Soft Computing Final Project

Mine Blast Harmony Search

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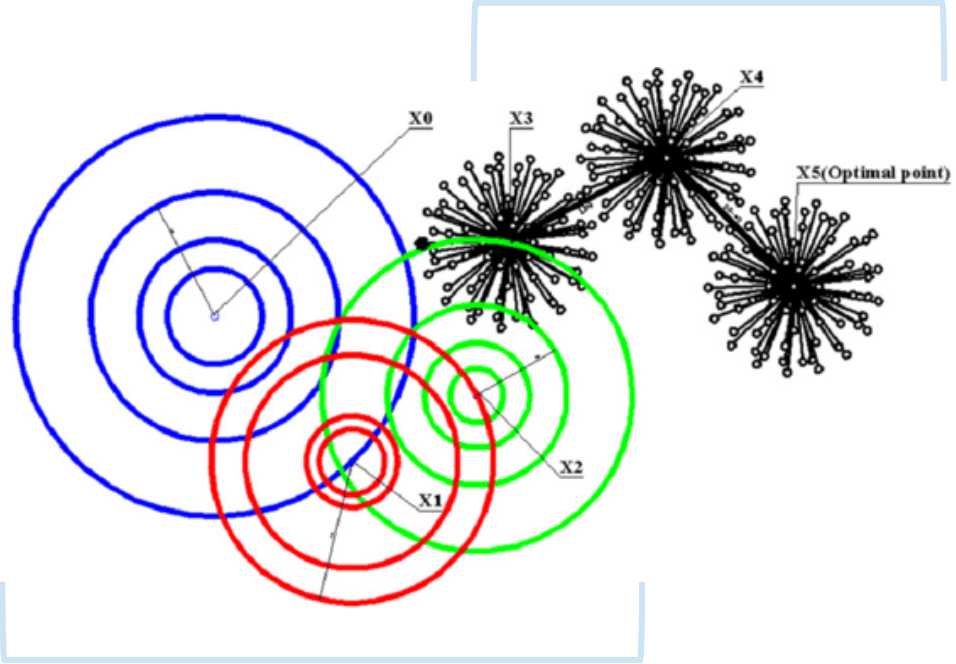
Outline

1 Mine Blast Harmony Search

Exploitation



Exploration

MBA：模擬一個礦坑開發的過程，找到最佳的炸彈設置位置，清除最大範圍的礦坑。

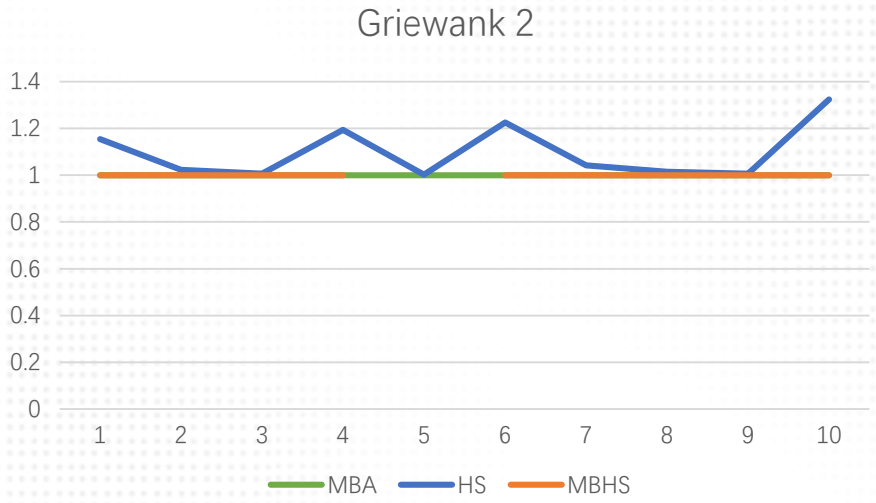
HS：以美學的角度，經由音調以及帶寬的調整，尋找可以產生最悅耳的頻率的組合狀態。

