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RESEARCH TRENDS & FUTURE SCOPE IN BLUE EYES TECHNOLOGY

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Abstract

Human brain can recognize other human's feeling by looking at their faces or by their touch, getting a computer to do the same is difficult but in modern world there can be such a technology which can make a computer understand the emotional level of the human being and that technology is called blue eyes technology. There are different ways and devices through which a system can understand human feelings. Among all devices, face detection is a very powerful tool for human computer interaction as face is through which people understand each other through their expression. There are a different number of face detection technique and this paper presents comparative analysis of those technique and different devices used in gathering human information for analysing their emotional level.

Keywords:

Blue eyes technology;
Gesture recognition;
Speech processing;
Artificial intelligence;
Neural network.

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1. Introduction

The Blue eyes technology came into highlight in 1977 when IBM started a research with a team at Almaden Research Centre (ARC) in San Jose, California. Blue eyes technology makes a computer understand and sense the feeling of human and also enables to act according to the sensed emotional level. Blue in this term stands for Bluetooth, which enables reliable wireless communication and the Eyes because through eye movement a lot of interesting and important information can be achieved which can be very useful. The basic idea behind blue eyes technology is to provide computer human power so that work done by human can have fully optimized efforts which can be very useful. The Blue Eyes Technology main aims is creating computational machines that have ability like those of human being have which can help computer to understand human feeling by the input given by different input devices. Face identification is main tool for human computer interaction. Face recognition is a successful way through which human facial expression could be understood by the computer for the improvement of the human computer interaction.

2. Review of Literature

The main reason behind the evolution is that the monitoring systems can concern only the state of the processes whereas human contribution to the overall performance of the system left unsupervised. If this problem of providing intelligence to the system is solved there are many benefits waiting ahead like data security which is require in the network system. Only those registered mobile devices can connect to the system Bluetooth connection authentication and encryption, Access rights restrictions, Personal and physiological data encryption and many more. An experiment inspired by the work of Peter J. Lang, Ward Winton, Lois Putnam, Robert Kraus and Dr. Manfred Clynes, that provides a first step toward designed a tool for sensing the human touch. Rosalind Picard (1997) describes why emotion is important to the computing community. Cameras have been used to detect a person's emotional state, Johnson (1999).

Charles Darwin is the first scientist to recognize that facial expression is one of the most powerful and immediate means for human being to communicate their emotions, intentions and opinions to each other. An important element of incorporating emotion into computing is for productivity for a computer user. A study (Dryer & Horowitz, 1997) has shown that people with personalities that

are similar or complement each other collaborate better. Dryer (1999) has shown that people view their computer as having a personality which can be an intimate partner. For these reasons, it is important to develop computers which can work well with its user.

In 2010, Renu Nagpal, Pooja Nagpal, Sumeet Kaur, gave a novel approach for the detection of emotions using the cascading of Mutation Bacteria Foraging optimization and adaptive Median Filter in highly corrupted noisy environment. Thee approach involves removal of noise from the image by the combination of MBFO & AMF and then detects local, global and statistical feature form the image. They found that the proposed method is suitable for identification of emotions in the presence of salt and pepper noise as high as 90%. And further future work includes that the same technique can be used for detection of emotions in the presence of other noise.

In the year 2011 Ligang Zhang and Dian Tjondronegoro developed a facial emotion recognition system (FER) they used dynamic 3D Gabor feature approach and obtained the highest correct recognition rate (CRR) on the JAFFE database and FER is among the top performers on the Cohn Kanade (CK) database using above approach. They testified the effectiveness of the proposed approach through recognition performance, computational time and comparison with the state-of-the-art performance. And concluded that patch based Gabor features show a better performance over point based Gabor feature in terms of extracting regional features, keeping the position information, achieving a better recognition performance, and requiring a less number.In 2013 as per the paper published by M R Mizna and Mamata Bachhani, they have proposed different approaches to implement Blue Eyes Technology. Specifically, the Emotion Sensory World Technique. This technique uses the image processing for detecting human emotions.

