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THREE DIMENSIONAL SECURITY SYSTEM IN GESTURE RECOGNITION

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Abstract: ***Gesture recognition enables humans to communicate with machine (HMI) & interact naturally without any mechanical devices. Using concept of gesture recognition, it is possible to point a finger at computer screen so that cursor will move accordingly. The main objective of research is to using 3d approach to compare Gesture detection & increase chances of accuracy. Gesture detection is widely used in personal identification & authentication for a precise & robust recognition. Gesture detection recognition has been reconnoitred over numerous years.***

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[1] Introduction

Gesture recognition is a topic in computer science & language technology with goal of interpreting human gestures via mathematical algorithms. Gestures could originate from any bodily motion or state but commonly originate from face or hand. Current focuses in field include emotion recognition from face & hand gesture recognition. Many approaches have been made using cameras & computer vision algorithms to interpret sign language. However, identification & recognition of posture, gait, proxemics, & human behaviours is also subject of gesture recognition techniques. Gesture recognition could be seen as a way for computers to begin to understand human body language, thus building a richer bridge between machines & humans than primitive text user interfaces or even GUIs (graphical user interfaces), which still limit majority of input to keyboard & mouse.

Gesture recognition could be conducted with techniques from computer vision & image processing.

The literature includes ongoing work in computer vision field on capturing gestures or more general human pose & movements by cameras connected to a computer

Gesture recognition & pen computing: Pen computing reduces hardware impact of a system & also increases range of physical world objects usable for control beyond traditional digital objects like keyboards & mice. Such implementations could enable a new range of hardware that does not require monitors. This idea may lead to creation of holographic display. The term gesture recognition has been used to refer more narrowly to non-text-input handwriting symbols, such as inking on a graphics tablet, multi-touch gestures, & mouse gesture recognition. This is computer interaction through drawing of symbols with a pointing device cursor.

1.1 Motivation for Current Research

During last years there has been an increasing use of automatic personal recognition systems. Palm print based biometric approaches have been intensively developed over last 12 years because they possess several advantages over other systems. Palm print images could be acquired with low resolution cameras & scanners & still have enough information to achieve good recognition rates. In this case, discriminant information relies in palm lines & texture. However, if high resolution images are captured, ridges & wrinkles could be detected, resulting in an image similar to fingerprints.

2. Literature Survey

In order to provide an accurate & efficient authentication system, there has been substantial research in area of palm print recognition system. For this, a number of relevant papers have been reviewed. Tee Connie et al' have proposed an automated palm print recognition system. In its proposed approach,

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they have used Principal Component Analysis (PCA), Fischer Discriminant Analysis (FDA) & Independent Component Analysis (ICA) for feature extraction from roi images.

Patprara Tunkpien used approach of compact extraction of principle lines from palm print images by using filtering operations consecutively . Here, image is first smoothed & then worked upon. For this, palm print images are passed through several filters. Palm print recognition with PCA & ICA have been presented by Tee Connie et al. K.Y. Rajput et al used Kekre Fast Codebook Generation algorithm for feature extraction. I Ketut Gede Darma Putr & Erdiawan have used two dimensional Gabor for development of a high performance palm print identification.

Sina Akbari Mistani et al proposed an approach which makes use of multispectral analysis of hybrid features to improve performance of palm print recognition system. David Zhang et al have proposed an online palm print identification system . This system was developed to make authentication possible in real time also. Hafiz Imtiaz et all have proposed a novel preprocessing technique for DCT domain palm print recognition in which task of feature extraction is carried out in local zones using 2 dimensional Discrete Cosine Transform (2D-DCT).

A survey of all palm print recognition systems has also been studied. An automated palm print recognition system evaluated results in terms of correct recognition rate & verification rate. Correct recognition rate is percentage of people that could be identified by system. Verification rate could be calculated by using False Acceptance Rate (FAR), False Rejection Rate (FRR), as well as Equal Error Rate (EER). FAR is percentage of accepted not genuine claims over total number of not genuine accesses. FRR is percentage of rejected genuine claims over total number of genuine accesses.

ERR is system threshold value when FAR is equal to FRR. For a biometric to work effectively, FAR & FRR must be as low as possible. Total Success Rate (TSR) is verification rate of system. Principal Component Analysis (PCA) is used for dimensionality reduction. It is useful as it decreases dimension of images & scales dimensions according to their importance.

It makes use of Eigen palms. Independent Component Analysis (ICA) has ability to deal with higher orders unlike PCA & FDA which could handle only up to second order. In ICA, palmprint images are considered as mixture of an unknown set of statistically independent source images. Gabor filters are widely applied to image processing, computer vision & pattern recognition. 2D Gabor filter is used for palm print feature extraction. It provides robustness against varying brightness & contrast of images.

3.Objective

The main objective of research is to using 3d approach to compare Gesture detection & increase chances of accuracy. Gesture detection is widely used in personal identification & authentication for a precise & robust recognition. Gesture detection recognition has been reconnoitered over numerous years.

