THE OPTIMAL METHOD OF SEARCHING THE EFFECTIVE COMBINATION OF DITHER MATRIX

Tsuneyasu Kato and Ken-ichi Tanaka

School of Science and Technology, Meiji University

1-1-1,Higashi-Mita,Tama,Kawasaki,Kanagawa 214-8571 Japan

E-mail:tanaken@isc.meiji.ac.jp |ce91022@isc.meiji.ac.jp

Abstract: In this study, three methods are compared for checking the most effective method of searching the optimal combination of dither matrix. Three methods are Genetic Algorithm (GA), Simulated Annealing (SA) and Taboo Searching. The images that are used in this study are Human, Human rotating 180 degrees and Swiss. As a result, the method of GA is the most excellent in these methods.

Keywords: Dither matrix, Bayer method, GA, SA, taboo searching, optimal combination.

I. INTRODUCTION

Nowadays, there are some popularly methods of dither matrix. These methods are good on a viewpoint of image quality. However, the study that is searching effective dither matrix viewpoint of optimization combination without method of GA is not able to be found. Then, the best effective method for searching better dither matrix is checked. Searching method s are three, GA, SA and Taboo Searching. The comparing candidate is Bayer method. Algorithm of GA, evaluating method and the exposition of dither matrix are shown by Tsuneyasu[1].

II. ALGORITHM OF SA

The algorithm of SA is as below.

- (1) An individual that have matrices which is set elements in at random is prepared.
- (2) New individual is made by changing element of the individual which is made at operation (1).
- (3) Comparing two individuals
- (4) New individual is made by exchanging element of the individual getting better evaluated value
- (5) Running over from (3) to (4) until the satisfaction of the conditions.

In this study, the conditions are that temperature is under number which is set at hand or evaluated value of SA is better than Bayer method.

III. ALGORITHM OF TABOO SEARCHING

The method of Taboo Searching is as below.

- The matrices which have elements set in at random are prepared (it is named individual A)
- (2) Making some individuals based the individual A
- (3) Evaluating and comparing these individuals
- (4) The best evaluated value individual (it is named individual B) is selected by these individuals
- (5) If combination of individual A and B has be selected before, return to operation (2)
- (6) Comparing individual A and individual B
- (7) If individual A is better than individual B, return to operation (2)
- (8) If individual B is better than individual A, making some individuals based the individual B
- (9) Running over from (3) to (8) until numbers of repeat time surpass numbers of generations

IV. RESULT

The evaluated value of four methods changing each images are as below.

(1) The image of human

Bayer: E=102.846, GA: E=102.785

SA: E=102.823, Taboo searching: E=102.836

(2) The image of human rotating 180 degrees Bayer: E=102.848, GA: E=102.817 SA: E=102.813, Taboo searching: E=102.929

(3) The image of Swiss

Bayer: E=101.544, GA: E=101.484

SA: E=101.526, Taboo searching: E=101.532

Then, the best evaluated value of Human rotating 180 degrees is SA. However, the best evaluated value of all patterns is GA. In addition, evaluated values of each image by using GA are averagely good. Then, as this result, the optimal method of searching the effective combination of dither matrix is thought that is GA.

VI. FIGURES/TABLES



Fig1. The image of human by using Bayer method



Fig2. The image of human by using GA



Fig3. The image of human by using SA



Fig4. The image of human by using Taboo Searching

2. Table

Table1. The matrix of using GA to human

7	11	0	8
3	13	6	15
9	2	10	4
12	5	14	1

Table2. The matrix of using SA to human

5	2	11	12
13	14	6	0
10	3	8	4
1	15	7	9

Table3. The matrix of using Taboo Searching to human

15	8	7	4
6	14	1	12
2	3	13	10
11	5	9	0

V. CONCLUSION

Unless using same image, the results of GA for human and human rotating 180 degree are not point symmetry. This reason will be that these results of GA are convergent local solution. Then, the problem is accuracy enhancement of GA by making change factors.

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