Linear Discriminant analysis is given by Ronald Fisher. LDA is a well-known technique for feature extraction and dimension reduction. LDA has similarities as analysis of variance (ANOV) and regression analysis like this two also attempt to express one dependent variable as a linear combination of another small feature. Each face is represented by a large number of pixel values, through the use of LDA number of feature is reduced to the manageable count. Each new dimension is a linear combination of the number of pixel values, and that form a template and this linear combination are called Fisher Face.

In 1996, Local Binary Pattern approach is given by ojala. Through the use of LBP, it is possible to find the texture and shape in the digital image. This is done by dividing the image into several small region through which features are extracted. Feature extracted contains some of the binary pattern that describes the surrounding of the pixel region. Then these different features are combined into a single feature histogram, which form an image representation.

Neural network in face recognition has a performance of more than 90% acceptance ratio. The main objective of neural network approach is that the feasibility of training a system to capture the complex class of face pattern. Neural network is a nonlinear technique, so it is widely used in the face recognition. Neural network has better feature extraction than that of PCA. The accuracy rate is 96.2% in the face recognition process when 400 images of 40 individuals. the classification time is less than 0.5 second but the training time is as long as 4 hours. A new type of neural network was presented that is hybrid neural network which is basically a combination of local image sampling, a self-organizing map neural network (SOM) and a conventional neural network (CNN). The SOM provides a analysis of image samples where the input that are near by the original space are nearby in the output space. The CNN is used for partial invariance to minor changes like rotation, translation etc. PCA+CNN and SOM+CNN methods are better than that of Eigen face. SOM+CNN perform better than PCA+CNN.

Another technique using neural network is proposed, spectral Regression Kernel Discriminate Analysis (SRKDA) based on regression and spectral graph. If the sample space is nonlinear then SRKDA provide better and exact solution. SRKDA only needs to solve a set of regression problem and no Eigen vector calculation is involved which is a huge computational cost saving. Recently in 2014 a new algorithm is given, Neural network based face detection which is a upfront face detection system. A neural network is attached which examine small windows of an image and chooses whether the window contain a face or not. The systems arbitrate overall several networks to improve performance over a single network. There are two states in this algorithm first is filter and second is merging overlapping detection and arbitration.

Template matching technique is a high-level machine vision technique that allows identifying the part of an image that matches the given pattern of the image. It is a technique for finding a part of a image that is similar (matches) to the template image (patch image). Template matching is one

of the profound areas for image matching. In 2004, karungaru et al. use template based generic algorithm, by adjusting the size of the template different result are taken into consideration and comparison is performed against the initial methods. In 2005, Anlong et al. work is done on the grids to construct reliable and proper structure. It is highly effective for large database that solve the problem of face recognition at a low cost. In 2007 sao and yegnanarayana et al. proposed an algorithm for person verification using template method. Initially, only one-dimensional image is calculated then the system somehow connects to the neural network which work for varying conditions like different pose, illumination etc. In 2008, Wang and Yang et al proposed an algorithm of face detection rather than face recognition as pre-processing steps. The feature in this algorithm is extracted with the help of PCA from 2D image. As the algorithm was finished 000000, its result showed that it gives a good recognition rate.

Geometrical feature matching technique is based on the computation between the set of geometrical features from the picture of a face. In this approach the primary step is to confine or track the facial points. The locations of this facial point are then used to find the shape of facial feature and the movement of the facial feature. The overall configuration can be described by a vector which uses to represent the whole face feature like eyes, nose, ear etc. and their size and position. In 1973, first work is done regarding the geometrical feature matching on automated face recognition. 75% recognition rate was reported on the database of 20 people using two images per person, one as main image and another one as test image. In 1993 R Bruneli and T Poogio, proposed a method which can automatically extract a set of geometrical features form the image of face such as nose length, eyes length and mouth position. As the features are extracted from the dimensional vector the recognition was performed using the Bayes classifier. This approach has 90% of the recognition rate. Another technique named mixture distance technique which gives 95% of recognition rate on a query database of 685 individual was given by I J Cox et al, he used the Gabor wavelet decomposing to detect the feature point for each face image which reduces the database size. Typically, 35-45 features are extracted from every image. The recognition rate for right person was 86% and 94% of the correct person faces were in top three options.

