

1

a

See graph.

b

i

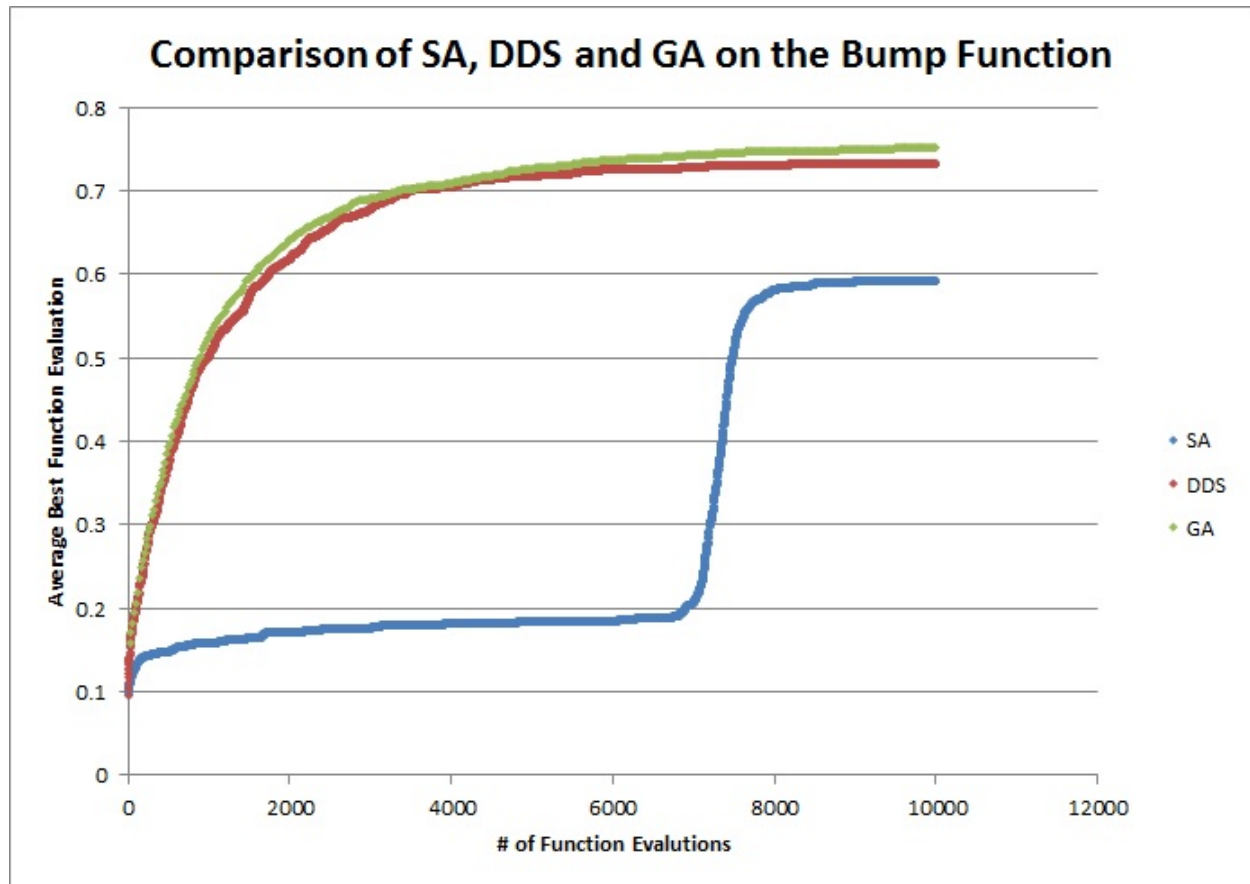
See graph.

ii

TODO.

Graph follows on the subsequent page.

