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ORIGINAL ARTICLE

APPLICATION OF COMPUTER VISION SYSTEM OR FACIAL EXPRESSION RECOGNITION SYSTEM

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Abstract:

We all know that the versatile use of Robots that make our task simpler .The Robots usage ranges from simple housekeeping, Complex surgeries, Bombay disposing , Space exploration etc.., the list goes endless. The main problem with Robots is a lack of Vision module will restrict them to be more autonomous. Hence the Robots have to be controlled manually.

KEY WORDS:

Computer Vision System , Facial Expression Recognition System , Integrates Computer Technology , Face Recognition.

INTRODUCTION

The main objective of this project is to develop small computer vision system modules that will aid the Robots for Face Recognition as a security tool. The Computer vision is a new & emerging area under research, which Integrates Computer Technology, AI & Expert systems, Pattern Recognition & Image processing Robotics.....etc. The ultimate goal of Computer Image understanding is to build system that equals or exceed the capabilities of human vision system. Ideally a Computer vision system would be capable of interpreting & describing any complex scene in the complete details. This means that the system must not only be able to identify a myriad's of complex objects, but also be able to reason about the objects, to describe their function & purpose, what has taken place in the scene, why any visible or implied events occurred, what is likely to happen & what objects in the scene are capable of doing. It is objective of many researchers in the Computer Vision to build systems capable of interpreting, describing & reasoning about the scenes of this type in real time. Unfortunately we are far from achieving this level of competency. Like natural languages understanding Computer Vision interpretation is a difficult problem. The amount of processing & storage required to interpret & describe a complex scene is enormous.

FACE RECOGNITION:

Face Recognition is an application of Computer Vision System .We make use of Artificial Neural N/W concept which is very flexible & supports massive parallel processing. This is required for high speed image processing. We can train the Neural N/Ws. The existing algorithm to train the Neural N/Ws involve lot of computing power because of the large number of iterations involved. My aim is to reduce the training time/Improve the learning curve by reducing computer power. Face Recognition require huge memory & processing power.& transaction fraud

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increases,

BIOMETRICS:

Biometrics is

- Iris
- Retinal
- Vein
- Voice.

The need for Biometric can be found in,

- Federal
- State & Local Govts.
- Military &
- In Commercial applications
- Enterprize –Wide N/W security Infrastructure
- Govt. IDs
- Law enforcement

There are two types of Biometric methods.

- Behavioral Biometrics
- Physical Biometrics

First method is used for Verification purposes. Second method is used for Identification or verification purposes. This method is commonly used in Criminal Investigation.

Types of Biometrics:

- Face Recognition
- Finger Print Recognition
- Voice Recognition
- Signature Recognition
- Palm Recognition

Face Recognition is a part of pattern Recognition Technology. With the rapid evolution of the technology & the commercialization of technological achievements, Face recognition became more & more popular, not only for research but also for the use of security systems. The main issue of building a facial Expression recognition system is

- Face Detection & Alignment
- Image Normalization
- Feature extraction
- Classification

CLASSIFICATION OF FACE RECOGNITION.

There are two types,

- Face Verification or Authentication
- Face Identification or recognition

Face Verification is a one-to-one match that compares a query face against a template face image whose identity is being claimed. To evaluate the verification performance, the verification rate (The rate at which legitimate users are granted access) vs. false accepts rate is plotted. A good verification system should balance these two rates based on operational needs.

FACE IDENTIFICATION:

It is a one-to-many matching process that compresses a query face image against all the template images in a face database to determine the identity of the query face. The identification of the test image is done by locating the image in the database that has the highest similarity with the test image.

The Identification process is a “closed” test which means the sensor takes an observation of an individual that is known to be in the database. The test subjects (normalized) features are compared to the other features in the system’s database & similarly score is found for each comparison.

The technique which I propose for Face Recognition is two dimensional discrete cosine transforms & Self organize map (SOM) Neural N/W as Classifier.

Next step I do is Face Identification.

Artificial Neural N/W :

- The Artificial Neural N/W is completely based on the natural neural N/W.
- It consists of Interconnected processing elements.
- Here each processing element performs simple summation operation called neurons.
- Each Neuron consist of fixed number of I/P either from other Neuron or from the external environment.
- The summation of the product value of the inputs and weights determine the output of the Neuron.
- The Artificial Neural N/W does not follow sequential approach & can support the massive parallel operations.
- It can be trained to the desired application.
- ANN can be applied to many areas:

Computer Vision, Military, Signature Verification, Power Control Systems ..etc.

BLOCK DIAGRAM OF METHODOLOGY :

Camera usage
2D Image
Capturing
Preprocessing
Image localization & Normalization
Feature Extraction
Image Preprocessing
Identification
And
Verification
Accept
Reject
Database
Stored

ALGORITHM FOR FACE RECOGNITION:

Input : DCT converted image
Output : Whether the given input image is found in the Database or not.

Steps:

- Image processing i.e. conversion of RGB to GRAY scale & save to any format say .pgm format.
- Use discrete cosine transformation to read image, Compress & Save to Separate folder.
- SOM Neural N/W takes DCT input uses unsupervised learning & gives
- output in the form of number. This number indicates how much the given Input image deviates from database images.
- If the test image is found in the database then it displays
- ound image', else 'Not found '.

This can be used for Criminal Face Recognition.

APPLICATIONS :

Government use:

mug shot & comparing school surveillance images to child molesters.

- Security/Counter terrorism: Access control, comparing surveillance to known terrorists.
- Immigration: Rapid progression through Customs.
- Legislature: Verify identity of Congressmen prior to Vote.
- Correctional institutions/Prisons, Inmate tracking, employee access.

COMMERCIAL USE :

- Day care : Verify Identity of individuals picking up the children
- Missing Children/Runaways : Search surveillance images & the Internet for missing children & runaways.
- Gaming Industry : Find card counters & thieves.
- Residential Security : Alert homeowners of approaching personnel
- Internet, E-Commerce : Verify identity for Internet purchases.
- Health Care : Minimize fraud by verifying identity.
- Benefit payments : Minimize fraud by verifying identity.
- Voter verification : Minimize fraud by verifying identity.
- Banking : Minimize fraud by verifying identity.

With this speedup of 93.33% compared to the existing system.
System Requirements :
Software Requirements :

- MATLAB for running the application
- Operating system : Microsoft Windows 2000/XP/Vista/07
- C compiler support

Hardware requirements :

- Processor : Pentium III or above
- Hard disk : 4 GB or above
- Memory : 1GB RAM or above.