CS410 - Assignment 02 Report: Bisection for sGA solving with Onemax and Trap5

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1 OneMax

1.1 Mean

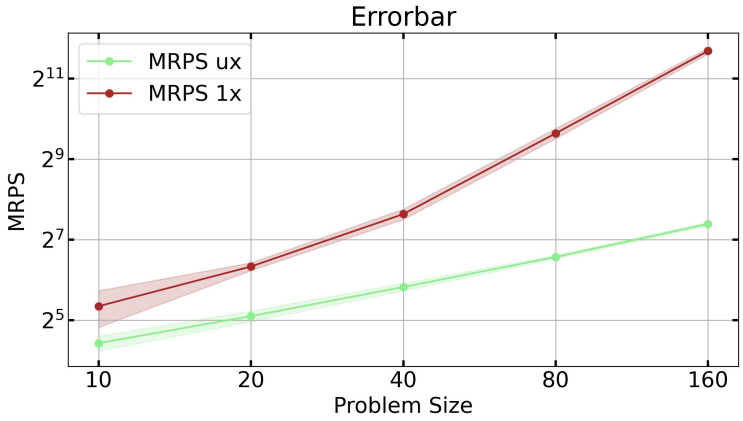
	OneMax			
	sGA-1X		sGA-UX	
Problem size	MRPS	Evaluations	MRPS	Evaluations
10	40.8	259.11	21.6	128.86
20	80.8	803.79	34.4	312.4
40	199.2	3178.4	56.8	776.78
80	800	19059.27	95.2	1845.25
160	3302.4	122526.02	168	4541.02

1.2 Standard Deviation

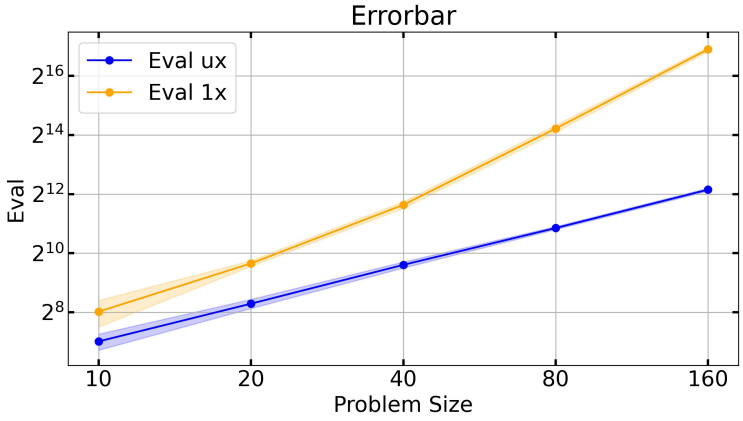
	Std OneMax			
	sGA-1X		sGA-UX	
Problem size	MRPS	Evaluations	MRPS	Evaluations
10	12.43	78.18	2.8	24.08
20	5.34	53.87	3.09	33.26
40	17.75	245.95	3.77	54.74
80	68.82	1585.99	2.95	63.79
160	165.54	6386.42	4.82	159.6

1.3 Graph

1.3.1 MRPS Graph



1.3.2 Eval Graph



2 Trap5

2.1 Mean

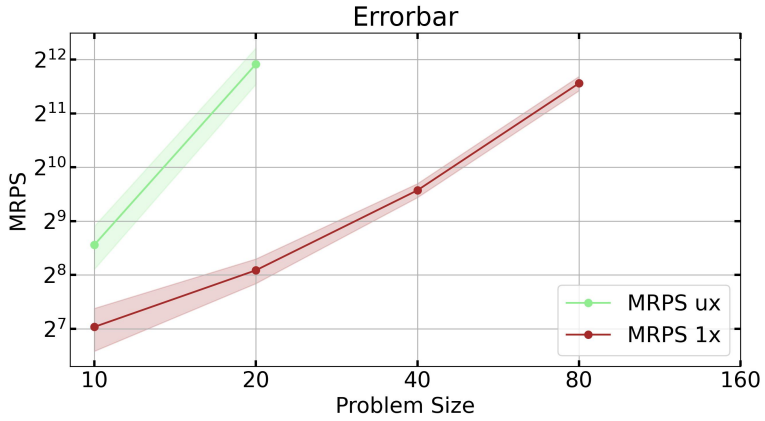
	Trap-5			
	sGA-1X		sGA-UX	
Problem size	MRPS	Evaluations	MRPS	Evaluations
10	131.2	951.89	377.6	3681.75
20	272	3029.61	3865.6	76454.02
40	761.6	13246.68	Can't Solve	Can't Solve
80	3020.8	79499.44	Can't Solve	Can't Solve
160	Can't Solve	Can't Solve	Can't Solve	Can't Solve

2.2 Standard Deviation

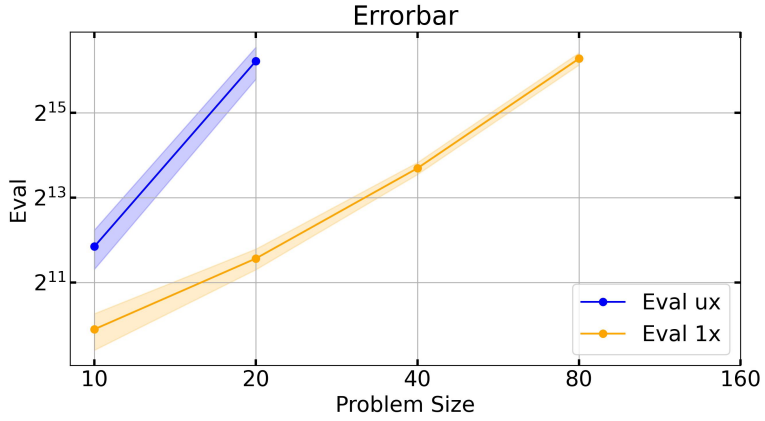
	Std Trap-5			
	sGA-1X		sGA-UX	
Problem size	MRPS	Evaluations	MRPS	Evaluations
10	35.27	275.82	102	1144.2
20	42.63	505.81	884.78	19530.07
40	67.81	1291.31	Can't Solve	Can't Solve
80	276.91	7840.31	Can't Solve	Can't Solve
160	Can't Solve	Can't Solve	Can't Solve	Can't Solve

2.3 Graph

2.3.1 MRPS Graph



2.3.2 Eval Graph



3 Comparision between OneMax and Trap

3.1 OneMax

Onemax function is simple to implement in sGA which the way it works is to sum the bits 1 present in the binary string of each instance.

As the line graph describes finding the number of individuals that converge with an optimal value of 1, we can see that for any population size (from 10 to 160), the model can find the best solution with very small value in short time.

Between the two graphs of measuring the number of individuals as well as the number of fitness evaluation function calls, we see that with the 1-point cross, it is necessary to call the fitness evaluation function more times to calculate the number of individuals with their optimal value. So for OneMax problem, if we use U-crossover it will be much more efficient and cost-effective than single point crossover.

3.2 Trap

Trap function is created to deceive the direction of individuals in the population.It can be seen that when populations are not large enough, it is often difficult for them to converge to the same maximum value.

For the two line graphs of the trap problem, we see that the choice of the crossover will also affect the performance of the model. As in ux-crossover we have to spend a lot of time to find the number of individuals that converge for a population size of 20, that is the opposite of 1-point-crossover. The number of individuals can be easily found when increasing the population size up to 80. So we can conclude that in this situation, the 1-point crossover will be much more efficient and cost-effective than.