Experiment Report

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12.12 - 12.18

1 Reverify Image Enhancement Method

1.1 Experiment Objective

I verified that enhancement method didn't contribute to the increase of the accuracy by three channel AlexNet last week. Firstly, the inputs are original images, high-pass filtering images after enhancement and lowpass filtering images. Next, the inputs are original images, high-pass filtering images without enhancement and lowpass filtering images. The accuracy is same. But I still doubt this result, so I decide to reverify the enhancement method again, I find that I am wrong last week.

1.2 Experiment Method

This time, I just use original AlexNet. Firstly, the input is high-pass filtering images without enhancement. Next, the input is high-pass filtering images after enhancement. The network and the other parameters are all same.

1.3 Experiment Result

The experiment result shows that the accuracy when the input is high-pass filtering images without enhancement is 94.65%, but the accuracy when the input is high-pass filtering images after enhancement is 94.81%.

表 1: Accuracy of Plankton Classification

database	network	inputs	accuracy
WHOI 103classes	AlexNet	original images	93.58%
WHOI 103classes	AlexNet	high-pass filtering images without enhancement	94.65%
WHOI 103classes	AlexNet	high-pass filtering images with logarithmic enhancement	94.81%
WHOI 103classes	AlexNet	original images, lpfilter images, hpfilter images	94.62%
WHOI 103classes	AlexNet	original images, lpfilter images, hpfilter images after log enhancement	94.63%
WHOI 103classes	AlexNet	original images, original images, original images	94.62%

1.4 Experiment Summary

We can get several conclusion from this experiment:

a. The logarithmic enhancement method helps increase the classification;

b. There maybe something wrong with the 3-channel AlexNet, this needs more verification;

c. The enhancement method only contribute a little to the accuracy enhancement.

2 Verify 3-channel network

2.1 Experiment Objective

As we can see in last experiment, the results of 3-channel network are all strange. So that, I even doubt that whether our 3-channel network really works as we expected.

2.2 Experiment Method

I checked AlexNet every detail again, the network is right. So I set the inputs of three channels are all original images, I want to compare with single channel network trained on original images and 3-channel network trained on original images, high-pass filtering images and lowpass filtering images. In my opinion, the accuracy should be between 93.58% and 94.62%. The net architecture is shown in fig.4(End of the report).

2.3 Experiment Result

The result is showed in label 1. The result is still 94.62%, all results of 3-channel network are about 94.62%.

2.4 Experiment Conclusion

The result shows that there are some problems with our 3-channel AlexNet, some possible reasons I thought are as follows: a. Now, I doubt that whether this 3-channel really combine these three features well. Next week, I want to try two-channel AlexNet, only origin images and high-pass filtering images.

b. We only use meanfile in channelA (original images' meanfile), this is following senior fellow apprentice Jialun Dai, he just use one meanfile in his work, I wonder that whether we should use three meanfile for each channel, this method may sounds more reasonable.

3 Histogram Enhancement

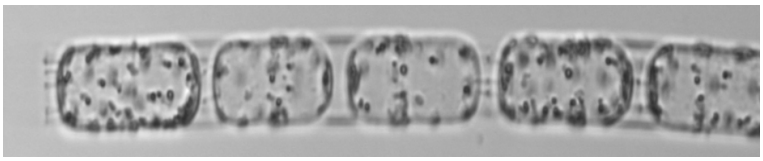
3.1 Experiment Objective

In the first experiment, I have mentioned that the enhancement method doesn't work very well. As a result, a useful image enhancement method is essential. As histogram enhancement is widely applied, I want to try this method to do image enhancement.

3.2 Experiment Method

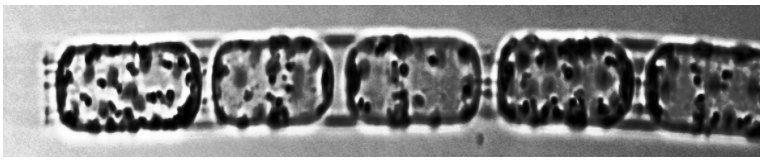
I use two histogram enhancement method, and get different result.

