ISSN(Online): 2320-9801
ISSN (Print): 2320-9798

International Journal of Innovative Research in Computer and Communication Engineering

*(An ISO 3297: 2007 Certified Organization)*

**Vol. 3, Issue 5, May 2015**

# Pose Invarient for Face Recognition and Lightening Conditions Using SVM Classifier

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**ABSTRACT:** Face recognition has been one of the most interesting and important research fields in the past two decades. Many papers have been published to overcome difference factors (such as illumination, expression, scale, pose ) and achieve better recognition rate, but there is no efficient technique against uncontrolled practical cases which may involve kinds of factors simultaneously. The problem of pose is big challenge applying these technology under real word condition. In this report, we'll go through the face detection and face recognition by using SVM classifier, Face recognition has diverse applications in identification has an identification solution which can meet the crime needs in security area.

**KEYWORDS:** illumination, pose invariant, Support Vector Machine, Training Sets, Testing Set.

## I. INTRODUCTION

The general undertaking of face acknowledgment still having numerous difficulties regarding changes in enlightenment, outward appearance, and posture. In numerous looks into, the light variety has been broadly examined in numerous face location and acknowledgment. It is created by different lighting situations. The variety in posture results from distinctive points and areas amid the picture procurement process. In this paper we have given diagram on face acknowledgment system for distinguished proof . Face acknowledgment framework for ID could be possible by two courses are as per the following :

- Identify an individual inside the substantial database of appearances( In these stand out picture is accessible for every individual and not important to be perceived continuously )
- Identification of the individual in a genuine time.(For one individual numerous picture are accessible for preparing and acknowledgment is done continuously.

Arrangement is simple assignment for human yet it is a complex issue for machine. The identification of human face is the first assignment performed in a face acknowledgment framework. Its come about altogether impact the general nature of the framework. The trouble is that face location is an issue of classification. The framework needs to perceive items fitting in with a class. Hypothetically, the arrangement of human countenances is limited, for all intents and purposes it is difficult to have entry to every one of its examples in light of the fact that all the appearances has the same structure, there must be a basic model that produces all cases of the face class. Presently the issue is to discover hearty and proficient model and a decent grouping capacity. A standout amongst the best methodologies is to model the situated of accessible faces as a sequence of straight close estimations. The best such close estimation is given by Principal Component Analysis (PCA). In the setting of face displaying the utilization of PCA demonstrated its capacities in diverse connections like face identification or face acknowledgment. In any case, in the case of most applications a direct classifier is utilized to separate in the middle of confronts and non-confronts or for face acknowledgment.

The point of a PCA is examining information to distinguish examples and discovering examples to lessen the measurements of the dataset with insignificant loss of data. our fancied result of the chief segment examination is to venture a highlight space (our dataset comprising of n x d-dimensional examples) onto a littler subspace that speaks to

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our information "well". Here we can diminish the computational cost by lessening the quantity of measurement of highlight space by extricating a subspace that depicts our information "best".

This paper tries to address the acknowledgment of the face utilizing SVM classifier. Its structure is as per the following: the fourth area address the hypothetical parts of the classifier utilized (SVM) keeping in mind fifth segment is committed to the exploratory result.

## II.RELATED WORK

Numerous papers identified with face acknowledgment methodologies are considered in this segment to comprehend the different strategies of past calculations. Some of them is focus on light and others in face acknowledgment. In 2006 Face Recognition Robust to Head Pose from one specimen Image [1].Ting Shan†, Brian C. Lovell†, and Shaokang Chen presents paper which contains Face Model and Rotation Model which is utilized to decipher facial highlights and blend practical frontal face pictures.

In 2010 Evaluation of Face Recognition Techniques[2]. Bo Dai DengshengZhangbHuiLiuaShixinSunaKeLicIn this paper, they connected and contemplated SIFT procedure on face acknowledgment, and contrasted it and the recorded face acknowledgment routes in writing, i.e., PCA and 2DPCA. Thorough tests were distributed on three noteworthy face databases. Our outcomes show SIFT has noteworthy favours over every PCA and 2 DPCA as far as acknowledgment rate and assortment of honing specimens. This paper conjointly points out a few weaknesses of excellent trial system to recognize confronts and enhance them, yet this methodology take more execution time as contrast with PCA.

