

**GLOBAL INSTITUTE OF MANAGEMENT SCIENCES
(AFFILIATED TO BANGALORE UNIVERSITY)**

**No.6, 3rd cross, D road, Ideal Homes Township, Second phase, Rajarajeswarinagar,
Bangalore-560098**



**DEPARTMENT OF COMPUTER APPLICATIONS
SOFTWARE REQUIRMENTS SPECIFICATION
ON
“FACE RECOGNITION”**

Submitted

By

HARISH .V

(18XBSB7018)

HEMANTH KASHYAP

(18XHBSB7021)

Under the guidance

of

DR . BHANU K. N.

Department of Computer Applications



Towards

Project

Prescribed By the **Bangalore University** for the
5th semester Bachelor of Computer Applications

For the academic year **2020**

INDEX

TABLE OF CONTENTS

1. ABSTRACT

2. Introduction

❖ FACE RECOGNITION

- Different approaches of face recognition
- Recognition algorithms can be divided into two main approaches:

1. Geometric

2. Photometric stereo

- Popular recognition algorithms include

❖ FACE DETECTION

- The face detection system can be divided into the following steps:

1. Pre-Processing

2. Classification

3. Localization

❖ Problems And Objectives

❖ Objectives

3. Literature Review

❖ Biometrics

❖ Face Recognition

❖ Shortcomings of Face Recognition

❖ History and Projects which using Face Recognition

❖ Purpose

❖ Scope of Project

4. References

5. The Overall Description

❖ System Environment

- ❖ Performance The System Requirement
- ❖ Operating Environment

6. External Interface Requirements
7. Security
8. Portability
9. Performance Requirements

ABSTRACT

Face (facial) recognition is the identification of humans by the unique characteristics of their Faces. Face recognition technology is the least intrusive and fastest biometric technology. It works with the most obvious individual identifier the human face. With increasing security needs and with advancement in technology extracting information has become much simpler. This project aims on building an application based on face recognition using different algorithms and comparing the results. The basic purpose being to identify the face and retrieving information stored in the database. It involves two main steps. First to identify the distinguishing factors in image n storing them and Second step to compare it with the existing images and returning the data related to that image. Keywords : Face Recognition, GrayScale Algorithm, Harcascade algorithm, Open CV . –

Introduction

Face recognition is the task of identifying an already detected object as a known or unknown face. Often the problem of face recognition is confused with the problem of face detection. Face Recognition on the other hand is to decide if the "face" is someone known, or unknown, using for this purpose a database of faces in order to validate this input face.

FACE RECOGNIZATION

DIFFERENT APPROACHES OF FACE RECOGNITION:

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: 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 and angles between features.
2. Photometric stereo: 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 normals (Zhao and Chellappa, 2006)

Popular recognition algorithms include

1. Principal Component Analysis using Eigenfaces, (PCA)
2. Linear Discriminate Analysis
3. Elastic Bunch Graph Matching using the Fisherface algorithm

FACE DETECTION

Face detection involves separating image windows into two classes; one containing faces (tarning the background (clutter)). It is difficult because although commonalities exist between faces, they can vary considerably in terms of age, skin colour and facial expression. The problem is further complicated by differing lighting conditions, image qualities and geometries, as well as the possibility of partial occlusion and disguise. An ideal face detector would therefore be able to detect the presence of any face under any set of lighting conditions, upon any background. The face detection task can be broken down into two steps. The first step is a classification task that takes some arbitrary image as input and outputs a binary value of yes or no, indicating whether there are any faces present in the image. The second step is the face localization task that aims to take an image as input and output the location of any face or faces within that image as some bounding box with (x, y, width, height).

The face detection system can be divided into the following 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 Department of ECE Page 3 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 nonfaces 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 Department of ECE Page 4 CHAPTER-2 LITERATURE SURVEY Face

Problems And Objectives

The problem of face recognition can be stated as follows : Face Recognition human facial features like the mouth, nose and eyes in a full frontal face image. We will be adapting a multi-step process in order to achieve the goal. To detect the face region we will be using a skin-color segmentation method. Morphological techniques will be adapted to fill the holes that would be created after the segmentation process. From the skeletonization process, a skeleton of the face will be obtained from which face contour points could be extracted. Facial features can be located in the interior of the face contour. We will use several different facial-images to test our method.

Objectives

- Trying to find a face within a large database of faces. In this approach the system returns a possible list of faces from the database. The most useful applications contain crowd surveillance, video content indexing, personal identification (example: drivers license), mugshots matching, etc.

- Real time face recognition: Here, face recognition is used to identify a person on the spot and grant access to a building or a compound, thus avoiding security hassles. In this case the face is compared against multiple training samples of a person

Literature Review

- Biometrics

Biometrics is used in the process of authentication of a person by verifying or identifying that a user requesting a network resource is who he, she, or it claims to be, and vice versa. It uses the property that a human trait associated with a person itself like structure of data with the incoming data can verify the identity of a particular person. There are many types of biometric systems like detection and recognition, iris recognition etc. These traits are used for human identification in surveillance systems, criminal identification, face details etc. By comparing the existing fingerprint recognition