2 Implement

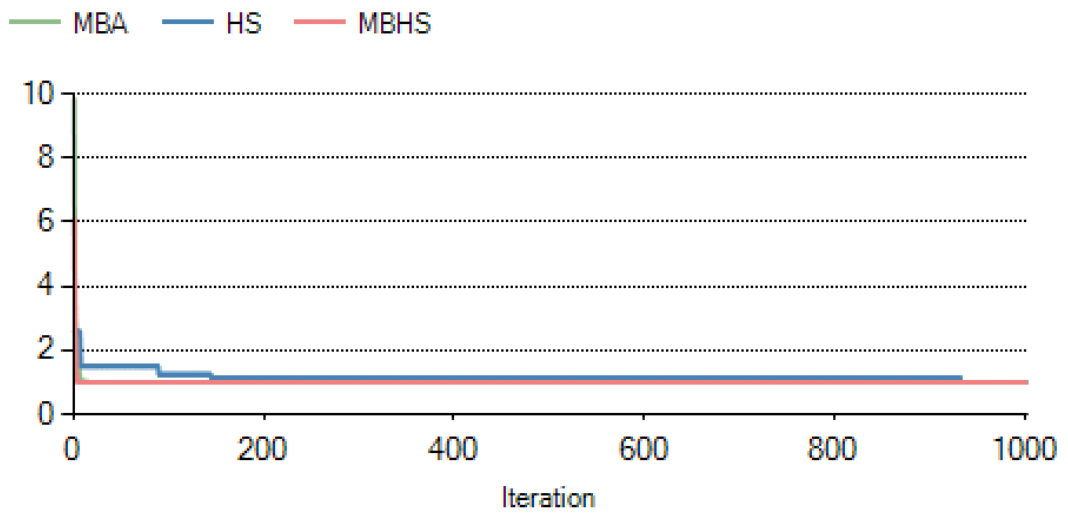
- ✓ 三個標竿問題：Griewank Function、Rastrigin Function、Rosenbrock Function
- ✓ 三個維度：2D、20D、50D
- ✓ 三種演算法分別跑10次做比較

	MBA	HS	MBHS
number of shrapnel pieces/ harmony memory size	50	50	50
exploration factor	200		200
reduction factor	200		200
min harmony memory size			0 (fixed)
max harmony memory size			0.99 (fixed)
harmony considering rate		0.98	
min pitch adjusting rate		0.05	0 (fixed)
max pitch adjusting rate		0.2	1 (fixed)
min bandwidth(distance)		0.005	
max bandwidth(distance)		0.02	
iteration limit	1000	1000	1000

