Project Topic

FACE DETECTION

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UNDER THE GUIDANCE OF

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PROJECT REPORT
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TO WHOM IT MAY CONCERN

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CERTIFICATEOF APPROVAL

The fore going Project is here by accepted as a credible study of an engineering subject carried out and presented in a manner satisfactory to warrant its acceptance as a prerequisite to the degree for which it has been submitted. It is understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn there in, but approve the project only for the purpose for which it is submitted.

FINAL EXAMINATION FOR
EVALUATION OF PROJECT

1. _____

2._____

(Signature of Examiners)

ACKNOWLEDGEMENT

The achievement that is associated with the successful completion of this project would be incomplete without mentioning the names whose endless cooperation made it possible. I would like to convey my regards to our college 'RCC INSTITUTE OF INFORMATION TECHNOLOGY' and our respected Principal for giving us such nice opportunity to enhance our skills in this domain.
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1. TITLE OF THE PROJECT

FACE DETECTION AND RECOGNITION SYSTEM

2. CATEGORY OF THE PROJECT

Simple solution of face detection with rich graphical design and image handling operations.

3. INTRODUCTION

In this work, a software for human face detection and recognition is prepared. Initial implementation of this work is service oriented. However, the analysis and design are done to promote the work as product based. The work is entitled as Face Detection and Recognition System.

Face Detection is a application software to deal with human face. It has the provisions to collect image from the user so that they can detect the eyes, nose, mouth and whole face of human in the image.

There are various advantages of developing an software using face detection and recognition in the field of authentication. Face detection is an easy and simple task for humans, but not so for computers. It has been regarded as the most complex and challenging problem in the field of computer vision due to large intra-class variations caused by the changes in facial appearance, lighting and expression. Face detection is the process of identifying one or more human faces in images or videos. It plays an important part in many biometric, security and surveillance systems, as well as image and video indexing systems.
Face detection can be regarded as a specific case of object-class detection. In object-class detection, the task is to find the locations and sizes of all objects in an image that belong to a given class.

The project titled 'Face Detection and Recognition System', is to manage all the front end back end system of finding or detecting particular region in human face. This software helps the people looking for more advanced way of image processing system. Using this software they can easily find or detect faces in image and also recognize the face after saving that. Face-detection algorithms focus on the detection of frontal human faces. It is analogous to image detection in which the image of a person is matched bit by bit. Image matches with the image stores in database. Any facial feature changes in the database will invalidate the matching process.

A reliable face-detection approach based on the genetic algorithm and the eigen-face technique.

Firstly, the possible human eye regions are detected by testing all the valley regions in the gray-level image. Then the genetic algorithm is used to generate all the possible face regions which include the eyebrows, the iris, the nostril and the mouth corners.

Each possible face candidate is normalized to reduce both the lightning effect, which is caused by uneven illumination; and the shirring effect, which is due to head movement. The fitness value of each candidate is measured based on its projection on the eigen-faces. After a number of iterations, all the face candidates with a high fitness value are selected for further verification. At this stage, the face symmetry is measured and the existence of the different facial features is verified for each face candidate.

Face detection is gaining the interest of marketers. A webcam can be integrated into a television and detect any face that walks by. The system then calculates the race, gender, and age range of the face.

4. OBJECTIVE:

Whenever we implement a new system it is developed to remove the shortcomings of the existing system. The computerized mechanism has the more edge than the manual system. The existing system is based on manual system which takes a lot of time to get performance of the work.

The proposed system is a web application and maintains a centralized repository of all related information. The system allows one to easily access the software and detect what he wants.

5. GOALS OF PROPOSED SYSTEM:

a. Planned approach towards working: - The working in the organization will be well planned and organized. The data i.e. Image will be stored properly in database stores which will help in retrieval of information as well as its storage.

b. Accuracy: - The level of accuracy in the proposed system will be higher. All operation would be done correctly and it ensures that whatever information is coming from the center is accurate.

c. Reliability: - The reliability of the proposed system will be high due to the above stated reasons. The reason for the increased reliability of the system is that now there would be proper storage of information.

d. No Redundancy: - In the proposed system utmost care would be that no information is repeated anywhere, in storage or otherwise. This would assure economic use of storage space and consistency in the data stored.

e. Immediate retrieval of information**: -** The main objective of proposed system is to provide for a quick and efficient detection of required information. Any type of detection would be available whenever the user requires.

f. Immediate storage of information: - In manual system there are many problems to store the largest amount of information for processing.

g. Easy to Operate**: -** The system should be easy to operate and should be such that it can be developed within a short period of time and fit in the limited budget of the user.

