very certain (strong) edge.

CONCLUSION

In this paper, we proposed an automatic hand-sign recognition system from different hand pose (image) of a single person. We present an approach for identifying and recognizing different hand sign expression of the human. The objective of the proposed system is to design an approach which automatically detects the hand and identifies the different hand-sign expression of the human. The proposed approach presents a very low degree of complexity, which makes it suitable for real-time applications such as assisting blind people for crossing roads and to make the electronic devices switch on.

REFERENCES

1. Malima, A., Ozgur, E. and Cetin, M. 2006. A Fast Algorithm for Vision-Based Hand Gesture Recognition for Robot Control. In Proc. of 14th IEEE Signal Processing and Communications Applications
2. Sachs, E. 1989. 3-Draw: a three dimensional computer aided design tool. In Proc. of IEEE International Conference on Systems, Man and Cybernetics
3. Hyunjin, A., Daijin, K. 2009. Hand Gesture Recognition using 3D Depth Data. Dept. of CSE. Pohang University of Science and Technology, Korea
4. LaViola Jr., J. J. 1999. A Survey of Hand Posture and Gesture Recognition Techniques and Technology. Masters' Thesis, Science and Technology Center for Computer Graphics and Scientific Visualization, USA.
5. Freeman, W. T., Weissman, C. D. (1995). Television Control by Hand Gestures. IEEE International Workshop on Automatic Face and Gesture Recognition
6. Bhuyan, M. K., Neog, D. R. and Kar, M. K. Fingertip Detection for Hand Pose Recognition. Int. J. On Computer Sc. and Engg. , 4(3) (March 2012), 501-511
7. Moeslund, T. B., Hilton, A. and Kruger, V. A Survey of Advances in Vision-Based Human Motion Capture and Analysis. Computer Vision and Image Understanding, 104(2) (2006), 90 - 126
8. Garg, P., Aggarwal, N. and Sofat, S. Vision Based Hand Gesture Recognition. World Academy of Science, Engineering and Technology, 49 (2009), 972- 977