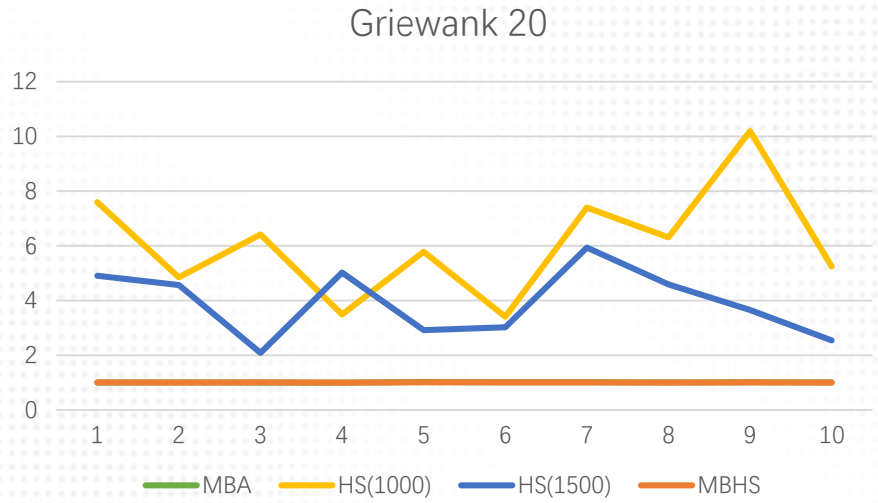
2 Griewank Function 2D

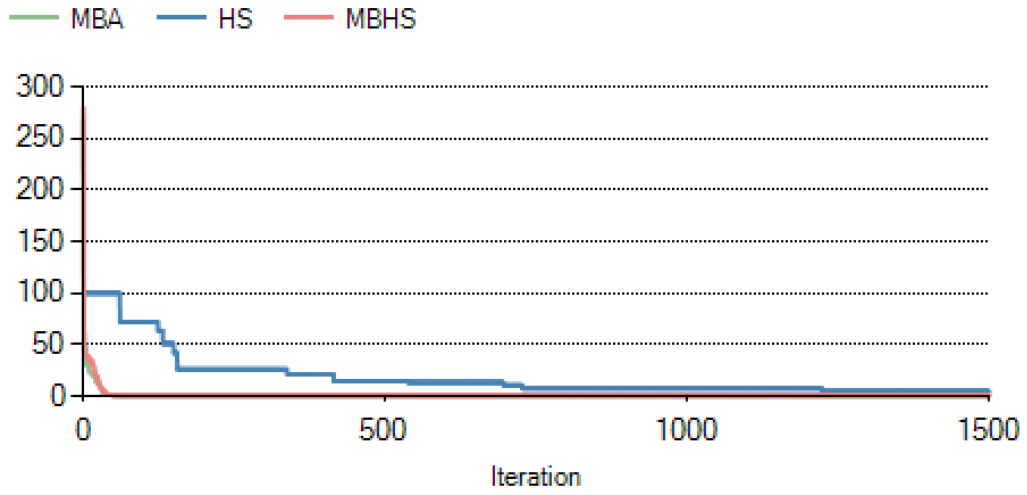


	Average	Best	收斂代次
MBA	1	1	180
HS	1.099041	1.00246	300
MBHS	1	1	190

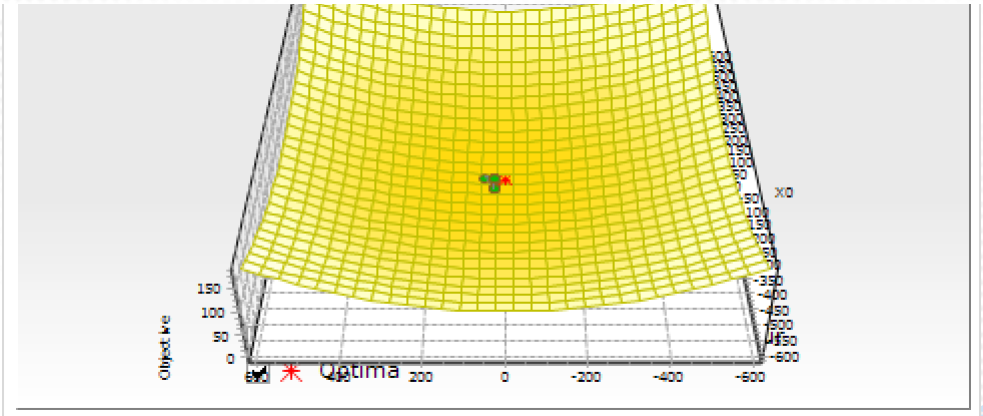


2 Griewank Function 20D



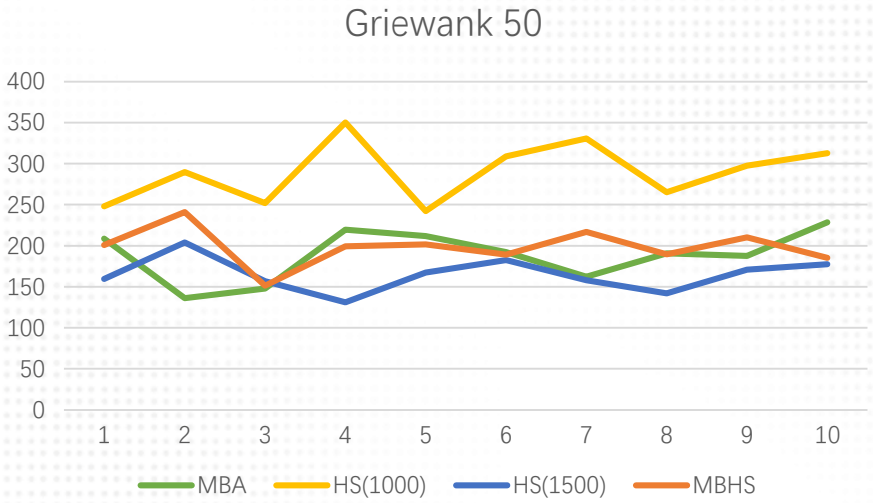


	Average	Best	收斂代次
MBA	1.0041505	1.000049	50
HS(1000)	6.0643984	3.40286	1500
HS(1500)	3.9213109	2.086269	1500
MBHS	1.0016192	1	80

