Incorporating Human Preference into Content-based Image Retrieval Using Interactive Genetic Algorithm*

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1 INTRODUCTION

Content-based image retrieval has been actively studied in several fields. However, most of the methods emphasize on the points that are far from human intuition and emotion. It has problem that is difficult to provide proper result when user wants the image that is not explicit or specific impression is required to retrieve. In order to solve this problem and supplement the lack of user's expression capability, we have proposed an image retrieval method based on human intuition and emotion by using interactive genetic algorithm.

2 INTERACTIVE GA

Interactive genetic algorithm is a technique that performs optimization based on human evaluation [1]. A human operator can obtain what he/she wants through repeated interaction with computer. It adopts user's choice as fitness, when fitness function cannot be explicitly defined. This property allows to develop a system for effective human-oriented image retrieval.

The entire system is constructed as shown in Fig. 1. In preprocessing step, we perform wavelet transform to extract features of images. A system displays twelve images, obtains the fitness value from human, and selects candidates based on the fitness. In this paper, a chromosome is constructed using index and signs of wavelet coefficients. A genetic operation, vertical or horizontal crossover, is applied to the selected candidates. To find the best twelve images, the stored image information is evaluated by human. Twelve images of the higher magnitude value are generated for the next generation of the search.

3 EXPERIMENTAL RESULT

It is pretty hard to measure the convergence in the case of interactive genetic algorithm. Toward this goal we have attempted to show the change of fitness according to the generations and compare the results obtained. We conduct GA convergence experiment with ten subjects and Fig. 2 shows the average curves of the average and best fitnesses for ten generations in the case of searching the image of gloomy impression. We can see that the fitness is effectively increased by adopting user's evaluation, despite the searching space of chromosome encoded using wavelet coefficients is very large.

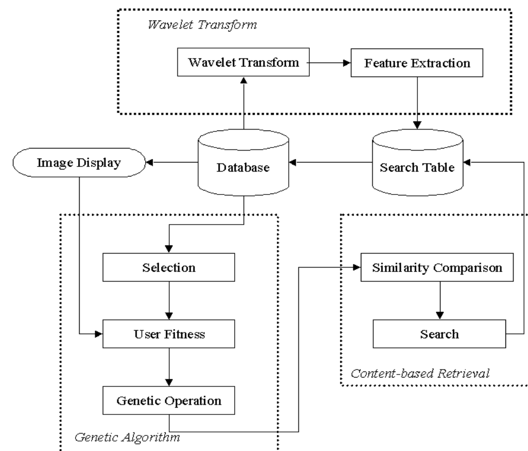

Fig 1. System structure.

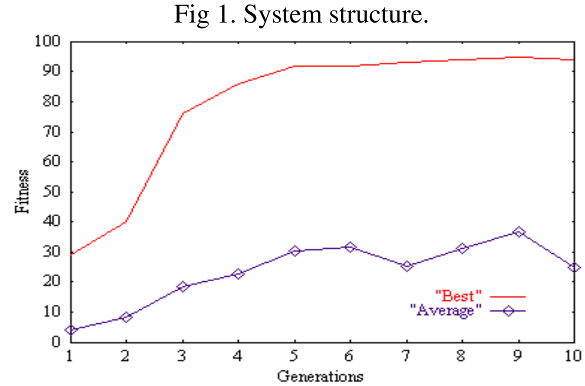

Fig 2. The best and the average fitnesses in the case of searching the image of gloomy impression.

References

[1] H. Takagi, "Interactive evolutionary computation: Cooperation of computational intelligence and human kansei," *Proc. of 5th Int'l Conf. on Soft Computing*, pp.41-50, Iizuka, Japan, 1998.

* This work has been supported in part by a grant no. 981-0919-099-2 from the Korea Science and Engineering Foundation (KOSEF).