6. ABSTRACT:

The project tiled ‘Face Detection and Recognition’ is done using the languages MATLAB, JSP, HTML as front end and MySQL as back end. This software offers an effective and easy way for a Face Detection System. In this project, we have used voila-jones algorithm to detect faces.
After being registered, a person can look for his data, store data securely and do all the works online.

Viola-Jones algorithm:

There are different types of algorithms used in face detection. Here, we have used Viola-Jones algorithm for face detection using MATLAB program. This algorithm works in following steps:

1. Creates a detector object using Viola-Jones algorithm
2. Takes the image from the video
3. Detects features
4. Annotates the detected feature

7. SPECIFICATION OF MODULE:

Before starting to design a software product, it is extremely important to understand the precise requirements of the user and to document them properly.

The goal of the requirement analysis and specification phase is to clearly understand the customer's requirements and to systematically organize these requirements in a specification document. Login system requires simple hardware and software to be implemented. This is a highly cost effective system which places no hard and fast restrictions on how environment and tools are to be used for its implementation. This is a highly flexible application from the view point of its execution in diverse environments. The technologies used for its development are all inbuilt since open source software is used. So no copyright issues are involved for installing and executing this software.

8. SYSTEM REQUIREMENT:

SOFTWARE AND HARDWARE SPECIFICATIONS

Development on the SOFTWARE

Technology	: MATLAB
Web Technologies	: Html, JSP, JavaScript, CSS, Adobe
Database	: MySql5.0
JDK Version	: JDK1.5

Development on the HARDWARE:

Processor	: Pentium
RAM	: 1GB

9. FACE DETECTION:

The problem of face recognition is all about face detection. This is a fact that seems quite bizarre to new researchers in this area. However, before face recognition is possible, one must be able to reliably find a face and its landmarks. This is essentially a segmentation problem and in practical systems, most of the effort goes into solving this task. In fact the actual recognition based on features extracted from these facial landmarks is only a minor last step.

There are two types of face detection problems:

1) Face detection in images and

2) Real-time face detection

10. FACE DETECTION STEPS:

1. Pre-Processing:

To reduce the variability in the faces, the images are processed before they are fed into the network. All positive examples that is the face images are obtained by cropping images with frontal faces to include only the front view. All the cropped images are then corrected for lighting through standard algorithms.

2. Classification: Neural networks are implemented to classify the images as faces or non faces by training on these examples. We use both our implementation of the neural network and the MATLAB neural network toolbox for this task. Different network configurations are experimented with to optimize the results.

3.Localization:

The trained neural network is then used to search for faces in an image and if present localize them in a bounding box. Various Feature of Face on which the work has done on:- Position Scale Orientation Illumination.

11.FACE RECOGNIZATION:

There are two predominant approaches to the face recognition problem: Geometric (feature based) and photometric (view based). As researcher interest in face recognition continued, many different algorithms were developed, three of which have been well studied in face recognition literature.

Recognition algorithms can be divided into two main approaches:

1. Geometric:

It is based on geometrical relationship between facial landmarks, or in other words the spatial configuration of facial features. That means that the main geometrical features of the face such as the eyes, nose and mouth are first located and then faces are classified on the basis of various geometrical distances.

2. Photometric:

It is used to recover the shape of an object from a number of images taken under different lighting conditions. The shape of the recovered object is defined by a gradient map, which is made up of an array of surface.

12. DIGITAL IMAGE PROCESSING:

Interest in digital image processing methods stems from two principal application areas:

1. Improvement of pictorial information for human interpretation
2. Processing of scene data for autonomous machine perception

In this second application area, interest focuses on procedures for extracting image information in a form suitable for computer processing.

Examples includes automatic character recognition, machine vision for product assembly and inspection, military recognizance, automatic processing of fingerprints etc.

Image:

An image refers a 2D light intensity function f(x, y), where(x, y) denotes spatial coordinates and the value of f at any point (x, y) is proportional to the brightness or gray levels of the image at that point. A digital image is an image f(x, y) that has been discredited both in spatial coordinates and brightness. The elements of such a digital array are called image elements or pixels.

A simple image model:

To be suitable for computer processing, an image f(x, y) must be digitalized both spatially and in amplitude.

Digitization of the spatial coordinates (x, y) is called image sampling.
Amplitude digitization is called gray-level quantization.

13. Types of image processing:

1. Low level processing : Low level processing means performing basic operations on images such as reading an image resize, resize, image rotate, RGB to gray level conversion, histogram equalization etc…, The output image obtained after low level processing is raw image.