In 2011 Face acknowledgment taking into account the multi-scale neighbourhood picture structures [3]. Cong Geng and Xudong Jiang. They proposes a structure of face acknowledgment upheld the multi-scale local structures of the face picture. while some essential devices amid this system are hereditary from the SIFT algorithmic tenet, this work explores and adds to all or any real ventures inside the highlight extraction and picture coordinating. New ways to deal with key reason discovery, halfway descriptor and irrelevant key reason evacuation an arranged particularly for face pictures, a system of key reason scavenge around for the nearest subject and a two-stage picture coordinating topic are produced for the face recognizable proof undertaking. Results demonstrate that the arranged system beats SIFT and a couple of all-encompassing ways to deal with face acknowledgment. This methodology is exceptionally proficient for general pictures yet not suitable for lit up pictures.

In 2011, Clustering and Bayesian system for picture of confronts arrangement. KhlifiaJayech 1 and Mohamed Ali Mahjoub 2 presents paper which is taking into account the picture arrangement framework Here we are utilizing the method of digression separation to figure a few digression spaces speaking to the same picture. Diminishment the lapse in the grouping stage is the fundamental target. Second, we cut the picture in an entire of pieces. For every square, we register a vector of descriptors. At that point, we utilize K-intends to bunch the low-level highlights including shading and composition data to manufacture a vector of names for every picture. At last, we apply five variations of Bayesian systems classifiers

In 2012,Pose Invariant Face Recognition under Arbitrary Unknown Lighting utilizing Spherical Harmonics[4].Lei Zhang, Dimitris Samaras presents paper which joins the quality of Morph capable Models to catch the variability of 3D Face shape and a Spherical Harmonic representation of the enlightenment. Pictures grew by this methodology is attaching high preparing force and also complex.

In September 2013A Novel Approach to Face Recognition with Pose and Illumination Variation utilizing Support Vector Machine as classifier .R.RajaLakshmi, M.K. Jeyakumar exhibited the Paper on actualize a computerized machine bolstered face Recognition framework that perceives well the personality of an individual in the pictures that were not utilized as a part of the Testing Phase that is an introduction and preparing by illustrative specimen of pictures continue an Evaluation Phase however exactness of this methodology ailing in assessment stage. They checked their outcomes just with bolster vector machine. Different classifiers can be utilized to advance the outcome.

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This paper is to develop a system that provides a lot of precise face recognition system and acknowledges the identity of an individual accurately. This method consists of 2 phases, image illumination and classification. Image illumination enhances the standard of image for post part of face recognition. create variations diminish the performance of external body part recognition. Feature Extraction is the technique which improve the performance. we tend to propose a completely unique approach for face recognition beneath create invariant and close illumination conditions.

## III.PROBLEM STATEMENT

Human face recognition system is disrupted whenever we changes the direction of light and pose. There are many problems on human face recognition system has been observed are as follows:

- Human capacity for face recognition is a dedicated process, Thus artificial face recognition system should also be face specific.
- To recognize different faces is easier than typical ones.
- To represent and recognize the faces ,features used are global and local features .
- People recognize face from their own race better than people from another race and may encode an 'average' face.

By using the present technology, we have the benefit of a computer system is that it has the capacity to handle large datasets of face images. As there is simple and efficient methods for the extraction of features and representation, Several methods (structural and global methods) have been proposed for face recognition and classification. Some techniques (structural) deals with local or analytical characteristics. The class of global methods includes methods that enhance the overall properties of the face. Among the most important approaches, Correlation Technique used is based on a simple comparison between a test image and face learning, Principal component analysis technique is based on principal component analysis (PCA) , discrete cosine transform technique (DCT) which based on computing the discrete cosine transform .

However ,recognition of face is with image variations in illumination condition, pose, facial expression or aging. For this several methods based on Gabor filters have been introduced. Face is represented as a graph, in which every vertex corresponds to a selected facial landmark (eyes, mouth or nose, etc.) and the edge represents the connection between them. After the construction of the graph, We canachieve identification by the proper matching between the reference graph and the probes one.

