ICIP Papers Research Progress

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1 Research Dataset

My database is WHOI - Plankton database which contains 103 classes and about 3.6 millions images. I set the images collected in 2006 - 2013 as training database, and images collected in 2014 as test database. The classes and amount of training database and test database are showed in table 1. The reason why test database is just 95 classes is that 8 classes of images collected in 2014 are empty. They are: Bacillaria, Bidulphia, bubble, Gonyaulax, Hemiaulus, Karenia, Strombidium_wulffi, Tiarina_fusus, Tontonia_appendic_ulariformis.

表 1: Research Dataset

Category	Classes	Amount
train_dataset	103	3.2 million
test_dataset	95	0.3 million

2 Research Evaluating Indicator

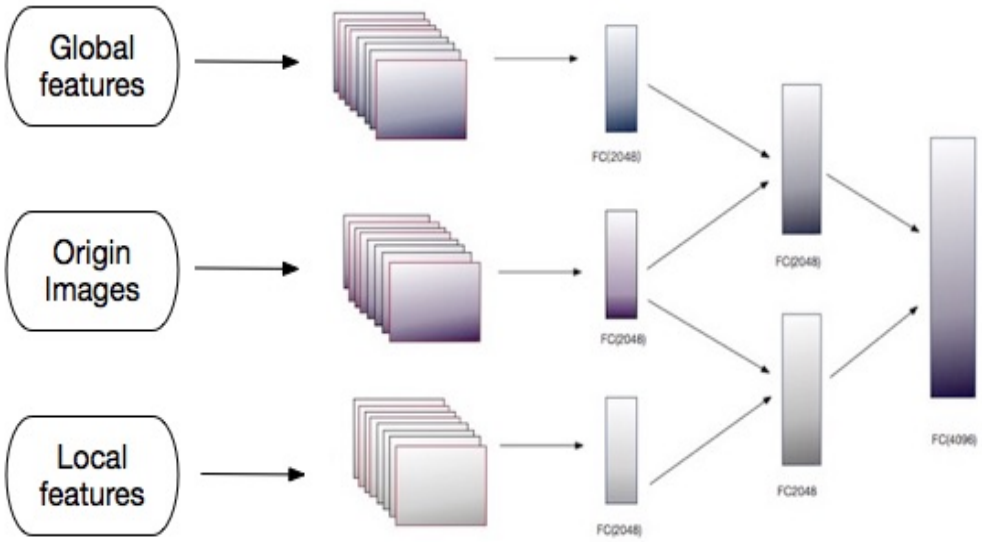
Classification Overall Accuracy:

$$classification\ overall\ accuracy = \frac{The\ amount\ of\ correct\ classified\ images}{The\ amount\ of\ all\ images}$$

I mainly focus on the overall accuracy of classifier and ignore the precision of each class. So, the classification overall accuracy is main evaluating indicator, a model with higher classification means more effective classifier. I aim to get higher and higher classification overall accuracy. Besides, the loss value is a reference.

3 Research Benchmark

My method of plankton classification is based on original CNNs, such as Cifar10, AlexNet, VGG16 and so on. As 3-channel AlexNet works better than 3-channel Cifar10, and VGG16 is too slow to train, so I choose AlexNet as main benchmark to test the effectiveness of different feature acquire methods during my feature-acquirement-methods-testing stage. After finding out the best method, I will try training on VGG16, and ResNet, and the other new types CNNs, such as Inception V4.



(a) Structure

My benchmark is training original images of our database on original CNNs to get the overall accuracy. After that, I need use my methods to acquire effective features and extend the convolution part (including convolution layer, pooling layer and Activation function layer) into three channels (showed in fig. a). After that, trained original images, global feature images and local feature images to trained on 3-channel CNNs to get the overall accuracy again. Finally, compare these two accuracies. Till now, I have got two benchmarks (AlexNet and VGG16):

表 2: Benchmarks

category	max_iter	highest_accuracy_iter	accuracy
AlexNet	200000	55980	93.58%
VGG16	200000	104000	94.89%

4 Research Method

We can see in figure(a) that, the global features and local features are vital. In the research, I mainly focus on acquiring effective global features and local features. As you can see in the following two figures, I aim to acquire effective global feature which means clear boundary which contains shape information without inside details and effective local feature which means clear and bright inside textures. To achieve this, my plan is as follows:

