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Hand Shape Recognition Report

Abstract

Over the last decade, automated hand form identification has been explored, and several commercial systems have been produced.Despite these advancements, there isn't a lot of available public literature on hand shape verification studies. This paper provides a solution based on quadtree approaches for recognizing the hand form picture in a very quick time. The geometrical form of a hand is a biometric feature of humans, however it differs even between twins. A parallel grating is used to project onto the rear of a hand in this experiment. The parallel grating will be warped as a result of the distortion.Image processing methods are used to recognize the hand's curvature form. This research also includes our findings.100 pupils' recognition results were recorded over a period of time.

Problem Definition

A computer system's input devices have evolved from a keyboard and mouse to a light pen, bar code, and touch screen, among other things. A large number of biometric input devices have been produced for security checks as computer technology has advanced. Until recently, there have been two basic types of human deification devices for information systems on the market: the card or person identification number (PIN);(I) and the biometric identification system (ii). In this article, we use a quadtree algorithm to do the feature extraction and recognition process of a human hand. The feature extraction of traditional pattern recognition must process the original image ®le back and forth many times. It takes a long time to process due to such things as thinning, edge enhancement, and noise altering, otherwise, the feature weighting is difficult to done and the accuracy of recognition rate is worse. The process of texture pattern recognition of human beings can easily and accurately be done even if the image possesses some noise. We can accurately and directly identify the image and do not need to ®alter the noise ®rest. The binary form of the origin image can remove most unnecessary pixels and the linear quadtree can code a binary form image to be a very short feature . We use parallel grating to project onto the backside of a hand. The curvature shape of the hand will distort the parallel grating. The distorted grating image will be grabbed by a CCD camera and processed by image processing techniques for recognition. The image is coded by quadtree for attaining the features, which are one-dimensional binary vectors. Our software calculates the variance of the standard sample feature coefficients and the testing sample feature coefficient clients. A threshold value will determine the recognition result.

Supervised and Unsupervised Learning for Hand Shape Recognition

We have developed a hand gesture recognition system, based on the shape analysis of static gestures, for Human Computer Interaction purposes. Our appearance-based recognition uses modified Fourier descriptors for the classification of hand shapes. As always found in literature, such recognition systems consist of two phases: training and recognition. In our new practical approach, following the chosen appearance-based model, training and recognition is done in an interactive supervised way: the adaptation for untrained gestures is also solved by hand signals. Our experimental results with three different users are reported. In this paper, besides describing the recognition itself, we demonstrate our interactive training method in a practical application. parameters of the hand e.g. position or movements are used for controlling purpose in the virtual environment. There are numerous methods in appearance-based recognition for recognizing static gestures. The majority of methods use parameters derived from image. In such cases, the model parameters are derived from the description of the shape. Systems can use one or more camera pictures [1]. They include: edge-based contours [2], edges, image moments [3][4], image eigenvectors [5], or geometric moment description of hand shapes. Some other techniques use second order moments (like Zernike methods [6]), which are invariant to the rotation of the shape. Another method uses orientation histograms [7], which are invariant to lighting conditions and represent summarized information of small patch orientations over the whole image. Geometric moment description is not invariant to rotation and the invariance of other moment-based methods is restricted. We need a method for contour classification where the parameters are invariant to translation, rotation, and scaling. The disadvantage of invariant moments is its high computational cost because features are computed using the entire region. Boundary-based methods, such as Fourier descriptor [8] use only contour-points. However, the Fourier descriptor is sensitive to the starting point of the shape boundary.

Interactive learning system

The conventional learning and recognition phases of the system will be extended by a new interactive training algorithm, which will improve the efficiency of the recognition methods. In the recognition phase the system can correct faulty detected gestures and interactively can modify and teach hand gestures with the user feedback. In this additional phase the user can modify the recognition strategy by modifying his gestures' clustering among classes. The user's feedback signal (crucial shapes to be trained) is a rapid gesture moving or shaking because under a normal interaction the user doesn't apply rapid moving. After the rapid moving or shaking, the system modifies the decision and it chooses the next most probable gesture. This gesture parameter will be trained by the actual gesture parameter grabbed from the camera. This way of interaction is quite natural considering the human behavior. Under the recognition phase the system refreshes parameters if the decision is right, so it is able to adapt to the gestures of the user. With this interactive training algorithm our system is able to adapt to

gestures of other users. In Figure 4-1 we see the algorithm of our training method.