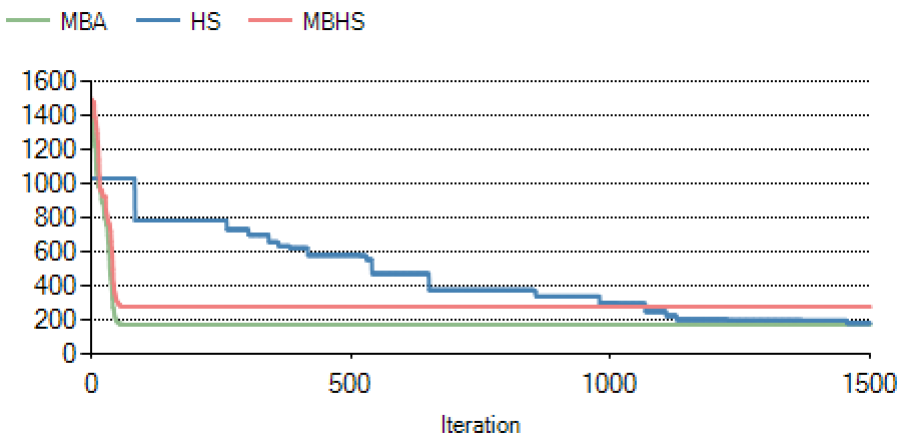


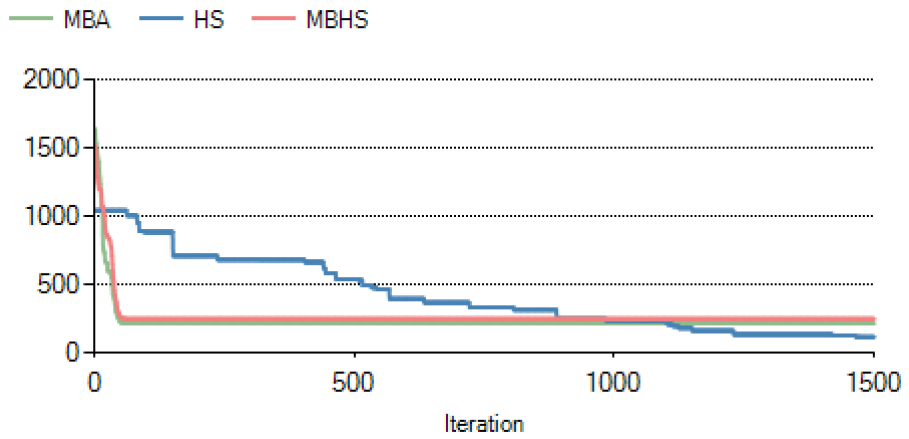
HS 1500 iteration

2 Griewank Function 50D

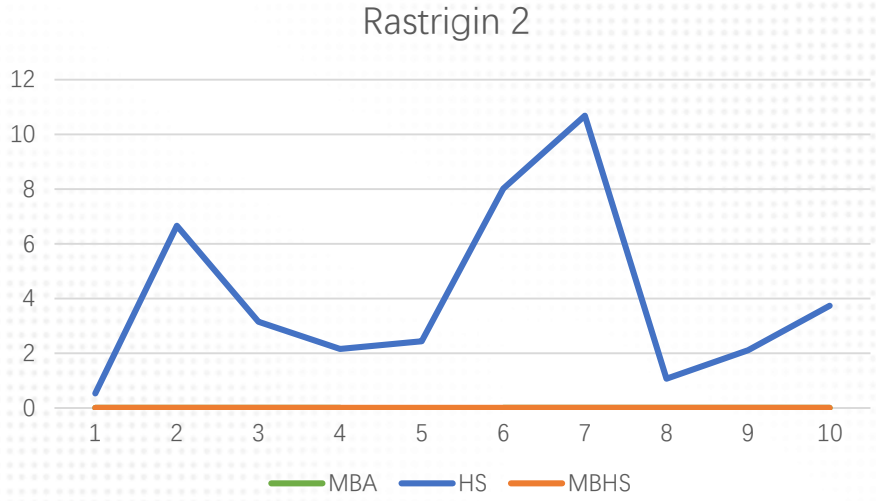


	Average	Best	收斂代次
MBA	188.51389	136.11066	50
HS(1000)	289.63681	242.19924	1500+
HS(2000)	164.94902	131.15278	1500+
MBHS	198.40509	151.20041	50