2. Medium level processing : Medium level processing means extracting regions of interest from output of low level processed image. Medium level processing deals with identification of boundaries i.e., edges .This process is called segmentation.

3. High level processing : High level processing deals with adding of artificial intelligence to medium level processed signal.

14. FUNDAMENTAL STEPS IN IMAGE PROCESSING:

Fundamental steps in image processing are

1. Image acquisition: to acquire a digital image
2. Image pre-processing: to improve the image in ways that increases the chances for success of the other processes.
3. Image segmentation: to partitions an input image into its constituent parts of objects.
4. . Image description: to extract the features that result in some quantitative information of interest of features that are basic for differentiating one class of objects from another.
5. Image recognition: to assign a label to an object based on the information provided by its description.
6. Image segmentation: to convert the input data to a from suitable for computer processing.

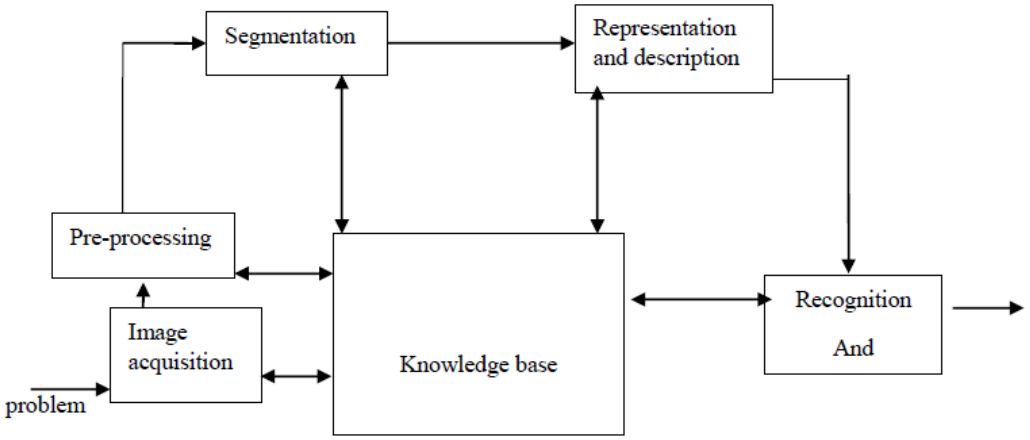


fig.3.1. Fundamental steps in digital image processing

A simple image formation model:

Image are denoted by two-dimensional function f(x, y).f(x, y) may be characterized by 2 components:

1. The amount of source illumination i(x, y) incident on the scene

2. The amount of illumination reflected r(x, y) by the objects of the scene

3. f(x, y) = i(x, y)r(x, y), where 0 < i(x,y) < and 0 < r(x, y) < 1

image Formats (supported by MATLAB Image Processing Toolbox)

Format name	Full name	Description	Recognized extensions
TIFF	Tagged Image File Format	A flexible file format supporting a variety image compression standards including JPEG	.tif, .tiff
JPEG	Joint Photographic Experts Group	A standard for compression of images of photographic quality	.jpg, .jpeg
GIF	Graphics Interchange Format	Frequently used to make small animations on the internet	.gif
BMP	Windows Bitmap	Format used mainly for simple uncompressed images	.bmp
PNG	Portable Network Graphics	Compresses full color images with trasparency(up to 48bits/p	.png

Table.3.3. Image Formats Supported By MATLAB

15. PROJECT OBJECTIVES:

To develop an efficient Face Detection system with front end web interface and back end database.

16. DIAGRAMS:

a.DATA FLOW DIAGRAM:

