CSE 573 - Computer Vision and Image Processing

Project Proposal

UB Landscape Recognition System

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INTRODUCTION

We will be implementing a UB landscape recognition system using the bag-of-words approach for creating visual vocabulary and then training and classifying the images accordingly. This model will recognize different landscapes in UB south and north campus (for eg. : Davis Hall, Capen, Lake La Salle, etc). Davis Hall will be one class, Capen will be another, similarly each landscape/building will have their own respective classes.

For feature extraction, we will be looking into 2 feature descriptors (SIFT and SURF) and use the most optimal approach which provides a higher accuracy. The feature vectors obtained are clustered into several visual words, all of which together form a vocabulary. To classify images, a robust classifier will be used that provides the best results.

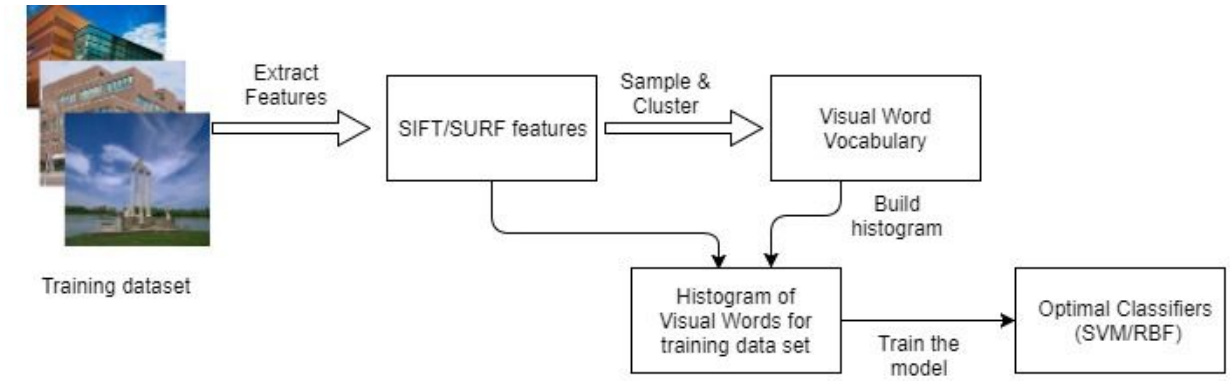
MOTIVATION

In Homework 1, we implemented a scene classification system using the bag-of-words approach and Spatial Pyramid Matching. We obtained an overall accuracy of 58.75 %. In this project, we aim to build a more accurate recognition system using SIFT/SURF feature extraction and SVM/RBF classifier to reduce the misclassification of the images observed in the former approach. Further, we will train this new system on our custom generated image dataset having different landscapes of University of Buffalo, where the system will predict image-classes using the Model generated by the classifier. In the end, test images are then passed to the system where the system will try to correctly classify each test image. The main objective of this project is to achieve higher accuracy rate (>=70%).

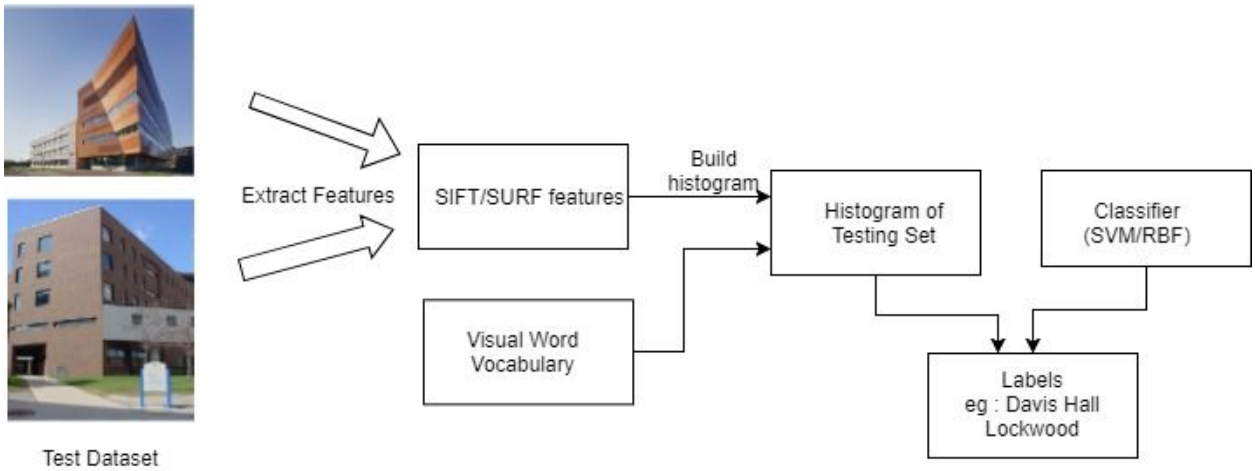
IMPLEMENTATION

1. Creation of UB Landscape dataset
2. Feature extraction for images using SURF/SIFT
3. Generation of visual vocabulary using k-means clustering
4. Creating the multi-level feature representation of the images using the histograms and SPM(Spatial Pyramidal Matching)
5. Learn a model for visual words based on bag-of-visual-words using SVM/RBF classifiers and generate training results.
6. Run the system on test dataset and compute the predicted labels of each image.

7. Compute confusion matrix and accuracy rate of correctly classified images for quantitative evaluation of the recognition system.



(a) Training Flowchart



(a) Testing Flowchart

SOFTWARE AND LIBRARIES USED

MATLAB and other relevant toolboxes.

TASK DISTRIBUTION AND SCHEDULE

		Team Members		
Tentative Schedule	**Tasks**	**Charushi**	**Jayant**	**Swati**
15th Nov - 18th Nov	UB Image Dataset	1	1	1
15th Nov - 22nd Nov	Literature Survey	1	1	1
15th Nov - 22nd Nov	Dataset Labeling	1	1	1
22nd Nov - 27th Nov	Features Detection	1	1	1
25th Nov - 30th Nov	Dictionary Generation	1	0	1
1st Dec - 2nd Dec	Histogram Generation	1	1	1
2nd - 6th Dec	Classifier Analysis	1	1	1
2nd - 6th Dec	Result Analysis	1	1	1
2nd Dec - 6th Dec	Visualisation	1	1	1
7th Dec-8th Dec	Documentation/Report	1	1	1

REFERENCE

1. Bag-of-Features (Bag-of-Words) -https://www.youtube.com/watch?v=iGZpJZhqEME
2. Kristen Grauman and Trevor Darrell. The pyramid match kernel: Discriminative classification with sets of image features. In Computer Vision, 2005. ICCV 2005. Tenth IEEE International Conference on, volume 2, pages 1458{1465. IEEE, 2005.
3. David G Lowe. Object recognition from local scale-invariant features. In Computer vision, 1999. The proceedings of the seventh IEEE international conference on, volume 2, pages 1150{1157. Ieee, 1999.
4. Hang Su. Scene recognition with bag of words http://cs.brown.edu/courses/cs143/2011/results/proj3/hangsu/