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FACE RECOGNITION AND EMOTION-DETECTION USING EIGEN FACE AND A CONVOLUTIONAL NEURAL NETWORK APPROACH

*seminar report submitted*

*in partial fulfillment of the requirement for award of the degree of*

Bachelor of Technology in

Computer Science & Engineering

By

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December, 2020

## BONAFIDE CERTIFICATE

It is certified that the work contained in the seminar report titled ”FACE RECOGNI-

TION USING EIGEN FACE AND A CONVOLUTIONAL NEURAL NETWORK

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We declare that this written submission represents our ideas in our own words and where others’ ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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## APPROVAL SHEET

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CONVOLUTIONAL NEURAL NETWORK APPROACH) by Y.VAIBHAV (18UECS0953),

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ACKNOWLEDGEMENT

We express our deepest gratitude to our respected Founder Chancellor and President Col. Prof. Dr. R. RANGARAJAN B.E. (EEE), B.E. (MECH), M.S (AUTO).

DSc., Foundress President Dr. R. SAGUNTHALA RANGARAJAN M.B.B.S.

Chairperson Managing Trustee and Vice President.

We are very much grateful to our beloved Vice Chancellor Prof. S.SALIVAHANAN, Ph.D., for providing us with an environment to complete our seminar successfully.

We obligated to our beloved Registrar Prof. Dr. E. KANNAN,PH.D., for providing immense support in all our endeavors.

We thankful to our esteemed Director Academics Dr. A.T.RAVICHANDRAN, Ph.D., providing a wonderful academic environment to complete our seminar successfully.

We record indebtedness to our Dean & Head, Department of Computer Science and Engineering Dr. V. SRINIVASA RAO, M.Tech., Ph.D., for immense care and encouragement towards us throughout the course of this seminar.

A special thanks to our Seminar Coordinators DR.T.VEERAMAKALI PH.D., for her valuable guidance and support throughout the course of the seminar.

We thank to our Seminar handling Faculty DR.N.MALARVIZI for the valuable information shared in proceeding with our seminar.

We also take this opportunity to express a deep sense of gratitude to Our Internal Supervisor S.Saran Raj for her cordial support, valuable information and guidance, he helped us in completing this seminar through various stages.

We thank our department faculty, supporting staff and friends for their help and guidance to complete this project.

Y.VAIBHAV (18UECS0953)

ABSTRACT

we presenting an approach to the detection and identification of human face and describe a working near real time face recognition system which (1) rack a subject head and then recognize the person by comparing characteristics of the face to those of know individuals , our approach treat face reconnection as a two dimensional or three dimensinoal recognition problem , taking advantage of the fact of the faces are small set of ( 2 D ) or ( 3 D ) characterisic views , face image are projected onto a feature space (” faces space ”) that best encode’s that the variation among know face image . The face space is defined by the ”eigen face” , which are the eigen vectors of the set of faces they do not necessarliy correspond to isolated facetures such as ( eyes , ears ,noses ) . The framework provides the ability to learn to recoginze new faces in an unsupervied manner.

Keywords: Face recognition , covolutional neural networks,self organizing feature maps , Karhunen Loeve transforms , hybrid systems , access control , pattern recognition , image classification

, two or three dimensinoal

# 

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## LIST OF ACRONYMS AND ABBREVIATIONS

ANN Artificial neural networking

SOM Self organizing map

MLP Multi layer perceptron

CNNA Convolutional Neural Network Approach

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Chapter 1

## INTRODUCTION

1.1 Introduction

Reliable automatic recognition of persons has long been an attractive goal. In face recognition, difficulties arise from the fact that the face is a changeable social organ displaying a variety of expressions, as well as being an active 3D object whose image varies with viewing angle, pose, illumination, accoutrements, and age. It has been shown that for facial images taken at least one year apart, even the best current algorithms have error rates of 43% to 50% . An Artificial Neural Network (ANN) system provides automatic recognition of an individual based on some sort of unique feature or characteristic possessed by the individual. ANN systems have been developed based on fingerprints, facial features, voice, hand geometry, handwriting, the retina etc.

1.2 Aim of the Seminar

The person with the help of a face using artificial neural network technique. This system is implemented in two stages. They are the learning stage and the testing stage. Image acquisition, preprocessing, image filtering, feature extraction and learning are included in the learning stage. At first the system takes the image of a person. The input image is then converted to a gray scale image and the position of the face is detected from the image after highpass filtering and edge detection.