## IV.PROPOSED METHOD

Multiple images are taken for each person and extract their features and stored in the database. Then whenever we get any face image as input, face detection and feature extraction has to be done, and compare its feature to each face class stored in the database. There are two general methods of face recognition, first method is known as identification and another one is known as verification. Identification refers to identify a person based on the image of the face. In Face verification To tell true or false about the prediction we validating a claimed identity based on the image of the face .classification is the problem of identifying to which of a set of category a new observation belongs, a training set of data containing observations (or instances) whose category membership is known.

Classifier is an algorithm that implements classification, especially in a robust implementation .The term "classifier" sometimes also refers to the mathematical function , implemented by a classification algorithm, which is used to map the data to a category.

Score $(A_i, k) = B_k . A_i$

Where $A_i$ is the feature vector for instance *i*, $B_k$is the vector of weights corresponding to category *k*, and is the Score $(A_i, k) = B_k . A_i$associated with assigning instance *i* to category. Instances represent people and categories represent choices, the score is for the utility associated with person *i* choosing category *k*.

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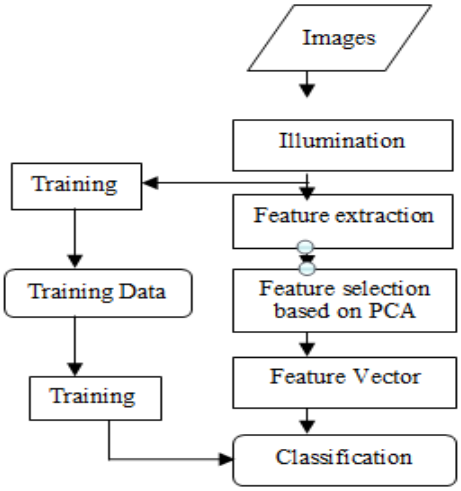


Fig 1. Features extracted and stored in training database

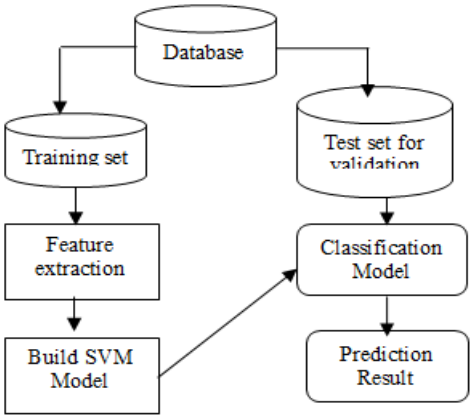


Fig 2.Testing and training of images

In Fig 1 flowchart of the execution elaborates each and every step of overall methodology and Fig 2 represents the how features are extracted and classification has been carried out.

## V.IMPLEMENTATION

The whole methodology can be implemented in four parts. The various parts are explained in phases A,B, C and D .

*A. Face illumination and pose invariant:*

In this part, we presenting some images from our dataset (Fig. 3).we are applying lights from different direction on various poses of face which can be shown in Fig 5.In this part we get the illuminated faces with good quality and better visibility.These images are ready to get trained.

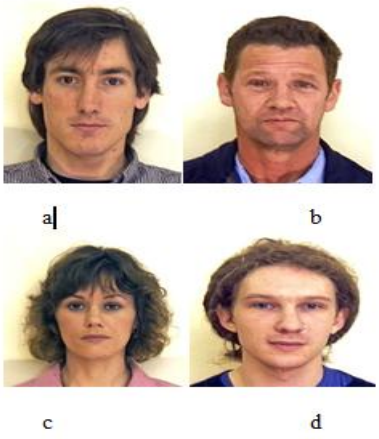


Fig3 . Some images from dataset.