3.3 Experiment Result

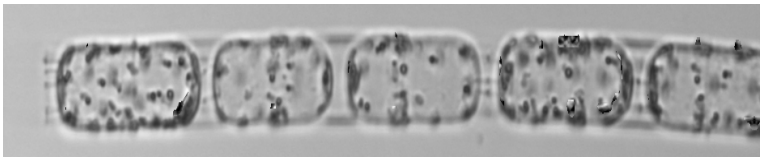


(a) high-pass filtering image

(b) log enhancement image



(c) histogram enhancement1



(d) histogram enhancement2

图 1: Similar in shapes but different in textures

4 Denoise

4.1 Experiment Objective

Fig.2 shows that the image after enhancement will suffer great salt noise, this week, I also try different median filtering methods to remove the salt noise. I used Geometric Mean Filter, Contrary Harmonic Mean Filter, Midpoint Filter and Median Filter(3*3).

4.2 Experiment Result

4.3 Experiment Summary

The result shows that result of median filtering is the best. But there is still some noise on the background, so I do two times or three times filtering, the result shows that, more filtering will lead to the details which we want to emphasize becoming blurred. From the third experiment and the forth experiment I think it difficult at least time-consuming to find a good method to do

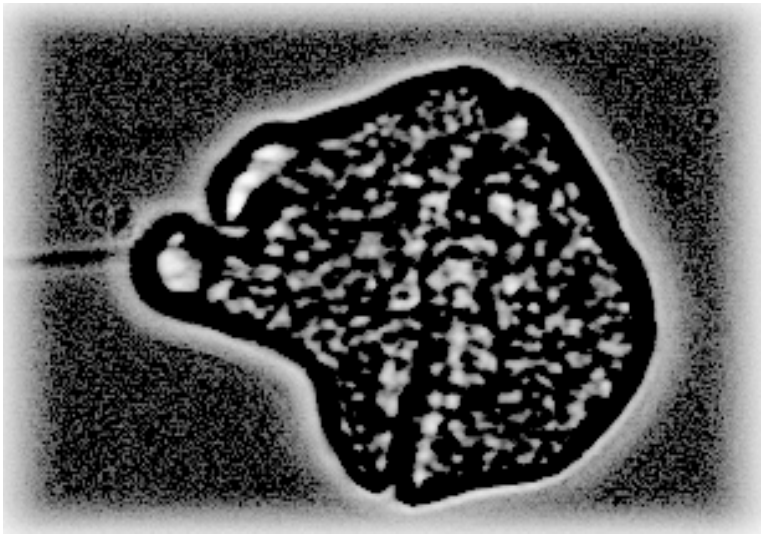
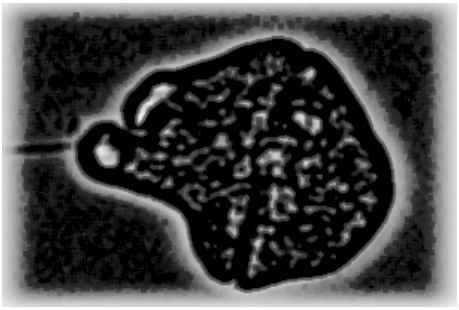
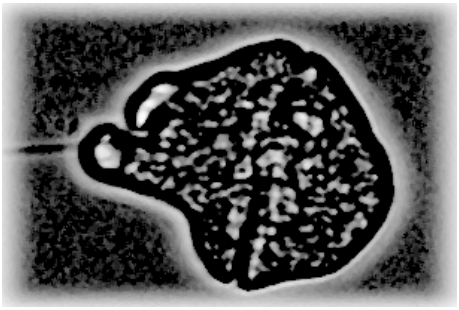


