

EEE6082 Computational Vision

Coursework

Department of Electronic & Electrical Engineering

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Submit electronically to: ling.shao@sheffield.ac.uk with the subject line: "EEE6082"

The coursework contributes to 40% of the overall module marks.

Face Recognition Using SIFT Features

The aim of this coursework is to design a simple face image recognition algorithm based on local features. Local features are usually more robust than global features w.r.t. image cluttering, viewpoint changes and partial occlusion. The local features you will use in this coursework are the well-known SIFT features [1].

1. You are required to read the highly cited paper describing SIFT [1]. Try to understand how SIFT features are extracted and used for image matching. Download the demo software from <http://www.cs.ubc.ca/~lowe/keypoints/> and refer to the README file for instructions of how the SIFT features can be loaded and used in Matlab.
2. Design a simple face recognition algorithm using the SIFT features. The face image dataset can be downloaded from <http://hercules.shef.ac.uk/eee/teach/resources/eee6082/eee6082.html>, which contains 450 face images of 27 unique people (some people with only few face images can be removed from the dataset in your experiments). The face recognition algorithm would consist of the following steps:
 - a. Run the SIFT descriptor on each face image to output keypoints and their associated feature vectors. You may write a batch script to do this.
 - b. Use part of the face image dataset as the training set and the remaining as the test set, e.g. the training set can consist of 10 images from each people in the dataset. Necessary training is performed to construct a model for each people.
 - c. Classify each face image in the test set to a class. Classification can be done based on various methods, e.g. feature voting, K nearest neighbour, naïve Bayes nearest neighbour [2], support vector machine, bag of features.
 - d. Calculate the average recognition accuracy of the designed algorithm. Discuss the advantages and drawbacks of the algorithm and possible solutions to improve the performance.

If you use an existing algorithm, reference the relevant papers. Write a technical report about the detailed algorithm, experiments, results and discussion. Marks will be determined on the quality of work, understanding of the methodology, experimental results and the presentation.

References

- [1] David G. Lowe, "Distinctive image features from scale-invariant keypoints," *International Journal of Computer Vision*, 60, 2 (2004), pp. 91-110.
- [2] O. Boiman, E. Shechtman and M. Irani, "In Defense of Nearest-Neighbor Based Image Classification," *IEEE Conference on Computer Vision and Pattern Recognition*, 2008.

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