

HUMAN FACE DETECTION

A Project Work Synopsis

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BACHELOR OF ENGINEERING IN COMPUTER SCIENCE WITH SPECILIZATION IN ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

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ABSTRACT

Face detection is a computer technology being used in a variety of applications that identifies human faces in digital images. It also refers to the psychological process by which humans locate and attend to faces in a visual scene. Face-detection algorithms focus on the detection of frontal human faces. The goal of this project is to evaluate various face detection and recognition methods, provide complete solution for image-based face detection and recognition with higher accuracy, better response rate as an initial step for video surveillance. Solution is proposed based on performed tests on various face rich databases in terms of subjects, pose, emotions, race and light.

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1 INTRODUCTION

1.1 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 super computers. A child can accurately identify a face, but for a computer it is a cumbersome task. Therefore, the main idea is to engineer a system which can emulate what a child can do. Advancements in computing capability over the past few decades have enabled comparable recognition capabilities from such engineered systems quite successfully. 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.

1.2 The aim of the proposed work is to detect human faces from different images or videos at real time. This work will try to achieve some or all the following objectives:

The objectives of Face Recognition for Real-Time Applications are given below:

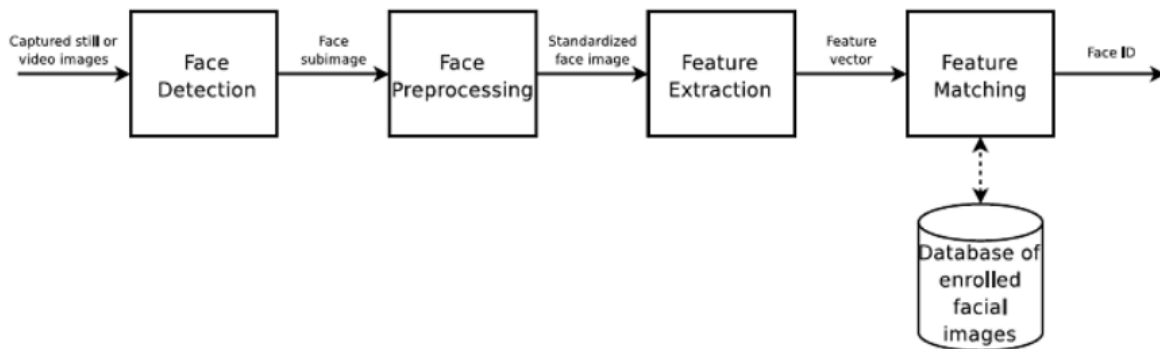
- Extract the important information in a face image.
- To enhance the Frame/sec for Face Recognition System, such that Recognition is done in Real Time.
- Presently, work on 30frames/sec Our motto is to achieve higher frames/sec or high Resolution frames/sec.

2 LITERATURE REVIEW

2.1 Today protection and surveillance structures are of fundamental importance in high- danger regions like military, groups and so forth. In a surveillance gadget, face popularity is a vital step for higher and accurate surveillance. The complexity includes in it are high measurement subspace, a selection of expressions, lighting fixtures, length etc. Motivates to develop a new and higher set of rules which genuinely decorate the safety of such systems. The necessity for private identification within the fields of personal and comfortable structures made face popularity one of the foremost fields of different biometric technologies. The importance of face reputation rises from the reality that a face popularity device does now not require the cooperation of

the man or woman even as the other structures want such cooperation. Face recognition algorithms attempt to remedy the hassle of each verification and identification. When verification is on call for, the face recognition machine is given a face photograph and its miles given a claimed identification. The system is anticipated to both reject or take delivery of the declare. On the other hand, inside the identity problem, the device is trained by a few images of regarded individuals and given a take a look at the image. It comes to a decision which character the check photo belongs to him.

The general face recognition model is as shown in Figure. The general face recognition model contains two basic parts Enrollment and Recognition. The Enrollment part includes Registration phase in which first the image is captured, then the face detection algorithm for capturing the image is called. The captured image is then stored in database. The second part that is the Face Recognition which takes place when teacher captures the image of the class. First image is captured then face detection of all students takes place, after detecting pre-processing is done on that image. Each students face features are extracted from the database and then the classification is done accordingly.