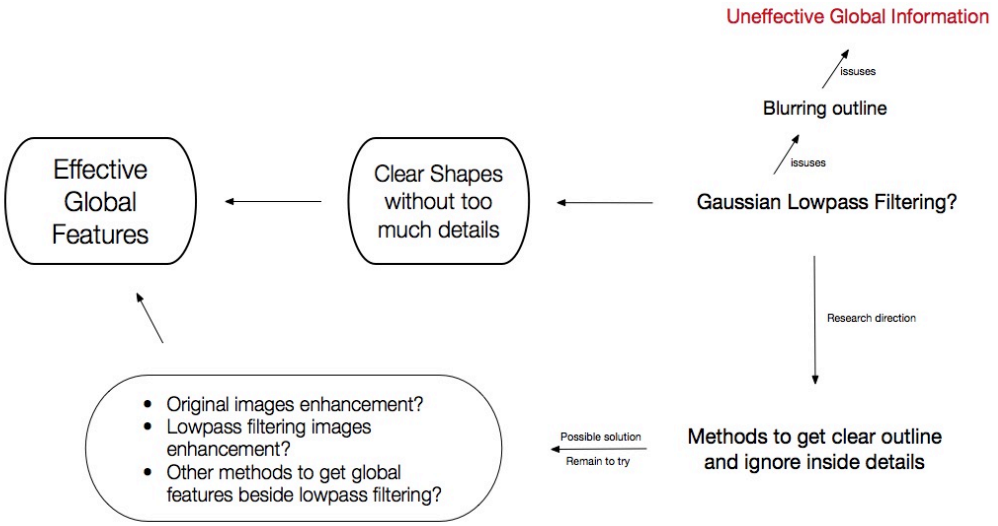
Firstly, I plan to change another enhancement method since logarithmic enhancement doesn't work well (verified by experiment, the accuracy after logarithmic enhancement didn't increase too much), I plan to try other enhancement methods.

Secondly, I plan to find out whether there are some enhancement methods can process the

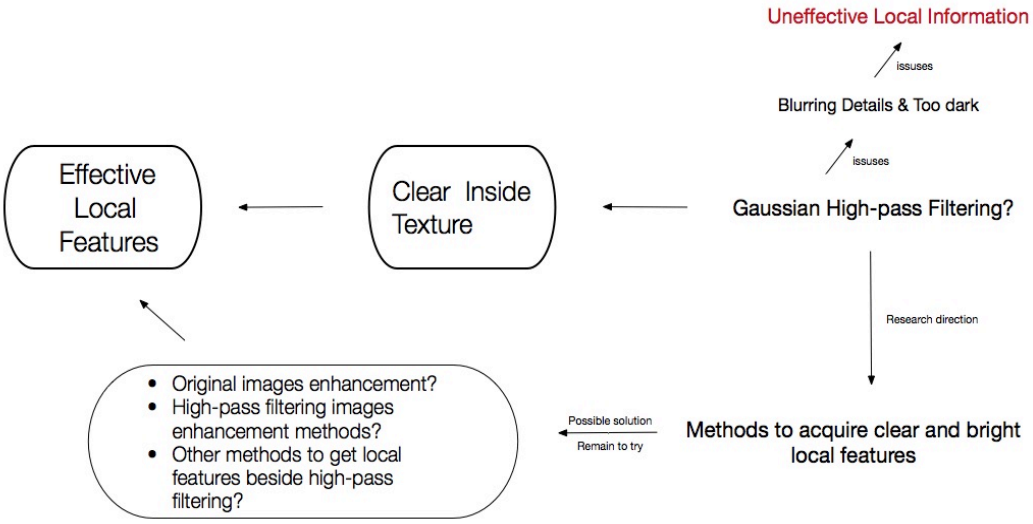
global feature images that can enhance the boundary.

Thirdly, I plan to try other methods to obtain global features and local features.

Finally, because the quality of original images is low, I wonder whether I can do enhancement to original images, such as histogram enhancement to get clear texture in dark parts of images.



(b) Global Features Acquirement



(c) Local Features Acquirement