**TABLE OF CONTENT**

|  |  |
| --- | --- |
| **CONTENTS** | **PAGE#** |
| Title | 2 |
| Abstract | 2 |
| Objectives | 2 |
| Description | 3 |
| Result outcome | 4 |
| conclusion | 4 |

----------------------------------------------------------------------------------------------------

**TITLE:**

*Face recognition*

**Abstract:**

As the world is advancing in Science and Technology, keeping security of one’s device is an important part of life, as all the information can be stored in the devices now days. After biometric the technology that is in mass use is the face recognition technology, it is currently been used to replace the biometric/fingerprint matching in technologies as face recognition can be fast and more efficient. Face recognition is also an important part to recognize criminals by matching their faces that has been captured by the CCTV camera.

**Objectives:**

The main goal of our project was to learn how a face recognition system work using Eigen values, Eigen vectors and Singular value decomposition using MATLAB as an ide.

**Description:**

In the project we have 3 functions namely readDatabase , meanimage, svd\_face\_recognition. Each function has it own working, but the main function is svd\_face\_recognition, it is used to call other 2 functions and run the face recognition test.

* **readDatabase**

This function is used for reading data from the database that contain 165 grey scale images from which 105 images are used to train the system and 60 images are used for testing purpose. Each image has been transformed into a matrix which is equal lent to its pixel that are 256X256, after each image has been transformed into 256 X 256 matrix form, they are converted to a one column form that will be 256^2 X 1 matrix form, after this transformation all the images used for training are being stored in one big matrix that will be of 256^2 X 105 matrix form.

* **Meanimage:**

This function is used for calculating the mean image of the train images from the train image dataset. The mean image will be combination of all the 105 images that have been train in the readDatabase function.

* **svd\_face\_recognition:**

This function is the main function of our face recognition system it is been used to recognize and find the accuracy of the find image with the test image, in this function we find the difference of each image with the mean image and afterward we find the SVD that is later used to find the Eigen value and Eigen vector of the big matrix that we calculated in readDatabase function, we then normalized the Eigenvector by dividing each eigen vector by its magnitude.

We follow the same steps for the image that is given to the system to test or to find its matching image from the train image dataset, to find the matching image from the train image for the dataset. we first find the weight of the test image by finding its normalize eigen vector and multiplying it by the difference that is obtained by subtracting the mean image from the test image.

To find the matching image from the train image dataset we compare test image weight with each train image from the train image dataset, by following this formula that is

Weight of test image – weight of train image

After comparing with all train images, we find the image with the least difference and says that it is our matching image with the test image.

**Output:**

**Graphical user interface, text, application

Description automatically generated**

**Image to be tested:**

**Graphical user interface, application

Description automatically generated**

**Matching image:**

**Graphical user interface

Description automatically generated**

**Conclusion:**

We analyzed the face recognition system that how does it work using Eigen values and Eigen vectors and we concluded that it matches the images by finding their Eigen vectors and magnitude and comparing them with other images and by checking which image have the most matched eigen vector.