Statistical Enhancement of Multiple Description Coded Pictures

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Student: TANG Chengzheng
Supervisor: Bing ZENG

Project Overview

Various IT technologies have been changing ordinary people's life greatly and they are being improved rapidly. Coding technologies are definitely important and they are related to data compression and data communication. In my final year project, I will do statistical enhancement of multiple description coded pictures, in which some MIMO (Multiple Input Multiple Output) system strategies are made use of. I mainly apply MATLAB to set up my model. The whole project is based on comparisons, including visual quality comparisons and numerical distortion measure comparisons.

Methodology

In the first stage of my FYP, I have only considered the example of a 4 by 4 matrix. The further step will be based on this first step.

In the second stage of my FYP, I will compare the real pictures. There are two original pictures, two sets of quantization schemes and totally 4 cases. In each case, there are 6 new pictures. I will compare them with the original picture based on visual quality and numerical distortion measure.

Project Plan

1. Choose two 12*12 bitmap image.
2. In MATLAB, read the image and convert it to a matrix.
3. Divide the matrix into small blocks, which are 4*4 in size.
4. Do MATLAB Programming to set up the system.
5. Change the quantization scheme.
6. Compare the quality of 6 predicted pictures.
7. Study which scheme is best and think of the reasons and optimize it.
8. Compare the results of two combination schemes based on both visual quality comparison and numerical distortion.
9. Study 4 cases and do comparison between 6 pictures.
10. See whether there is a quality improvement made by 2 different combination schemes and do a research.
11. Prepare the report

Two ways of comparisons

2. Numerical distortion measure comparison, such as MSE.

Results

First, I did programming on the 4*4 matrix. Furthermore, I will do experiments on real pictures. In each case, there are 6 new pictures. The original pictures and the 6 new pictures are shown as follows.

Actually, it is difficult to compare the visual qualities of these pictures, and I also compare the numerical distortion measure, MSE:

- Picture 1: MSE=9.5865
- Picture 2: MSE=17.5922
- Picture 3: MSE=23.4306
- Picture 4: MSE=36.2179
- Picture 5: MSE=6.2304
- Picture 6: MSE=8.9633

The experimental results are consistent with our predicted results.

First, the performance of single description coded picture will be worse, if the quantization step becomes larger.

Second, the performance of multiple description coded picture is better than any other single description coded picture.

Third, in each case the quality of picture 5 is always better than picture 6. This conclusion is consistent with my analysis before the experiments. The reason is that when we were inventing the picture 5, we kept more details of each single description coded picture, not just getting average value of the final predicted value of these 4 descriptions like inventing picture 6.

Fourth, as we can see, among pictures 1, 2, 3 and 4, the quality of picture 1 is the best. Although the quality of pictures 2, 3 and 4 is not as good as picture 1, the details of pictures 2, 3 and 4 have contributed a lot to the multiple description coded pictures 5, 6, since we find that the quality of pictures 5 and 6 is better than picture 1. Therefore, we can say that the descriptions with low quality can also collaborate with the descriptions with high quality on inventing a even better final picture.