

Title	モルフォロジーにおける画像処理構造要素の最適設計法に関する研究
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Optimization of Structuring Element on Mathematical Morphology

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This paper proposes the method to decide a optimum structuring element that attain the object of a image processing defined by Mathematical Morphology.

Many image processing techniques have been developed so far with the edge detection filter, pattern matching, and so on in the field of the image processing. But, that mutual relationship hasn't been made a problem because those techniques have been developed corresponding to each purpose.

Image processing is defined in the setting operation with the object image and the structure element in Mathematical Morphology.

It is able to realize diverse image processing by a combination of fundamental set operations and a structuring element. Because MM systematize a image processing field by expressing it in only fundamental set operations, they are easy to demonstrate clearly logical validity of the image processing and to design of hardware for image processing .

But a morphological operating expression is able to logical design , design of structuring element is very difficult if a feature of object image is difficult to mathematical express.

This paper proposes the method to decide a optimum structuring element that attain the object of a image processing defined by Mathematical Morphology.

This method decide a optimum structuring element by the training to improve value of a estimation function to institute for the object of the image processing. but the structuring element is many pattern , because it is a subset of vector in 2 dimension or 3 dimension. We need the efficient algorithm to decide a optimum structuring element in many them. This paper proposes two optimization methods by Simulated Annealing and it by Genetic Algorithm.

SA usually permit to change of a structuring element if estimated value of a near structuring element improve, and it permit to change of a structuring element by a probability

if it change for the worse. It can decide a precision structuring element by to repeat this process.

The method on one point search that search for near the structuring element can decide a precision structuring element on limited search area ,but we must make the model of the gray scale structuring element ,because a structuring element can change to many pattern in the case of gray scale image. Consequently,we can't achieve the object of a image processing sufficiently because of difficulty of modeling the gray scale element that has intricate shape.

Therefore, this paper proposes an optimization method for a gray scale structuring element that has intricate shape by GA. The method repeat regeneration ,crossover and mutation, for that improvements the estimated value of set for a structuring element.

The method on a plural point search that search for set of the structuring element can efficiently decide a structuring element that has intricate shape on extensive search area in the case of gray scale image.

Because this paper ascertain efficacy of the proposed methods, it applied to the edge detection for model images and the texture analysis based on pattern spectrum. Specially,we proved adequacy for application to expression analysis of facial images.

Consequently,in the edge detection for model images, the method by SA could attain the object of image processing in all cases. We ascertain to be able to decide a precision structuring element by SA. on the other hand, the method by GA costed a many search times in comparison with the method by SA,but it could attain the object of image processing in all cases. Accordingly,we ascertain that the method by SA efficient in comparison with the method by GA on limited search area in the case of gray scale image.

In the the texture analysis based on pattern spectrum,we ascertain efficacy of the proposed methods from application to expression analysis of facial images,because the capable of discrimination improved to use the optimum structuring element. For the reason of the method by GA can have a structuring element intricate shape than it by SA ,the ability of discrimination is better the method by GA than it by SA. Accordingly,we ascertain that the method by GA can have a structuring element that give high estimated value than it by SA on extensive search area in the case of gray scale image.

Finally,as the next step of this research, we must propose a flexible model of structuring element to decide it of intricate shape on the optimization method by SA. And we must investigate a genetic operation that be suited to optimization of structuring element.