CITS4402 – Facial Recognition using Linear Regression Classification

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**1. Overview**

The goal of this project was to develop a piece of software which could process and intelligently recognise faces. The images provided were grouped based on the individual. For each individual a number of photos were taken at different angles of their face. Furthermore, these photos were split into two groups; training and test images. The process used to process these images was taken from “Linear Regression for Face Recognition”, IEEE PAMI 2010.

**2. How to run**

1. Training images must be located in the directory where the **GUI.fig** and **GUI.m** and must be called *Training*.
2. In the *Training* directory, all the images from one class must be placed in a directory called where the class number is e.g. s1.
3. Within each class directory, each image must be labelled “1” through “10” and must be an image file. The extension does not matter.
4. Every class directory needs to have 10 images in it.
5. The *Testing* directory should follow the exact same format as the Training director however it can be located anywhere. You will be able to locate the directory through the GUI.
6. In both the Testing and Training directory, the class directories should follow the same naming convention i.e. the “s4” class in the training should have the same images the “s4” class in the Testing. This is so that our program can check if the identified image is correct and update the recognition accuracy.

Once you run the program a GUI will open: click the “Open Directory” button and you will be prompted to choose a testing directory. The program will then start training and this usually takes about 10-20 seconds. Once the training has been completed, the testing will begin which will be displayed on the screen. A recognition accuracy will be constantly updated and the minimum Y-Hat distance will be shown for every photo.

**3. Results**

We recorded the recognition accuracy which is obtained by checking if the program correctly predicted which class the image is from. We used 40 of the classes provided in the face dataset and 3 of our own classes which consisted of our group members. We ran the program with 1 through 9 training images being used.

When the program was run with 1 training image, it used the other 9 images as testing. When the program was run with 2 training images, it used the other 8 as testing and so on. When 1 training image was used, the accuracy was 74.255% and had the lowest recognition accuracy as expected. When 9 training images were used, the accuracy was 100%. This was expected, due to the large number of training images.

*Table 1: Recognition Accuracy vs Number of Training Images*

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Number of Training Images** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** |
| **Recognition Accuracy (%)** | 74.255 | 85.061 | 89.895 | 90.244 | 95.122 | 95.732 | 95.935 | 96.341 | 100.0 |

*Graph 1: Recognition Accuracy vs Number of Training Images*