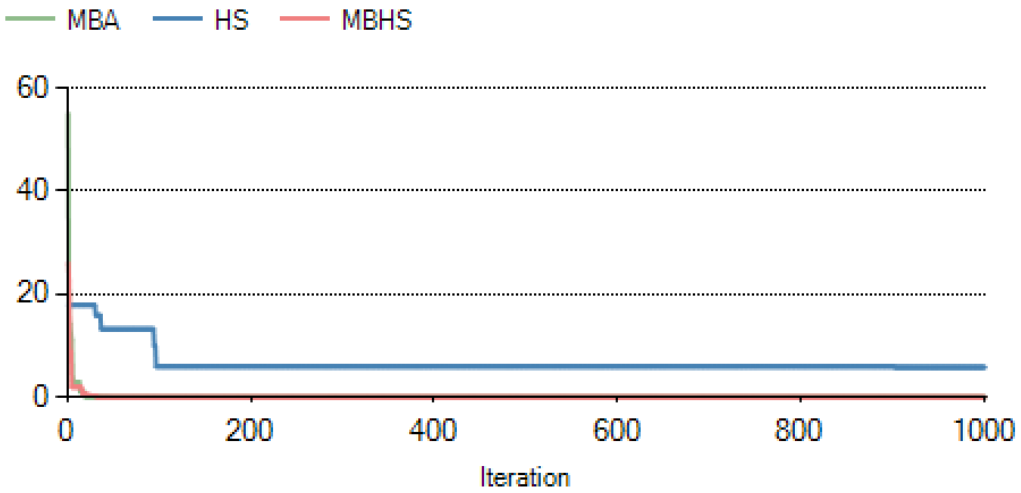




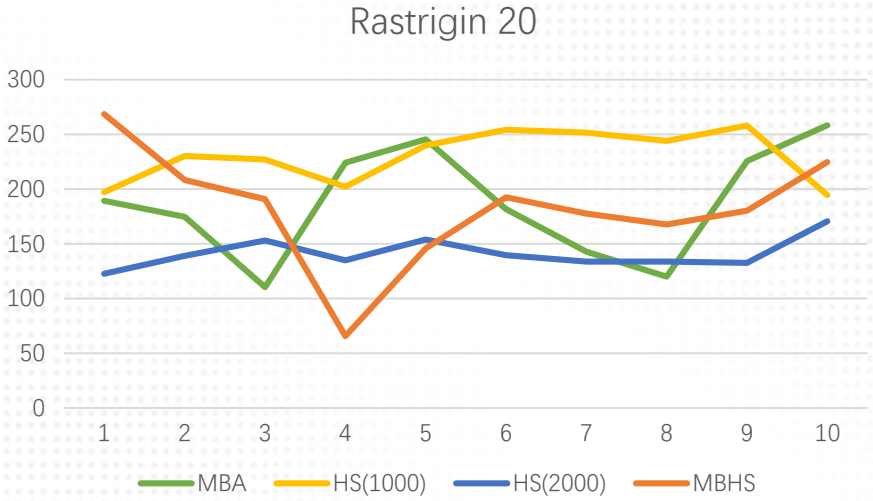
2 Rastrigin Function 2D



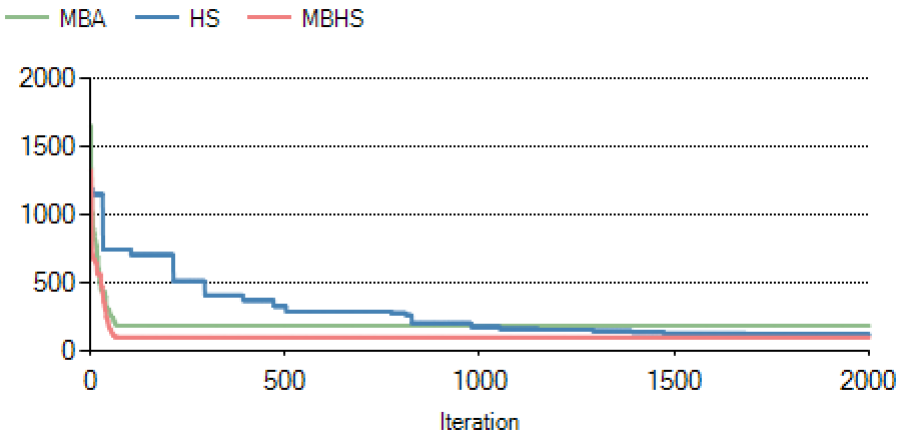
	Average	Best	收斂代次
MBA	0	0	180
HS	4.0501585	0.5276	550
MBHS	0	0	400