1.3 Scope of the Seminar

The security systems and can be compared to other biometrics such as fingerprint or eye iris recognition systems. In this paper we focus on 3 D facial recognition system and biometric facial recognision system

1.4 Methodology

* EIGEN FACE
* A CONVOLUTIONAL NEURAL NETWORK APPROACH

## Chapter 2 LITERATURE REVIEW

2.1 Face Recognition Using Neural Network

Face recognition from the real data, capture images, sensor images and database images is challenging problem due to the wide variation of face appearances, illumination effect and the complexity of the image background. Face recognition is one of the most effective and relevant applications of image processing and biometric systems. In this paper we are discussing the face recognition methods, algorithms proposed by many researchers using artificial neural networks (ANN) which have been used in the field of image processing and pattern recognition. How ANN will used for the face recognition system and how it is effective than another methods will also discuss in this paper. There are many ANN proposed methods which give overview face recognition using ANN. Therefore, this research includes a general review of face detection studies and systems which based on different ANN approaches and algorithms. The strengths and limitations of these literature studies and systems were included, and also the performance analysis of different ANN approach and algorithm is analysing in this research study.

2.2 A Fast and Accurate Face Detector

Detecting faces in images with complex backgrounds is a difficult task. Our approach, which obtains state of the art results is based on a new neural network model: the Constrained Generative Model (CGM). Generative, since the goal of the learning processis to evaluate the probability that the model has generated the input data, and constrained since some counterexamples are used to increase the quality of the estimation performed by the model. To detect side view faces and to decrease the number of false alarms, a conditional mixture of networks is used. To decrease the computational time cost, a fast search algorithm is proposed. The level of performance reached, in terms of detection accuracy and processing time

2.3 Artificial Neural Networks for Face Recognition

This paper introduces some novel models for all steps of a face recognition system. In the step of face detection, we propose a hybrid model combining AdaBoost and Artificial Neural Network (ABANN) to solve the process efficiently. In the next step, labeled faces detected by ABANN will be aligned by Active Shape Model and Multi Layer Perceptron. In this alignment step, we propose a new 2D local texture model based on Multi Layer Perceptron. The classifier of the model significantly improves the accuracy and the robustness of local searching on faces with expression variation and ambiguous contours. In the feature extraction step, we describe a methodology for improving the efficiency by the association of two methods: geometric feature based method and Independent Component Analysis method. In the face matching step, we apply a model combining many Neural Networks for matching geometric features of human face.

2.4 Face Recognition This paper introduces some novel models for all steps of a face recognition system. In the step of face detection, we propose a hybrid model combining AdaBoost and Artificial Neural Network (ABANN) to solve the process efficiently. In the next step, labeled faces detected by ABANN will be aligned by Active Shape Model and Multi Layer Perceptron. In this alignment step, we propose a new 2D local texture model based on Multi Layer Perceptron. The classifier of the model significantly improves the accuracy and the robustness of local searching on faces with expression variation and ambiguous contours.

2.5 Face recognition using neural networks this paper we depict an experiment to the face recognition problem by combining eigenfaces and neural network. Eigenfaces are applied to extract the relevant information in a face image, which are important for identification. Using this we can represent face pictures with several coefficients (about twenty) instead of having to use the whole picture. Neural networks are used to recognize the face through learning correct classification of the coefficients calculated by the eigenface algorithm. The network is first trained on the pictures from the face database, and then it is used to identify the face pictures given to it. Eight subjects (persons) were used in a database of face images. A recognition accuracy of 95.6% was achieved with vertically oriented frontal views of a human face.

Chapter 3

## SEMINAR DESCRIPTION

3.1 Existing System

Face recognition, as one of the most successful applications of image analysis, has recently gained significant attention. It is due to availability of feasible technologies, including mobile solutions, but the problem is still largely unsolved. Last decade has provided significant progress in this area owing to advances in face modelling and analysis techniques. Although systems have been developed for face detection and tracking, reliable face recognition still offers a great challenge to computer vision and pattern recognition researchers

Advantages

* There are many benefits to using facial recognition in society, such as increasing safety and security,
* preventing crimes and reducing human interaction. It can even help support medical efforts
* Law enforcement agencies use facial recognition to find missing people.
* It’s been used to find children who’ve gone missing.

