

RNA-Based Artificial Fish Swarm Algorithm for Edge Detection of Medical Images



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Abstract

- Edge detection of medical image is the premise of medical image processing. It can extract the edge of the region of interest from medical image and lay the foundation for medical image restoration and reconstruction. It is an important basis for clinical diagnosis and medical research, as well as one of the key technologies of medical image processing. This study aimed to propose the ribonucleic acid (RNA) with the artificial fish swarm algorithm (RNA-AFSA) optimization method for edge detection of medical images. The gradient matrix of the gray image pixels was obtained based on the medical image matrix, and RNA-AFSA was applied to search for the maximum of gradient to achieve edge detection of medical images. RNA-AFSA introduced RNA conversion, recombination, and substitution in the later stage of AFSA operation, improving fish swarm diversity and quickly jumping out of local optimization. The simulation results demonstrated that RNA fish swarm algorithm is a high efficiency and high precision method as a new edge detection method of medical image.

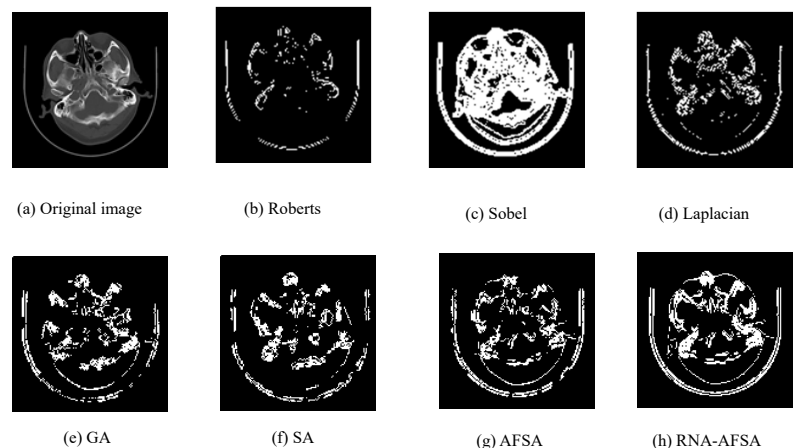
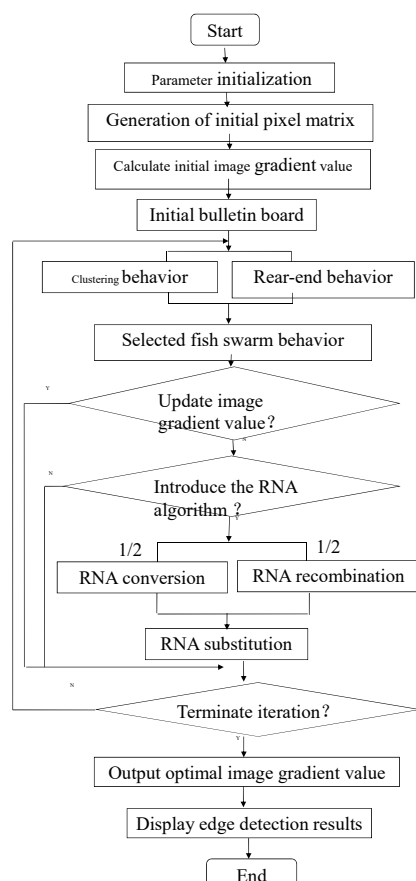


Table 1. Edge intensities comparison table

	Experiment 1	Experiment 2	Experiment 3	Experiment 4
Roberts	26.55	19.89	17.91	9.56
Sobel	38.11	30.67	27.63	13.72
Laplacian	48.55	41.22	37.1	17.48
GA	53.96	52.05	46.04	19.43
SA	58.93	56.79	50.29	21.21
AFSA	62.33	59.36	53.43	22.42
RNA-AFSA	70.89	68.32	60.49	25.52

Table 2. edge retentions comparison table.

	Experiment 1	Experiment 2	Experiment 3	Experiment 4
Roberts	7.036	6.548	5.893	2.533
Sobel	7.842	7.316	6.585	2.823
Laplacian	8.012	7.621	6.861	2.884
GA	8.315	7.915	7.121	2.927
SA	8.671	8.054	6.942	2.969
AFSA	8.986	8.104	7.094	3.035
RNA-AFSA	11.069	9.383	8.445	3.895

Figure 1. RNA-AFSA for medical image edge detection flowchart