- Face Recognition

Human beings have recognition capabilities that are unparalleled in the modern computing era. These are mainly due to the high degree of interconnectivity, adaptive nature, learning skills and generalization capabilities of the nervous system. The human brain has numerous highly interconnected biological neurons which, on some specific tasks, can outperform. Early face recognition algorithms used simple geometric models, but recently the recognition process has now matured into a science of sophisticated mathematical representations and matching processes. Major advancements and initiatives have propelled face recognition technology into the spotlight. Face recognition technology can be used in a wide range of applications. Computers that detect and recognize faces could be applied to a wide variety of practical applications including criminal identification etc. Face detection and recognition is used in many places nowadays, verifying websites hosting images and social networking sites. Face recognition and detection can be achieved using technologies related to computer science. Features extracted from a face are processed and compared with similarly processed faces present in the database. If a face is recognized it is known or the system may show a similar face existing in the database else it is unknown. In surveillance systems if an unknown face appears more than one time then it is stored in a database for further recognition. These Steps are very useful in criminal identification. In general, face recognition techniques can be divided into two groups based on the face representation they use appearance-based, which uses holistic texture features and is applied to either whole-face or specific face image and feature-based, which uses geometric facial features (mouth, eyebrows, cheeks etc), and geometric relationships between them.

- Shortcomings of Face Recognition

There are some issues that still need to be solved like illumination, pose and facial expression. Firstly, difference of illumination and pose and facial expression affect face recognition in a bad way like lighting of ambient can change among indoor and outdoor environments and because of the 3D of human face shape, illumination angle makes shadow some points on the face so, nodal points can be affected in a bad way and some information cannot be reached, so experts still struggle with this problem and they go on improving new image preprocessing algorithm for illumination variations. In addition, changing the pose and facial expression can cause loss of nodal points on the face because of

changing the measure of existent parts at a human face like lip, nose so, recognition fail rate can increase than before, so experts need to robust the algorithms to ensure consistency.

- History and Projects which using Face Recognition

Face Recognition system has been started at the 1960s due to the rise of crimes, so Woodrow Wilson Bledsoe who is the father of Facial Recognition started the first step of Facial Recognition systems and when the years show 2011, the government of Panama did first major installation of Face Recognition in an airport with U.S and also, Osama Bin Laden was identified by the face recognition system and he was killed in U.S. raid .

Purpose

The purpose of this System Requirement Specification document is describing the security system which is called Face Recognition system. This system aims to provide a security system which holds a personal information keep in safe and decrease the rate of information theft against who want to steal your private information. This document includes detailed information about requirements of the project. It also identifies the function and non-functional requirements .Overall, this document is used for how users interact with the system and understand how the mechanism works at backend without any problems and explains how concerns of the stakeholders are met.

Scope of Project

Most of the people use a private computer to do their jobs in the company and they may need to hide information in documents which relevant to work. Some information can be public and this files that are not important, if they are seized by someone else, but some files need a special protection system which is in the high-level secret status because people are wasting their time for hours on end and some hacker can steal their information from victim's computer easily without any protection system and worst of all, people are unprepared for this situation. The application to be improved is Recognition of Human Face Patterns for Biometric Identification. We offer a high-level security system which is the Biometric based on Face Recognition for a company who want to save their information from a hacker or information theft. The company should identify chosen workers to the security system according to document while using their face pattern on the camera. After registration done, only chosen workers can access the high-level secret documents, if face recognition can be done correctly. We are using Object Detection using Haar feature-based cascade classifiers is an effective object detection method proposed by Paul Viola and Michael Jones in their paper, "Rapid Object Detection using a Boosted Cascade of Simple Features" in 2001. It is a machine learning based approach where a cascade function is trained from a lot of positive and negative images. It is then used to detect objects in other images.

Here we will work with face detection. Initially, the algorithm needs a lot of positive images (images of faces) and negative images (images without faces) to train the classifier. Then we need to extract features from it. For this, haar features shown in below image are used. They are just like our convolutional kernel. Each feature is a single value obtained by subtracting sum of pixels under white rectangle from sum of pixels under black rectangle

References

- [open](#) cv
- Haar based cascade classifier
- Greyscale

The Overall Description

- System Environment

This application Face Recognition System. Firstly, A person's image should be provided using the camera. Then, camera transfers it to the Face Recognition System. Next, an image is pre- processed for features of face. After that, they are compared with an image in the system database and matched. The System Admin can do add and delete operations in the database, can set appropriate match rate of accepting user and handle whole application.

- Performance The System Requirement

The system will accept or reject user in 4 seconds, after scanning.

- Operating Environment

The system will use python as its programming language, there are no hardware or software constraints the system will use a web cam or an inbuilt camera to detect the faces.

External Interface Requirements

- User Interfaces

The user interface will run on Windows.

- Hardware Interfaces

The Face a Recognition system require a camera. The camera requires necessary driver installed within the operating system. Also, it requires 1 USB port on the PC.

- Software Interfaces

There are no external software interface requirements.

- Communication Interfaces

There are no external communications interface requirements

Security

The computer that runs the program will have its own security. Only the System Admin will log in to the system with his/her username and password. The person whose face and the iris are recognized will access to view the output.

Portability

To ensure portability, the application will be developed in PYTHON language.

Performance Requirements

Camera's visual must run smoothly without any error and delay more than 4sec to get the image of the user. This requirement is depended on many aspects of the user pc. Minimum requirements for running are:

1. GPU: Intel HD Graphics
2. CPU: Intel Celeron
3. Camera: Minimum 2MP Camera
4. USB port: 1x USB 2.0 or better port
5. Operating system: Windows XP or better