

# Implementation of Symmetry Measures in Face Recognition Algorithm for Efficient Computation

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## Abstract

Face recognition presents a challenging problem in the field of image analysis and computer vision, and as such has received a great deal of attention over the last few years because of its many applications in various domains.

Face recognition system is a computer application for automatically identifying or verifying a person from a digital image or a video frame from a video source. Face recognition has been one of the principal concepts in the dictionary of Image Processing with innumerable applications.

**Keywords:** *Face recognition, Image analysis, Computer vision, Image processing*

## 1. Introduction

A facial recognition system is a computer application for automatically identifying or verifying a person from a digital image or a video frame a video source. One of the ways to do this by comparing selected facial features from the image to a facial database.

Face recognition is an important area if computer vision research and has gained significant interest in recent years. Efforts in improving security, such as automatic surveillance and the use of biometrics in identification, are partly responsible for this increased interest. However, several challenges remain in improving the accuracy of face recognition under illumination changes, variations in pose, occlusions (including self-occlusion), and image resolution. Many face recognition algorithms have been developed and each has its strengths and weakness.

It is well – known that the face exhibits reflection symmetry about a bilateral symmetry axis. The average – half- face exploits facial symmetry by dividing the frontal full face into two halves about

the bilateral symmetry axis, mirroring one of the halves across the symmetry axis, and then averaging the two resulting images. The use of the average- half –face in face recognition research has shown a potential increase in accuracy and decrease in storing and computation time as compared to using the original full face. In this project we demonstrate the effectiveness of using the average-half-face as an input to face recognition algorithms for an increase in accuracy and potential decrease in storage and computation time.

## 2. Literature Review

Face detection is a process that determines whether or not there are any faces in an image. Face detection is governed by lot external and internal factors which affect the detection. Even if a subject's face is stored in the database, a disguise or even a minor change in the appearance, like wearing sunglasses or wearing, growing a mustache can often fool the system. Even a usual facial expression can confuse the software. Facial identifiers often cannot distinguish twins. Different illuminations deform faces significantly.

## 3. Proposed methodology (Average –Half-Face)

The average –half –face is an average of the two halves of the face along a bilateral symmetry axis of the face, which has proven to produce better results than the original full face for 2D face data.

It is well –known that the face is roughly symmetrical and uses the idea of face symmetry to solve the problem of illumination in face recognition using Symmetric shape from- shading introduce the introduce the notion of 'Half-faces' (in the sense of exactly one half of the face) to assist in computing a similarity measures between faces using images that have non-uniform illumination. In face recognition,

the use of the bilateral symmetry of the face has been limited to extracting facial profiles for recognition.

#### 4. Implementation

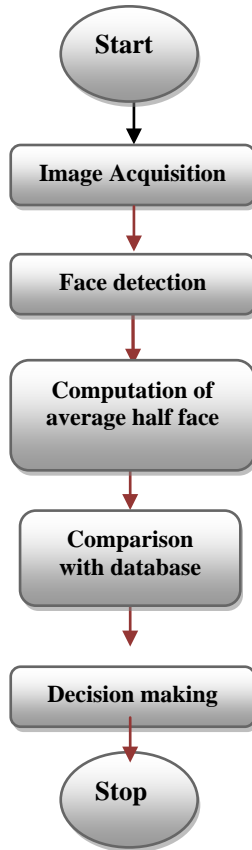


Fig. 1 Flow chart for proposed algorithm.

MATLAB is a high-level language and interactive environment for numerical computation visualizations, and programming. Using MATLAB, by you can analyze data, develop algorithms, and create models and applications. The language, tools, and built-in math functions enable you to explore multiple approaches and reach a solution faster than with spreadsheets or traditional programming languages, such as C/C++ or Java tm. You can sue MATLAB for a range of applications, including signal processing and communications, image and video processing, control systems test and measurement, computational finance, and computational biology. More than a million engineers and scientists in industry and academia use MATLAB, the language of technical computing.

#### 5. Conclusion

An Eigen faces based face recognition approach including the implementation of Symmetry measures were implemented in MATLAB. The project mainly consists of 2 phases as follows:

- Training
- Testing

In training phase the original images are projected onto a low-dimensional linear subspace termed as “face spaces” for reference, defined by Eigen faces are calculated using Principal Component Analysis (PCA).It also involved the implementation of symmetry measures which is one of the main goals of the project.

Coming to the testing phase, a new average-half-face in fact, we just selected an image of a person existing in the database and were compared to the database consisting of known face classes of different expressions of some persons. This approach was tested on a number of natural face images. Fairly good recognition results were obtained alongside showing the decrease in computation time.

#### 6. Future Enhancement

The future work will address the robustness of the proposed scheme against noise. The current system can be improved in many respects. The current system relies on the image database that is clicked from a particular distance which can be extended to clicking at any distance range. This would probably improve matching accuracy further and would provide more precise geometrical information which could be used to increase recognition performance. Further work will include introducing additional symmetry measures as well as extending this analysis to more databases of 2D faces. The system can be combined with the biometric in future for a better face recognition system.

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