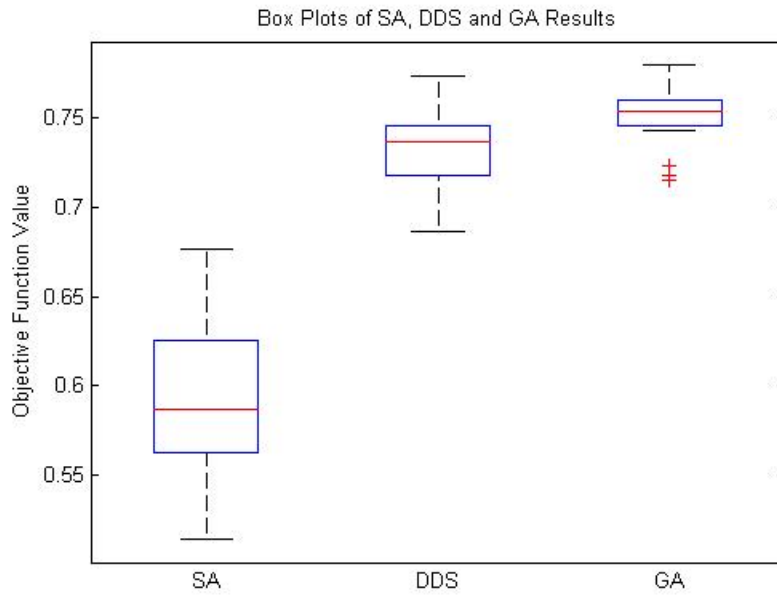
C



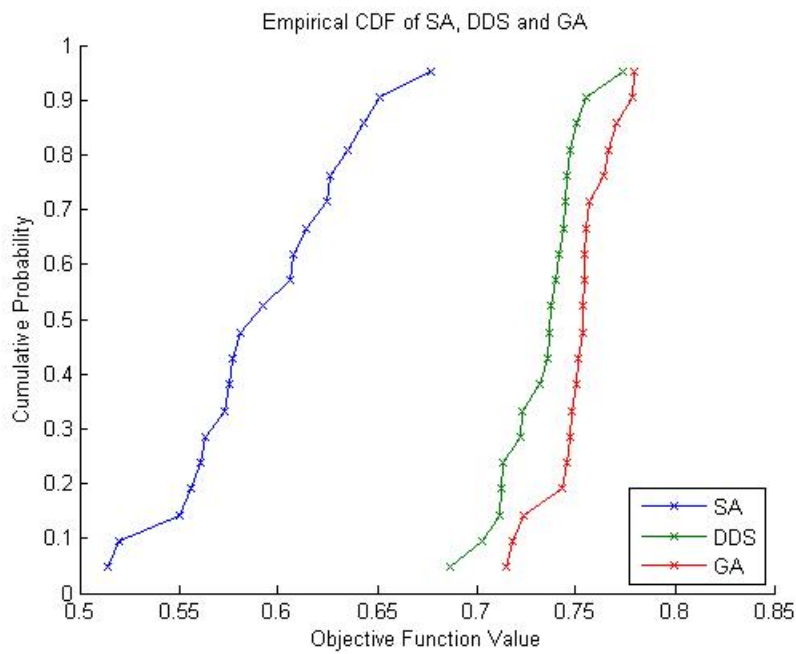
From the graph alone, it is clear that both GA and DDS dominate SA. It also appears that GA performs slightly better than DDS over the course of the run, and may dominate at the end.

d

Comparison 1: Box Plot



Comparison 2: CDF



Comparison 3: Two sample t test

The null hypothesis for each pair is that the mean value of the two search heuristics is the same.

SA/DDS:

Statistics: T Statistic: -13.509848
P value for Two Sided: 0.000000
P value for One Sided: 0.000000

For comparison at $\alpha = 0.05$, $t_{\alpha/2,v} = 2.052042$, $t_{\alpha,v} = 1.703421$. As $t < -t_{\alpha/2,v}$, we reject the null hypothesis and accept that the two mean values are different. Then, since $t \leq -t_{\alpha,v}$, we can accept the alternate hypothesis that $\mu_x - \mu_y < \Delta_0$, indicating that the mean of SA is statistically significantly less than the mean of DDS.

As the means were so far off, it can easily be seen that SA performed much worse than DDS. This confirms what was seen in the graph in part c, the box plot above, and in the cdf, where DDS dominated SA.

SA/GA:

Statistics: T Statistic: -15.615549
P value for Two Sided: 0.000000
P value for One Sided: 0.000000

For comparison at $\alpha = 0.05$, $t_{\alpha/2,v} = 2.058272$, $t_{\alpha,v} = 1.707344$. As $t < -t_{\alpha/2,v}$, we reject the null hypothesis and accept that the two mean values are different. Then, since $t \leq -t_{\alpha,v}$, we can accept the alternate hypothesis that $\mu_x - \mu_y < \Delta_0$, indicating that the mean of SA is statistically significantly less than the mean of GA.

As the means were so far off, it can easily be seen that SA performed much worse than GA. This confirms what was seen in the graph in part c, the box plot above, and in the cdf, where GA dominated SA.

DDS/GA:

Statistics: T Statistic: -3.172571
P value for Two Sided: 0.003015
P value for One Sided: 0.001508

For comparison at $\alpha = 0.05$, $t_{\alpha/2,v} = 2.025410$, $t_{\alpha,v} = 1.686598$. As $t < -t_{\alpha/2,v}$, we reject the null hypothesis and accept that the two mean values are different. Then, since $t \leq -t_{\alpha,v}$, we can

accept the alternate hypothesis that $\mu_x - \mu_y < \Delta_0$, indicating that the mean of SA is statistically significantly less than the mean of GA.

The means were significantly closer together in this pairing, but since both standard deviations were so low, it makes sense that we can still confirm that GA performed better than DDS. This confirms what was seen in the graph in part c, the box plot above, and in the cdf, where GA dominated DDS.