In 2006 Basavaraj and Nagaraj proposed a method for feature extraction. This process includes chin and ears in the frontal face image. This face method identification is divided into four steps.

Pre-processing is the first step main of this step is reducing the noise from the image and covert into binary one. Second step involves pointing the facial feature and finding the original of this point feature. In last it calculates the estimated distance used for matching purpose.

In 2008, Khalid et al, proposed a method which tries to reduce the search space by minimizing the facial feature information. 60 facial control points are extracted in different light and poses. The recognition rate of these processes is 86%. In 2011, Zhen et al, presented a face recognition approach based on the geometry of face. This approach work as the face image is divided into the multiple facial geometrical domains and then LBP is calculated. In 2011 another author named Pavan et al. presented a new geometrical approach which uses subspace-based models.

A different device is also used in the human computer interaction. IBM developed a device called Emotion mouse which can sense human feeling. This device obtains the psychological and emotional state such as number of heart beat, blood pressure, temperature of the human body etc through the mouse which have internal sensors like heart beat sensor, blood pressure sensor etc. From the physiological data obtained from the user, an emotional state may be determined which would then be related to the task the user is currently doing on the computer. Over a period of time, a user model will be built in order to gain a sense of the user's personality.

The sentic was an inspired work from of Peter J Lang, Ward Winton, Lois Putnam, Robert Kraus and Dr. Manfred Clynes who thought of designing a tool which can understand the subject's emotional level. This initiative has begun to apply quantifying values of the emotions. Peter J Lang and others showed subjects a series of pictures and asked them to self-rate their emotional response. Dr Manfred Clynes conducted a series of sentic experiments, gathering data from the finger pressure. As we want computer human interaction to be effective three different purposes for heart beat, blood pressure and for human body temperature. Sentic data, heart beat and self assessment are three measures results this three are compared against each other to the theoretical data.

IBM also developed some devices for eyes called Expression glasses, are general purpose machine vision face recognition to identify the meaningful expressions such as confusion or interest. A sample of such glasses has already made and tested. These types of glasses have

piezoelectric sensors hidden in the visor extension to a pair of glass providing for solidity and user control.

Another device for eyes is developed MAGIC means Manual and Gaze Input cascaded pointing, which is a device which help in keeping a track of user eyes and with that cursor movement covered area is reduced according to the combination of eye movement cursor area is defined and track of that is recorded. However, a large portion of the cursor movement is eliminated by warping the cursor to the eye gaze area, which encompasses the target. There have been two separate techniques that are building and tested, one is conservative and other one is liberal. The user can then take control of the cursor by hand near (or on) the target. Operationally, a new object is defined by sufficient distance (e.g., 120 pixels) from the current cursor position, unless the cursor is in a controlled motion by hand. Since there is a 120-pixel threshold, the cursor will not be warped when the user does continuous manipulation such as drawing. Note that this MAGIC pointing technique is different from traditional eye gaze control, where the user uses his eye to point at targets either without a cursor or with a cursor that constantly follows the jittery eye gaze motion. Once the manual input device has been actuated, the cursor is warped to the gaze area reported by the eye tracker. This area should be on or in the vicinity of the target.

For eyes, Eye Tracker is build, when the light source is placed on-axis with the camera optical axis, the camera is able to detect the light reflected from the interior of the eye, and the image of the pupil appears bright. This effect is often seen as the red-eye in flash photographs when the flash is close to the camera lens. Bright (left) and dark (right) pupil images resulting from on-and off-axis illumination. The glints, or corneal reflections, from the on-and off-axis light sources can be easily identified as the bright points in the iris. The Almanden system uses two near infrared (IR) time multiplexed light sources, composed of two sets of IR LED’s which were synchronized with the camera frame rate. One light source is placed very close to the camera’s optical axis and is synchronized with the even frames. Odd frames are synchronized with the second light source, positioned off axis. The two light sources are calibrated to provide approximately equivalent whole scene illumination.

