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CS-C

Assignment3(GA)

a) Population Encoding:
Image is converted into 1D array. Another array of genes is maintained that contains values between 0 to 255(image colors range). For each individual a random number is selected from the genes array and stored in chromosome array of an individual. An individual is a class that contains fitness value and a chromosome array. This repeats for the total image 1D array size. The total population size is 100. This whole process is repeated for 100 individuals.

b) Fitness Function: Absolute difference of our target image and an individual(chromosome array). The function takes the difference of the image and individual. It takes the absolute of the differences and returns the sum of the differences. The value of the fitness function for the best solution is 5492.

c) CrossOver: For each case, a pivot is selected at random between the range of our target image size. And then a probability is taken at random if that probability is less than 50% then parent1 values are selected till pivot and parent 2 values are selected after the pivot till the end of the array. Hence parent 1 and parent 2 values are combined together to form a child(chromosome).
Mutation: For each case, again a random pivot is selected and that pivot index value in the chromosome is changed by selecting a number randomly from our genes array that contains values between 0-255.
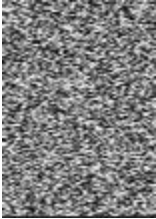
d) The initial population size is 100. In my case none of the individuals converged to the best, since it was taking a long time to get to the fitness value of 0, according to my fitness function achieving zero is my best solution but i have achieved the accuracy of 99.26% in case 3, around the generation count 456823
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e) Case-1: selection rate = 10%, crossover rate = 90% and mutation rate =90%
   Case-2: selection rate = 0%, crossover rate = 100% and mutation rate =100%
   Case-3: selection rate = 10%, crossover rate = 90% and mutation rate =90%

f) Case-1:

Image	fitness value	Accuracy	Iterations
	712056	3.75%	1000000

Case-2:

Image	fitness value	Accuracy	Iterations
	726663	2.08%	1000000

CASE-3: it took 456823 iteration to converge to the best solution.

Image	fitness value	Accuracy
	5492	99.26%

g) Evolving images during the running of the program:
CASE-1:
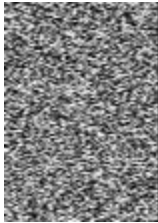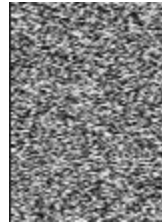
100iteration	1000iteration	10000 iterations	1000000iterations
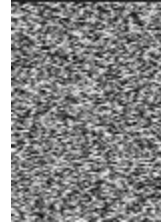
CASE-2:

100iteration	1000iteration	10000 iterations	1000000iterations

CASE-3:

100iteration	1000iteration	10000 iterations	1000000iterations