During this instance of time, several different glitches related to Gesture detection recognition have been addressed. Furthermost of studies has been done in palm print recognition due to its stability, reliability & exclusivity. Furthermore it has been used for law enforcement, civil applications & access control applications.

Researchers have proposed a variety of Gesture detection preprocessing, feature extraction & matching approaches. This Work synopsis deliberates a novel & efficient method for Gesture detection identification based on Gabor wavelet by using local binary patterns. Proposed method is further supervised through multi-layer feed-forward neural network for more accurate & computationally efficient recognition.

Results will be in terms for false acceptance ratio, false rejection ratio, computational time & accuracy & will outperform available traditional approaches.

4. Methodology

The Gesture detection based systems to capture Gesture patterns. These systems are not widely accepted because of high attention & co-operation of users to provide data.

The ability to track a person's movements & determine what gestures they may be performing

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could be achieved through various tools. Although there is a large amount of research done in image/video based gesture recognition, there is some variation within tools & environments used between implementations.

1. **Wired gloves**. These could provide input to computer about position & rotation of hands using magnetic or inertial tracking devices. Furthermore, some gloves could detect finger bending with a high degree of accuracy (5-10 degrees), or even provide haptic feedback to user, which is a simulation of sense of touch. The first commercially available hand-tracking glove-type device was DataGlove,[10] a glove-type device which could detect hand position, movement & finger bending. This uses fiber optic cables running down back of hand. Light pulses are created & when fingers are bent, light leaks through small cracks & loss is registered, giving an approximation of hand pose.
2. **Depth-aware cameras**. Using specialized cameras such as structured light or time-of-flight cameras, one could generate a depth map of what is being seen through camera at a short range, & use this data to approximate a 3d representation of what is being seen. These could be effective for detection of hand gestures due to their short range capabilities.[11]
3. **Stereo cameras**. Using two cameras whose relations to one another are known, a 3d representation could be approximated by output of cameras. To get cameras' relations, one could use a positioning reference such as a lexian-stripe or infrared emitters. In combination with direct motion measurement (6D-Vision) gestures could directly be detected.
4. **Gesture-based controllers**. These controllers act as an extension of body so that when gestures are performed, some of their motion could be conveniently captured by software. Mouse gestures are one such example, where motion of mouse is correlated to a symbol being drawn by a person's hand, as is Wii Remote or Myo armband or mForce Wizard wristband, which could study changes in acceleration over time to represent gestures. Devices such as LG Electronics Magic Wand, Loop & Scoop use Hillcrest Labs' Freespace technology, which uses MEMS accelerometers, gyroscopes & other sensors to translate gestures into cursor movement. The software also compensates for human tremor & inadvertent movement.[16][17][18] AudioCubes are another example. The sensors of these smart light emitting cubes could be used to sense hands & fingers as well as other objects nearby, & could be used to process data. Most applications are in music & sound synthesis,[19] but could be applied to other fields.
5. **Single camera**. A standard 2D camera could be used for gesture recognition where resources/environment would not be convenient for other forms of image-based recognition. Earlier it was thought that single camera may not be as effective as stereo or depth aware cameras, but some companies are challenging this theory. Software-based gesture recognition technology using a standard 2D camera that could detect robust hand gestures.

5. Proposed Work

The objective of research is to implement three dimensional security system in gesture recognition system.

Gesture recognition technology using a standard 2D camera that could detect robust hand gestures could be used to capture multiple 2D captures & make multidimensional security system. It will increase accuracy but takes lot of time on rendered images. So we have extract only useful part of biometric object such as pattern of gestures in multidimensional form. Such system would be useful in banking security systems as well as criminal identification system.

Algorithm

Depending on type of input data, approach for interpreting a gesture could be done in different ways. However, most of techniques rely on key pointers represented in a 3D coordinate system. Based on relative motion of these, gesture could be detected with a high accuracy, depending on quality of input & algorithm's approach.
In order to interpret movements of body, one has to

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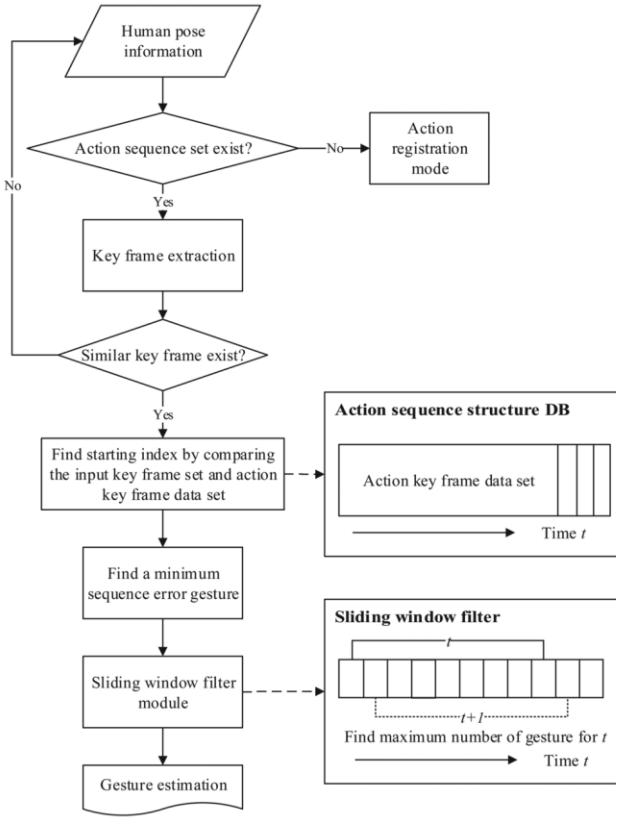
classify them according to common properties & message movements may express.