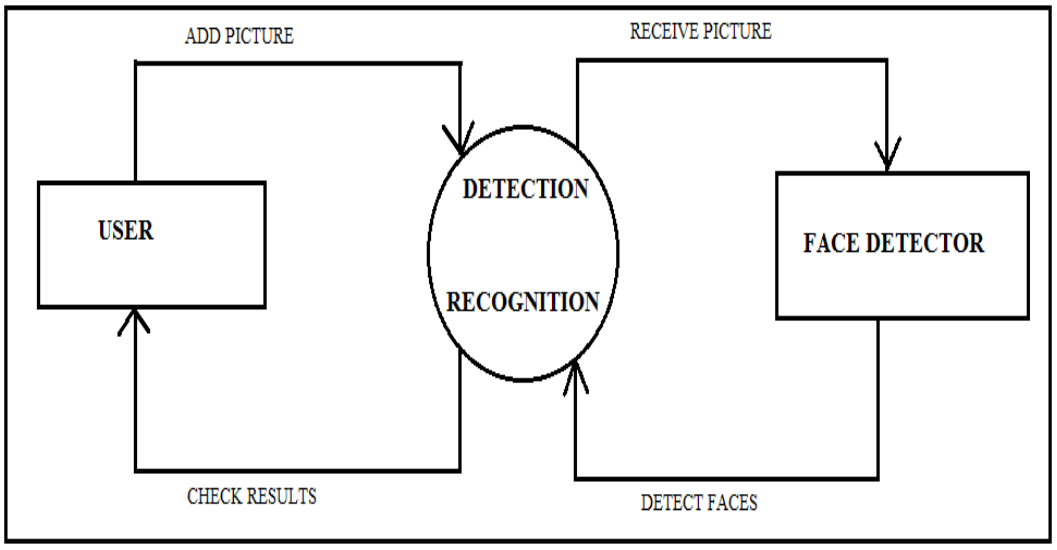


Fig1: data flow diagram (level 0)

b. ENTITY RELATIONSHIP DIAGRAM:

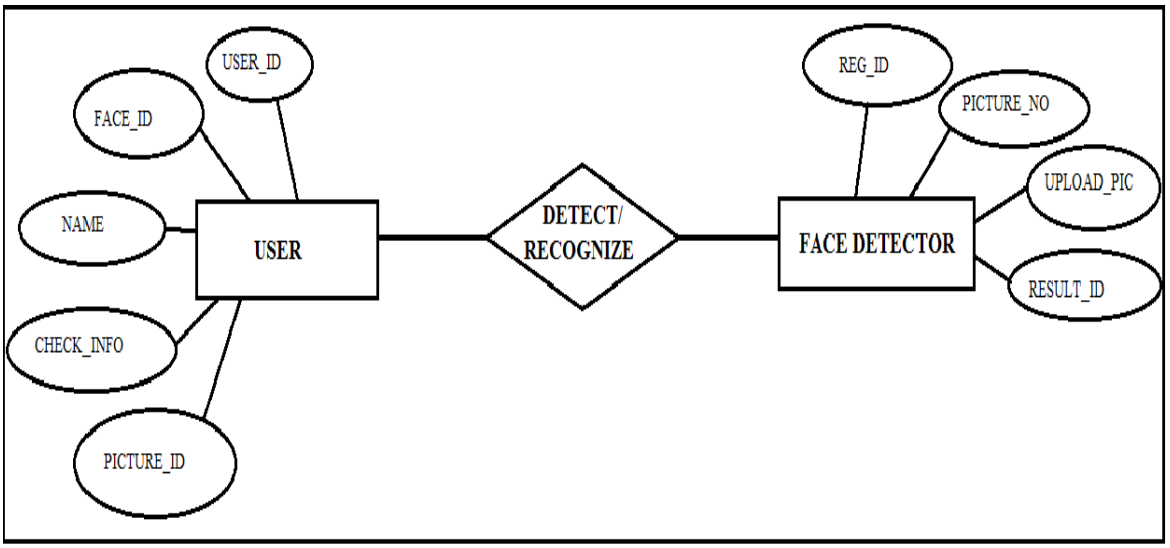
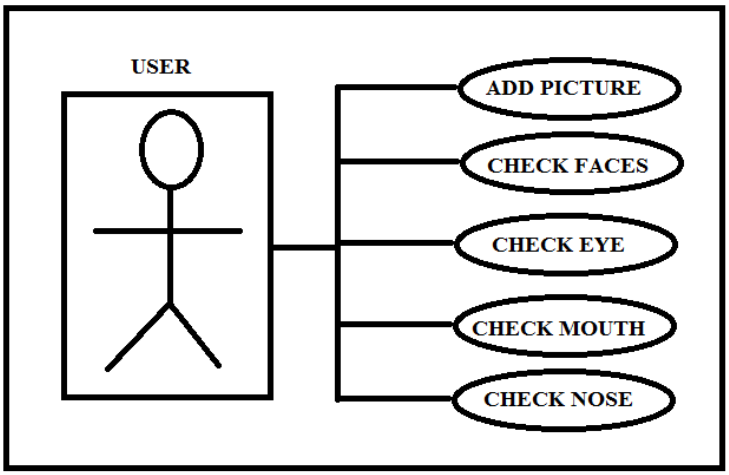