For human computer interaction, another device can be used is speech recognition, emotional level of a human being can also be understood by the pitch of the voice and through the voice a human can also be identified but it requires very deep testing for the system to understand and

recognize whose voice is it. Environment is also a factor which is important for the speech recognition as the level of noise, noise type, position of the microphone is some factor which can have an adverse effect. The operator communicates with the system with a microphone; a simple system must contain a minimum three filter. As the number of filter increases the quality of voice increase which is terms increase the chance of identification. Presently, switched capacitor digital filters are used because these can be custom-built in integrated circuit form. Active filter is more costly and complex than the digital filter. The output of the filter is then given to translator to translate the analogue signal to digital word. The translator filters many words per second. Each sample represents different amplitude, each value is then converted into the binary number proportional to the amplitude. In a large RAM all the digital words are stored which are later processed by the CPU. The normal speech has a frequency range between 200 Hz to 7 KHz.

3. Comparative Analysis

Comparative analysis is done on the basis of several parameters in the face detection and recognition and some of them are described below:

- Illumination challenged effect: performance of face recognition in indoor is achieved a great level but when it comes to outdoor platform problem remain the same.
- Face pose: in the security areas, cameras are situated in the area where the people cannot reach at the camera lens. And the next problem is that sometimes people don't even look at the lens.
- Face expression: human have different face but less then the face pose or illumination.
- Recognition result: in a face normal eye does not create a problem but a smile or close eye does affect the face recognition rate by 1% to 10% and with a large smile it effects up to 30%.
- Face aging: aging affects the face structure like wrinkle around the eyes expression it affects the make eyes look smaller or the check skin gets dull which affect the processes of detection of the face.

Dynamic background: in a normal condition, in static background it doesn't cause a problem for detecting the face but in dynamic background it is quite challenging to detect the face. Single face detection is easier.

4. Conclusion and Future Scope

Blue Eyes need for a real-time monitoring system for a human operator. The approach is innovative since it helps supervise the operator not the process, as it is in presently available solutions. The use of a miniature CMOS camera integrated into the eye movement sensor will enable the system to calculate the point of gaze and observe what the operator is actually looking at. Introducing voice recognition algorithm will facilitate the communication between the operator and central system and simplify authorization process. Despite considering in the report only the operators working in control rooms, our solution may well be applied to everyday life situations. These new possibilities can cover areas such as industry, transportation, military command centres or operation theatres, etc. Researchers are attempting to add more capabilities to computers that will allow them to interact like humans, recognize human presents, talk, listen, or even guess their feelings through their face expressions. In recent years face recognition has received substantial attention from researchers in biometrics, pattern recognition, and computer vision communities. There is a large number of commercial, security, and forensic applications requiring the use of face recognition technologies. As we can see, face recognition system is very important in our daily life. It is possessing a really great advantage. Among the whole types of biometric, face recognition system is the most accurate. In this paper the classification of face detection techniques been done with that some of the face recognition algorithms andtechniques been discussed along with their advantage and disadvantage in tabular form.

In future it is possible to create a computer which can interact with us as we interact each other with the use of blue eye technology integrated with many other techniques. It seems to be a fiction, but it will be the life lead by “BLUE EYES” in the very near future. Ordinary household devices – such as televisions, refrigerators, ovens, etc. – may be able to do their jobs when we look at them and speak to them.

The Blue Eye technology hence has lots of future scope and advantages for the world, although there are some demerits which are only because of improper implementation and some limitations like it can’t predict the human thoughts etc but even than the technology has lots of merits and scope for future technologies. Overall the Blue Eye technology has much more merits over its demerits and hence has ability to completely change the future of technology.

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