2.2 FACE DETECTION

a. High-Level Language based Face Detection P Daesik Jang, Gregor Miller, Sid Fels, and Steve Oldridge et. al. gives a new method for a user-oriented language model for face detection. Hear many open sources or commercial libraries to solve the trouble of face detection. There are still hard to use because they need explicit knowledge on details of algorithmic techniques. They projected a high-level language model for face detection with which users may develop systems easily. Important conditions are mainly considered to classify the big trouble of face detection. The conditions recognized here are then

represented as expressions in terms of a language model so that developers may use them to express various problems. Once the conditions have developed by users, the proposed associated interpreter interprets the conditions to find and classify the best algorithms to solve the represented problem with corresponding conditions. The purpose of this technique is to come up with a high level language model for face detection with which users will expand systems easily and even without specific knowledge of face detection theories and algorithms. By doing this, the problem of selecting algorithms and deciding complicated parameters for algorithms are isolated from development of face detection applications.

FEATURE EXTRACTION: PCA is used to extract features from an image of human face. The Flow chart of PCA Algorithm Principal component analysis (PCA) algorithm is used to extract features from a cropped and resized face image. It is used as a tool in predictive analysis and in explanatory data analysis and is used to transform higher dimensional data into lower dimensional data. A bunch of facial images in a training set of size $M \times M$ are converted into lower dimensional face images by applying principal component analysis technique.

FACE RECOGNITION: In this stage the data taken from the images are simulated using a previously trained ANN. The input will be a vector array from the previous stage. The networks are trained with face descriptors as input. The number of networks will be equal to the number of persons in the database. To understand the concept of Artificial Neural Networks, one should know how the natural neural network system in brain works. Natural Neural Networks system in the brain has neurons as the basic building blocks. All neurons are connected by a path to carry electrical signals referred to as synapses. They communicate through these paths and approximately there are 100 billion neurons in a brain. Each cell has inputs and outputs.

FACE TAGGING: In the Face Tagging stage the result from the simulation is used by the recognition system to tag an appropriate name to the image of the person. The data is in binary form and hence this block is also responsible in evaluating the expression into a certain value and matching it to a person's name in the name list. However, if the interpreted value is not one of the values listed in the roster, then the name returned will be automatically predefined as "Unknown".

3 PROBLEM FORMULATION

During software development, clones can occur in software intentionally or unintentionally. Our goal is to provide the users a wonderful experience. To keep pace with this fast-moving world, we need to be adaptable to changing circumstances. Face recognition is one of the most important aspects. And being able to develop these features is essential to growing a business. The computational models, which are implemented in this project, are chosen after extensive research, and the successful testing results confirm that the choices made by the researcher are 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 is 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.

4 OBJECTIVES

The proposed work is aimed to carry out work leading to the development of an approach for better Human Face Detection System. The proposed aim will be achieved by dividing the work into following objectives:

- 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.

5 METHODOLOGY

The following methodology will be followed to achieve the objectives defined for proposed research work:

Phase1: Searching research papers and collecting data of Face Detection and Recognition, software requirements.

Phase2: Implementation of code of Face Detection and Data Gathering and Train the Recognizer

Phase3: Implementation of code of Face Recognition

Phase4: Finalize Project and All Documentation of project.

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.

CONCLUSION AND FUTURE SCOPE:

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.

Future work is to work on the same domain but to track a particular face in a video sequence. That is like avoiding all other faces except the face required. To evaluate various face detection and recognition methods, provide complete solution for image based face detection and recognition with higher accuracy, better response rate as an initial step for video surveillance.

6 TENTATIVE CHAPTER PLAN FOR THE PROPOSED WORK

CHAPTER 1: INTRODUCTION

This chapter will cover the overview of face detection

CHAPTER 2: LITERATURE REVIEW

This chapter include the literature available of the pre-existing model available. The findings of the researchers will be highlighted which will become basis of current implementation.

CHAPTER 2: BACKGROUND OF PROPOSED METHOD

This chapter will provide introduction to the concepts which are necessary to understand the proposed system.

CHAPTER 4: METHODOLOGY

This chapter will cover the technical details of the proposed approach.

CHAPTER 5: CONCLUSION AND FUTURE SCOPE

The major finding of the work will be presented in this chapter. Also directions for extending the current study will be discussed.

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7 REFERENCES

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