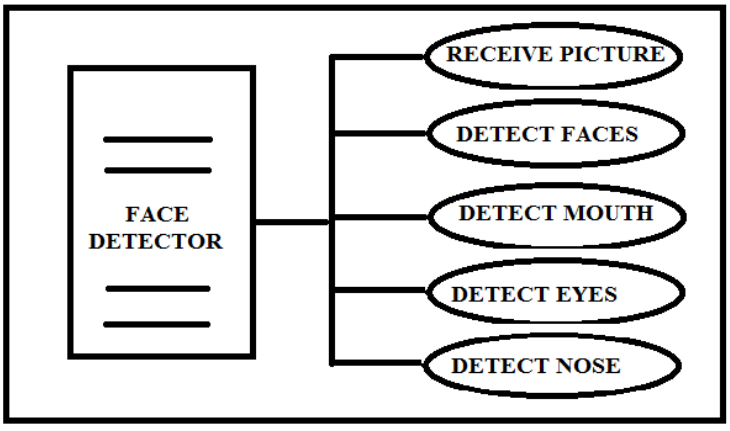
Fig2: E-R diagram

c. USE CASE DIAGRAM:

User Module:



Software Module:



17. PROGRAM CODE:

1. FACE DETECTION:

```
clear all
clc
%Detect objects using Viola-Jones Algorithm
%To detect Face
FDetect = vision.CascadeObjectDetector;
%Read the input image
I = imread('cameraman.jpg');
%Returns Bounding Box values based on number of objects
BB = step(FDetect,I);
figure,
imshow(I); hold on
for i = 1:size(BB,1)
rectangle('Position',BB(i,:),'LineWidth',5,'LineStyle','-','EdgeColor','r');
end
title('Face Detection');
hold off;
```

2. NOSE DETETION:

```
NoseDetect = vision.CascadeObjectDetector('Nose','MergeThreshold',16);
BB=step(NoseDetect,I);
figure,
imshow(I); hold on
for i = 1:size(BB,1)
rectangle('Position',BB(i,:),'LineWidth',4,'LineStyle','-','EdgeColor','b');
end
title('Nose Detection');
hold off;
```

3. EYE DETECTION:

```
%To detect Eyes
EyeDetect = vision.CascadeObjectDetector('EyePairBig');
%Read the input Image
I = imread('harry_potter.jpg');
BB=step(EyeDetect,I);
figure,imshow(I);
rectangle('Position',BB,'LineWidth',4,'LineStyle','-','EdgeColor','b');
title('Eyes Detection');
```

```
Eyes=imcrop(I,BB);
figure,imshow(Eyes);
hold off;
```

4. **MOUTH DETECTION:** %mouth detect

```
    MouthDetect  = vision.CascadeObjectDetector ('Mouth','MergeThreshold',16);
BB=step(MouthDetect,I);
figure,
imshow(I); hold on
for i = 1:size(BB,1)
rectangle('Position',BB(i,:),'LineWidth',4,'LineStyle','-','EdgeColor','r');
end
title('Mouth Detection');
hold off;
```

18. HOW TO MIGRATE THE APPLICATION:

To reuse and reengineer the developed code and database, provide the details migration details as follows. The migration includes database migration of Oracle 11G from one computer to another computer in Microsoft platform. After database migration, software needs to be migrated.

19.CONCLUSION:

Our goal is to provide the users a wonderful experience of studying and gathering knowledge. The computational models, which were implemented in this project, were chosen after extensive research, and the successful testing results confirm that the choices made by the researcher were reliable.

The system with manual face detection and automatic face recognition did not have recognition accuracy over 90%, due to the limited number of eigen faces that were used for the PCA transform. This system was tested under very robust conditions in this experimental study and it is envisaged that real-world performance will be far more accurate.

The fully automated frontal view face detection system displayed virtually perfect accuracy and in the researcher's opinion further work need not be conducted in this area.

The fully automated face detection and recognition system was not robust enough to achieve a high recognition accuracy. The only reason for this was the face recognition subsystem did not display even a slight degree of invariance to scale, rotation or shift errors of the segmented face image.

This was one of the system requirements identified in section However, if some sort of further processing, such as an eye detection technique, was implemented to further normalize the segmented face image, performance will increase to levels comparable to the manual face detection and recognition system. There are better techniques such as iris or retina recognition and face recognition using the thermal spectrum for user access and user verification applications since this need a very high degree of accuracy.

The real-time automated pose invariant face detection and recognition system would be ideal for crowd surveillance applications. The implemented fully automated face detection and recognition system (with an eye detection system) could be used for simple surveillance applications such as ATM user security, while the implemented manual face detection and automated recognition system is ideal of mug shot matching., were we obtained in this study, which was conducted under adverse conditions. Implementing an eye detection technique would be a minor extension to the implemented system and would not require a great deal of additional research. All other implemented systems displayed commendable results and reflect well on the deformable template and Principal Component Analysis strategies.

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