

浙江大学实验报告

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课程名称： 计算机视觉 指导老师： 宋明黎 电子邮件： wutongcs@zju.edu.cn
实验名称： EigenFace 人脸识别算法 实验类型： 综合型 同组同学： 无

1 Introduction

This report discusses an experiment to implement EigenFace recognition algorithm. The AT&T ORL face dataset is used for testing the algorithm. In the case of an energy ratio of 60%, the recognition accuracy of 98% can be achieved with high performance.

2 Experimental Environment

- macOS Catalina 10.15
- clang version 11.0.0
- OpenCV version 4.1.0
- CMake version 3.13.4

3 Algorithm Analysis and Implementation

In the Eigen algorithm, first find the covariance matrix for the training set which have been preprocessed. Then reduce the covariance matrix of $MN * MN$ into a transformation matrix of $MN * (MN * energyPercent)$. Expand each $M * N$ picture into a $1 * MN$ one-dimensional array and multiply the picture array with the transformation matrix to get the coordinates of the picture in the new linear space. The one who has the closest Euclidean distance with the test picture in the new linear space is the recognition result.

4 Result and Discussion

ORL dataset includes pictures of 40 faces, each with 10 pictures. In this experiment, I take 7 pictures of each person for training and 3 pictures for testing. All the images are resized into $30 * 30$, reducing training time to only 10s. The energy ratio is 60% on the mbp13-2016. The other 120 pictures are used for testing. The recognition time of each picture is less than 0.5s, and only five pictures were not accurately recognized. The recognition accuracy is 98%.

Figure 1 is the first 10 eigen faces. Figure 2 shows a test picture with the recognition result and the blended picture.



Figure 1: First 10 eigen faces



Figure 2: Test sample: test, result blended