Disadvantages

* it’s consume more storage
* Facial recognition technology’s indiscriminate and large-scale recording, storing and analysing images
* Blanket surveillance can deter individuals from attending public events

3.2 Feasibility Study

A feasibility study is an assessment of the practicality of a proposed project or system. Generally, feasibility studies precede technical development and project implementation

## Chapter 4 METHODOLOGIES

4.1 A covolutional nerual network approach

Face represent complex multidimensional meaningful visual stimuli and developing a computional model for face recognition is some what hard to perfect face and some one subject or object can clone the face so , we present a hybrid nerual networking solution wich compares favorably with combining of (

”EIGN FACE RECONITION and A CONVOLUTION NERUAL NETWORK-

ING APPROACH ”) the system combine ” local image ” and ” present image ”sampling , a self organizing map in the formate of (SOM) nerual net working and a convolational nerual network , The SOM provide a quantization of the image sample into a topological space where inputs that near by the orginal space , there by providing dimensionality redution and invariance to minor changes in the image sample , and the convolutional nerual network provides for the partial invariance to transulation , rotation , scale , and deformation . The convolution nerual network extract image successively larger features in a hierarchinal set of layers . we presenting results using the Karhunen Loeve (KL) transform in place of the SOM , and a multilayer perceptron (MLP) in place of the convolutional network . The KL transform performs almost as well (5.3% error versus

3.8%) . THE( MLP)performs very poorly (40% error versus to 3.8%) ,

4.2 Eigenface for recogintion

Much of the previous work on automated face recognition has ignored he issue of just what aspects of the face stimulus are important for pedefined measurements were relevant and sufficient.This us that an information theory approach of coding and decoding face images may give insight into the information content of face images,emphasizing the significant local and global “features”. Such features may or may not be directly related to our intuitive notion of face features such as the eyes, nose, lips, and hair.In the language of information theory, we want to extract the relevant,information in a face image, encode it as efficiently as possible, and compare one face,encoding with a database of models encoded similarly. A simple approach to extracting.the information contained in an image of a face is to somehow capture the variation in collection of face images, independent of any judgement of features, and use this information to encode and compare individual face images.In mathematical terms, we wish to find the principal components of the distribution of faces, or the eigenvectors of the covariance matrix of the set of face images. These eigenvectors can be thought of asa set of features which together characterize the variation between face images. Each image location contributes more or less to each eigenvector, so that we can display the eigenvector as a sort of ghostly face which we call an

eigenface.

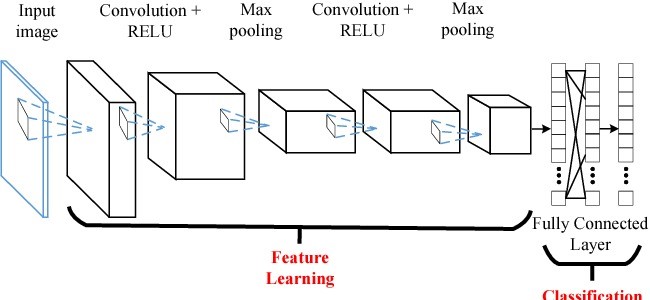


Figure 4.1: Convolution Neural Network

## Chapter 5 RESULTS AND DISCUSSIONS

These experiments show an increase of performance accuracy as the acceptance threshold decreases. This can be tuned to achieve effectively perfect recognition as the threshold tends to zero, but at the cost of many images being rejected as unknown. The tradeoff between rejection rate and recognition accuracy will be different for each of the various face recognition applications.The results also indicate that changing lightingconditions causes relatively few errors, while performance drops dramatically with size change. the neighborhood pixel correlation remains high,clear that there is a need for a multiscale approach, so that faces at particular size are compared with one another People are constantly moving. Even while sitting, we fidget and adjust our body position, blink, look around, and such. For the case of a moving person in a static environment, we built a simple motion detection and tracking system, which locates and tracks the position of the head. Simple spatio-temporal filtering followed by a nonlinearity accentuates image locations that change in intensity over time, so a moving person “lights up” in the filtered image.

Chapter 6

CONCLUSION AND FUTURE

## ENHANCEMENTS

6.1 Conclusion

This paper has described advances in the authors’face detection and recognition technologies. For facedetection, a hierarchical scheme for combined face and eye detection has been developed, based on the Generalized Learning Vector Quantization method. For face recognition, the perturbation space method has been improved to reduce the adverse effects of illumination changes as well as of pose changes. Experimental results reveal that the proposed method achieves much higher performances for several databases than by our previous method. It is also revealed that the accuracy of eye positions by the proposed face detection method is almost the same as for human estimation. This would be greatly helpful for putting automatic face recognition into practice. In future works, estimating three-dimensional facial shape from an image should be developed to improve the recognition performance even further.

6.2 Future Enhancements

The Face Recognition (FR) is growing as a major research area because of the broad choice of applications in the fields of commercial and law enforcement. Traditional FR methods based on Visible Spectrum (VS) are facing challenges like object illumination, pose variation, expression changes, and facial disguises.

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