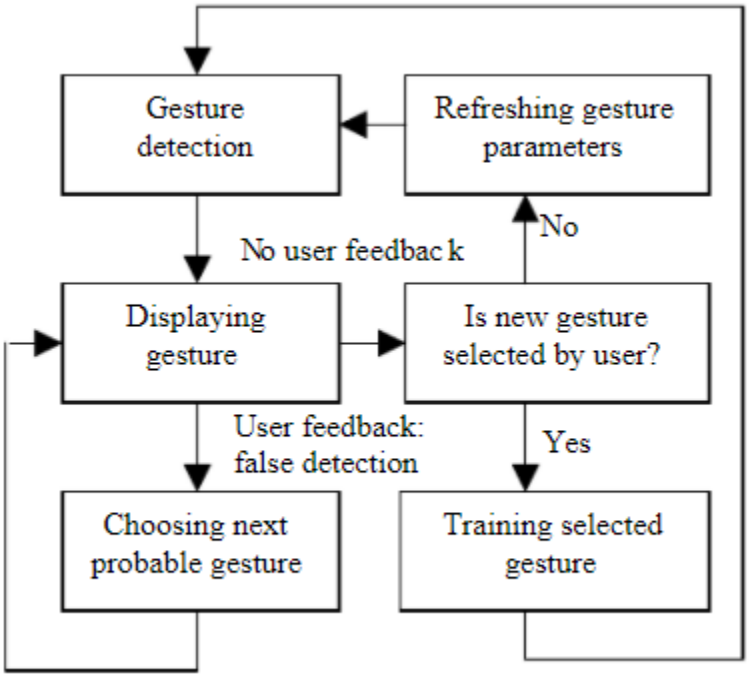

Figure 4-1:Interactive training algorithm

In the natural languages, when people show rapid hand shaking, it usually means denial signal. Our method applies the same movement to get user's feedback of negation. The user's feedback can also be hand shaking or rotating. These signals can be extracted from the variations of the palm position and orientation. When the variations of the position or the rotation are greater than a threshold value, the system recognizes a negation signal. If the detection is true then parameters of the detected gesture continuously will be refreshed by the parameters of the current gesture with a predefined small weight. Continuously refreshing the static gesture, the system is

able to adapt to small changes of gestures. For example,

when the user is tired and cannot show standard gestures,

the system may learn it. If the detection is wrong, the user

indicates it by rapid hand shaking. In this situation the

system chooses the next most-probable gesture-class and

this gesture will appear on the screen. The user can see

the result and can generate feedback again until the result

is accepted. In this case the system uses supervised

training and corrects the false recognition. Continuously refreshing the static gesture, the system is

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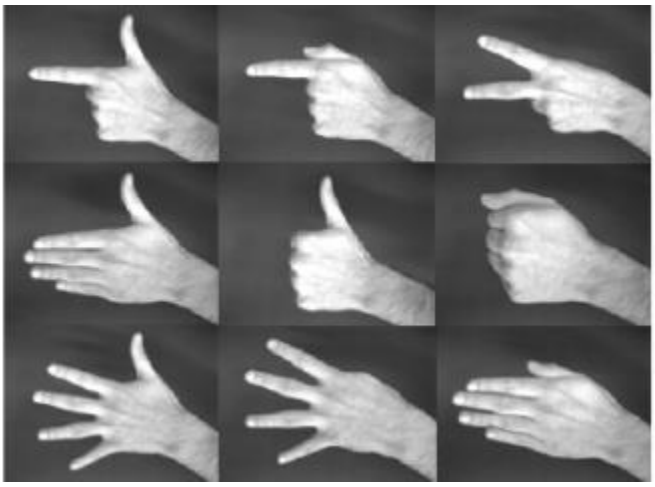
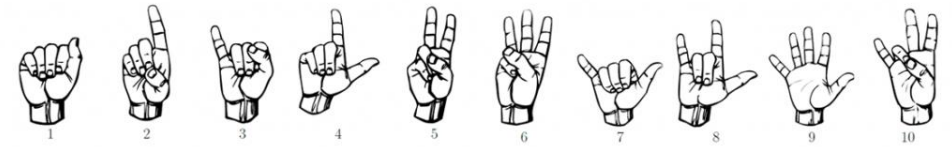
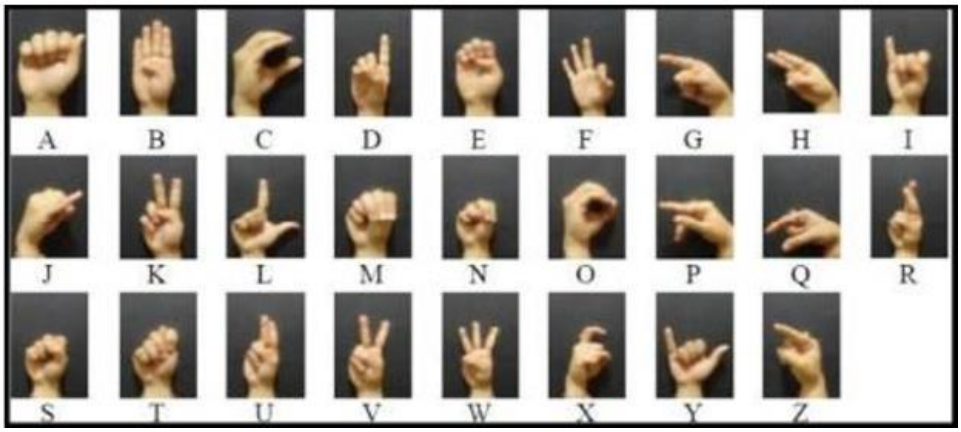
The report should have explanation figures



Some of hand gestures used in our system



images. A sample data set is shown in figure 3.



Conclusion

The above work has shown that

• Interactive training is user-friendly and user-independent;

• Gestures classes can be trained from a limited number of training sets (it also works with solo training set);

• Unsupervised training can be continuously run to follow the slight changes in the gesture styles;

• Supervised training is possible to recognize and correct the possible overlap among the different classes;

• We have tested the supervised training system with three users and found that the performance of recognition has increased significantly as experimental data shows above.

Reference

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