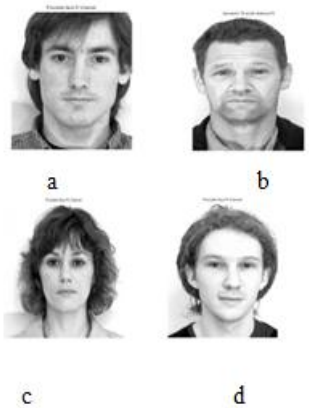


Fig4 .lightning effect on images

Fig 3 shows target dataset of image pre-processing and illumination which will be further use in face recognition. Fig4 demonstrate the lightening effect of each target image which are used in feature extraction and face recognition.

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Fig 5. Test images from dataset after illumination

Fig 5 represents the post illumination effect of target images which shows significant improvement in terms of visibility and contrast.

*B. Images Pre-processing :*

In this part , images has to be taken from the database and classified into training and testing set. For example, the database contains 69 images of person and for training and other some images are used for testing. Thus by using the trained images the values are entered into the reference matrix and then used as a reference to compare the values generated from the testing images .Input image function from the database and is applied to the Gabor function to get the Gabor output. These image is convolved with the Gabor output to get the Gabor magnitude and phase. The database is split into training and testing sets.

Fig6. Image of the person used for extracting Gabor features and Gabor output.

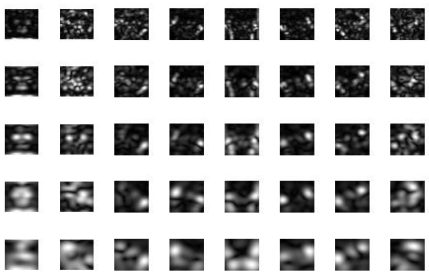

Fig7.Gabor Magnitude output.

Fig 6 represents the test image which have been used to recognise face using SVM classifier and Fig 7 show how gabor filter the features from target image.

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*C. Getting local and global Gabor features:*

When the magnitude and the phase are modelled ,subdivision of the image take place into a series of smaller images and the local Gabor magnitude and phase representations are obtained . After combining we get the Gabor magnitude phase texture representation.

*D. Using the Support Vector Machine to classify the image:*

The SVM classifier is designed and classification of the image is based on the extracted parameters and it recognizes the image content (face). The SVM maps the features to higher dimensional space and then uses an optimal hyper plane in the mapped space. This implies that though the original features carry adequate information for good classification, mapping to a higher dimensional feature space could potentially provide better discriminatory clues that are not present in the original feature space. The selection of suitable kernel function appear in trial-and-error process.

## VI.SIMULATION RESULT

When we run the program a window will open which contains some options (Generate database, Create SVM, Test on Photos and Exit) as shown in fig 5 .On clicking Generate Database, it stores all the trained data in database i.e. it loads all the facial and non facial images in database then creation of svm take place. It shows how svm classifier is used to detect the face and and non face part image . Images has been tested againsted the training data .

We presented a technique and evaluating the performance with respect to robustness against illumination and different poses. The component-based system is used for detection and extraction. A set of 69 facial components and arranged them in a single feature vector that was classified by linear SVMs. In this system whole face is detected, extracted from the image and used it as input to the classifiers. The system consisted of a single SVM for each person in the database and trained a set of view-specific SVM classifiers. After training phase we tests the datasets against the trained data .

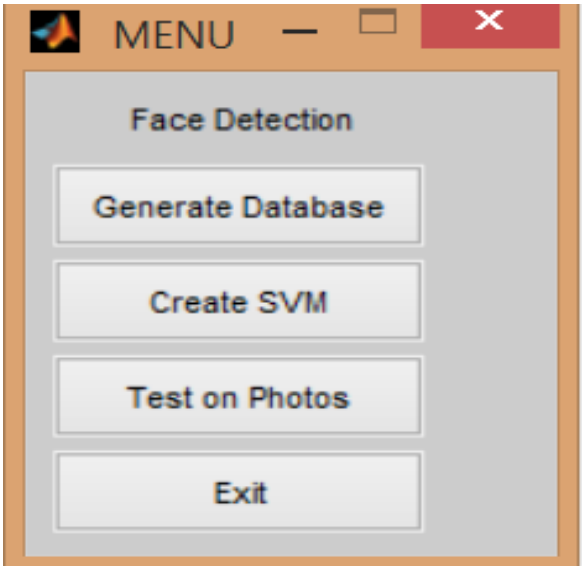


Fig 8. Interface for testing and training data using svm.