Flowchart



The 3D model approach could use volumetric or skeletal models, or even a combination of two. Volumetric approaches have been heavily used in computer animation industry & for computer vision purposes. The models are generally created from complicated 3D surfaces, like NURBS or polygon meshes.

The drawback of this method is that is very computational intensive, & systems for real time analysis are still to be developed. For moment, a more interesting approach would be to map simple primitive objects to person's most important body parts (for example cylinders for arms & neck, sphere for head) & analyse way these interact with each other. Furthermore, some abstract structures like super-quadrics & generalised cylinders may be even more suitable for approximating body parts. The exciting thing about this approach is that parameters for these objects are quite simple. In order to better model relation between these, we make use of constraints & hierarchies between our objects.

Skeltan based algorithm

Instead of using intensive processing of 3D models & dealing with a lot of parameters, one could just use a simplified version of joint angle parameters along with segment lengths. This is known as a skeletal representation of body, where a virtual skeleton of person is computed & parts of body are mapped to certain segments. The analysis here is done using position & orientation of these segments & relation between each one of them.

Advantages of using skeletal models:

1. Algorithms are faster because only key parameters are analyzed.
2. Pattern matching against a template database is possible
3. Using key points allows detection program to focus on significant parts of body

After capturing multiple biometric patterns they are stored in image base for comparison in future.

6. Tools & Technology

This Research Work is using MATLAB software environment for my proposed work in video steganography, MATLAB (matrix laboratory) is a numerical computing environment & fourth-generation programming language. Developed by Math Works, MATLAB allows matrix manipulations, plotting of functions & data, implementation of algorithms, creation of user interfaces, & interfacing with programs written in other languages, including C, C++, Java, & FORTRAN.

It integrates computation, visualization, & programming in an easy-to-use environment where problems & solutions are expressed in familiar mathematical notation. Typical uses include Math & computation Algorithm development Data acquisition Modeling, simulation, & prototyping Data analysis, exploration, & visualization Scientific & engineering

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graphics Application development, including graphical user interface building

MATLAB is an interactive system whose basic data element is an array that does not require dimensioning. This allows you to solve many technical computing problems, especially those with matrix & vector formulations, in a fraction of time it would take to write a program in a scalar non interactive language such as C or FORTRAN.

6.1 Features of MATLAB:

1. Advance algorithm for high performance numerical computations.
2. A large collection of predefined mathematical functions & their ability to define once own functions.
3. 2-D & 3-D graphics.
4. A complete online help system.
5. Powerful, matrix/vector oriented, high level programming language for individual applications.
6. Ability to cooperate with programs written in other languages.
7. Toolboxes available for solving advance problems e.g. Signal processing, image processing, neural networks etc.

7. Future Scope & Conclusion

During this instance of time, several different glitches related to gesture recognition have been addressed. Furthermost of studies has been done in palm print recognition due to its stability, reliability & exclusivity. Furthermore it has been used for law enforcement, civil applications & access control applications.

Verification rate could be calculated by using False Acceptance Rate (FAR), False Rejection Rate (FRR), as well as Equal Error Rate (EER). FAR is percentage of accepted not genuine claims over total number of not genuine accesses. FRR is percentage of rejected genuine claims over total number of genuine accesses. For 3 D recognition multidimensional data has been taken & complexity of algorithm increases as array of matrix are compared in such cases.

It will increase accuracy but takes lot of time on rendered images. So we have extract only useful part of biometric object such as pattern of gestures in multidimensional form. Such system would be useful in banking security systems as well as criminal identification system.

There are many challenges associated with accuracy & usefulness of gesture recognition software. For image-based gesture recognition there are limitations on equipment used & image noise. Images or video may not be under consistent lighting, or in same location. Items in background or distinct features of users may make recognition more difficult.

The variety of implementations for image-based gesture recognition may also cause issue for viability of technology to general usage. For example, an algorithm calibrated for one camera may not work for a different camera. The amount of background noise also causes tracking & recognition difficulties, especially when occlusions (partial & full) occur. Furthermore, distance from camera, & camera's resolution & quality, also cause variations in recognition accuracy.

In order to capture human gestures by visual sensors, robust computer vision methods are also required, for example for hand tracking & hand posture recognition or for capturing movements of head, facial expressions or gaze direction.

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