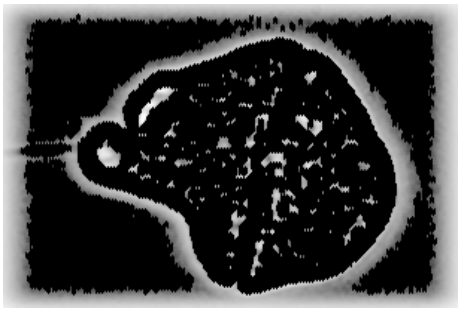
图 2: image after enhancement



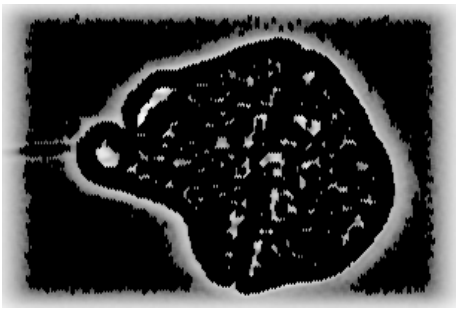
(a) midpoint filter



(b) median filter



(c) Geometric filter



(d) Contrary Harmonic Mean Filter

图 3: Similar in shapes but different in textures

enhancement or filtering, because this kinds of methods will 'hurt' texture, we must 'protect' out texture to remove noises.

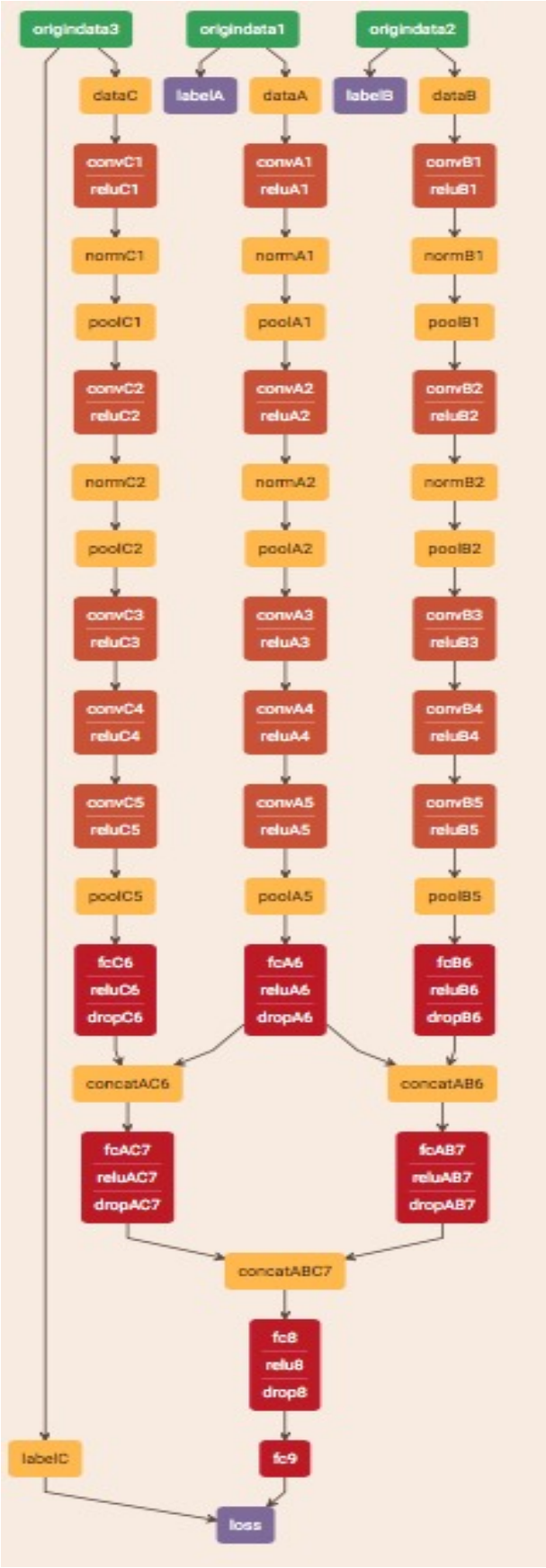


图 4: Structure of our neural network.