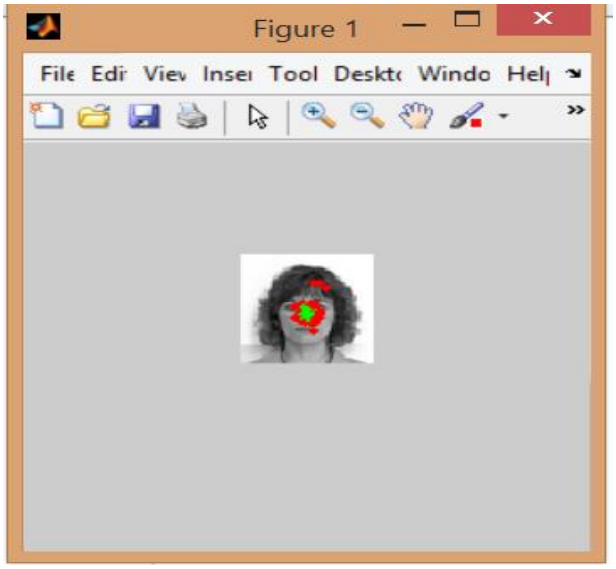


Fig9. Face detection using the svm,green. portion shows the face area.

Fig 8 represents the graphical user interface to execute the SVM classifier and Fig 9 shows how the SVM classifier detect the face using extracted feature and training. Green area shows the facial region of image in Fig 9.

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```
Number of Support Vectors: 207
done. 0
Elapsed time is 4.588811 seconds.
```

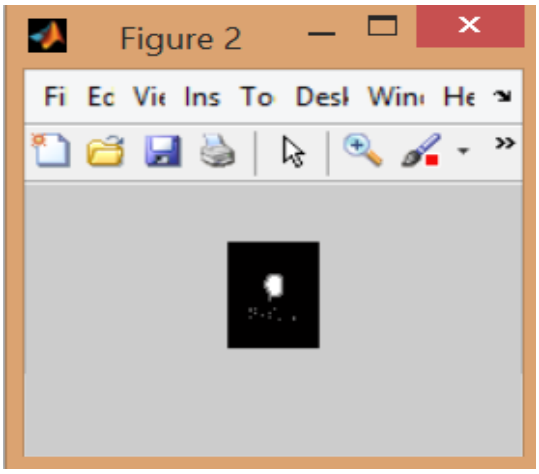


Fig 10.Highlighted area is human face.

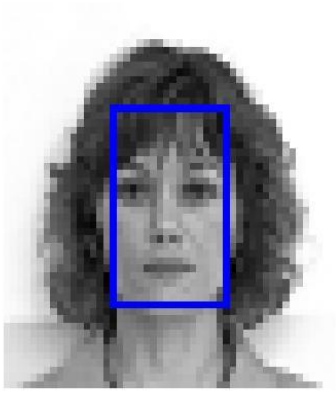

Fig 11.Final face detection using SVM classifier.

Fig 10 shows the highlighted area of human face which is detect and recognise by using SVM classifier and Fig 11 shows the final output as face has been recognise successfully.

The performance of classifier depends on the characteristics of the data to be classified. There is not a single classifier that works best on all given problems .To compare the performance of the classifier various empirical tests has to be performed.

## VII.CONCLUSION AND FUTURE WORK

We proposed pose invariant for face recognition and lightening conditions using support vector machine classifier. In first phase we performed illumination of images, we also consider different pose of similar images in order to extract feature. In second phase we trained our date sets using SVM classifier based on features we extracted earlier. After that we performed test on several images against trained data sets. In svm Classifier when we had classified between faces and non-face which are two classes, it successfully detect the face in very less execution time.so we can conclude that our approach is well suited for large scale face recognition systems.
In future we can take more classifiers such as artificial neural network and k near neighbourhood classifier and compare the results among them . In future we can work with real time webcam camera based face recognition system.

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