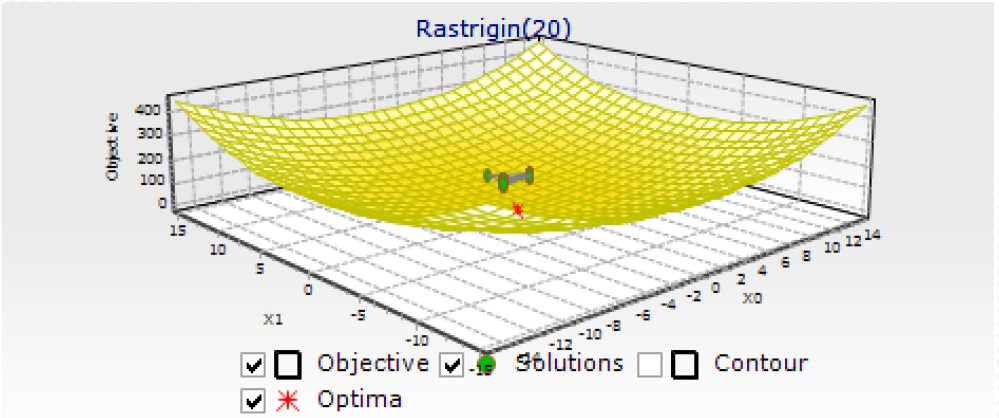


2 Rastrigin Function 20D



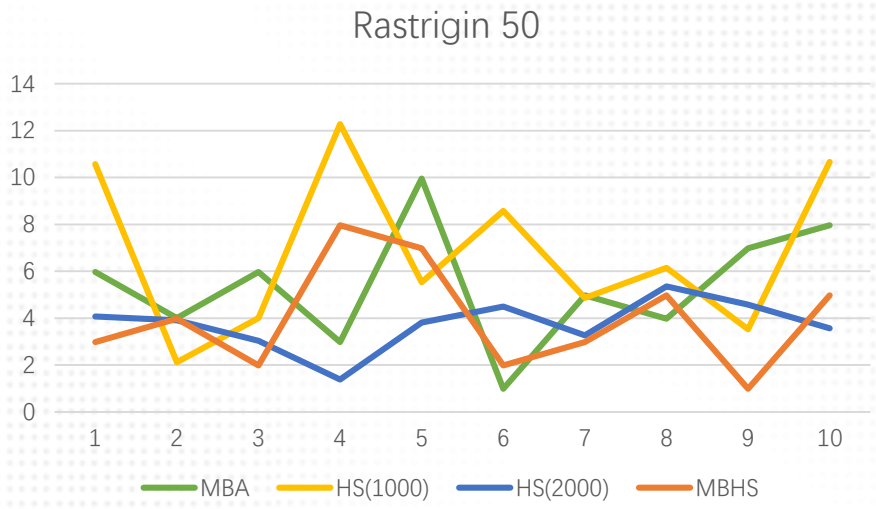
	Average	Best	收斂代次
MBA	187.15065	110.2865	80
HS(1000)	229.79389	194.48421	2000
HS(2000)	141.27557	122.65332	2000
MBHS	182.07945	65.438059	80



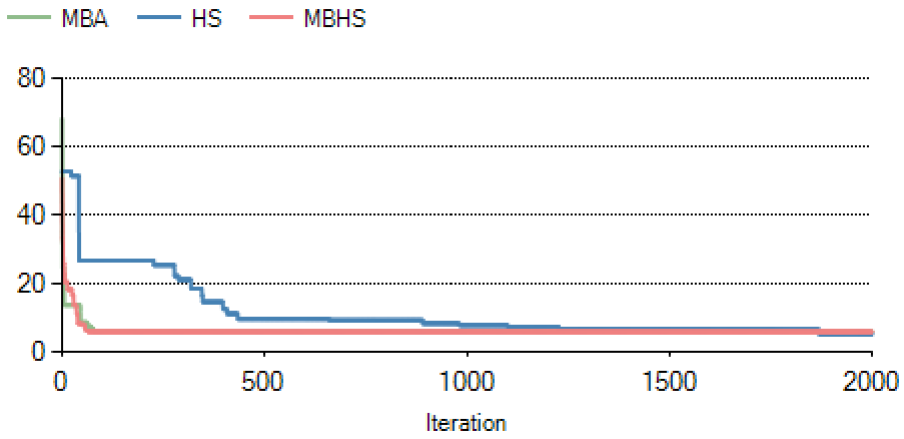


HS 2000 Iteration

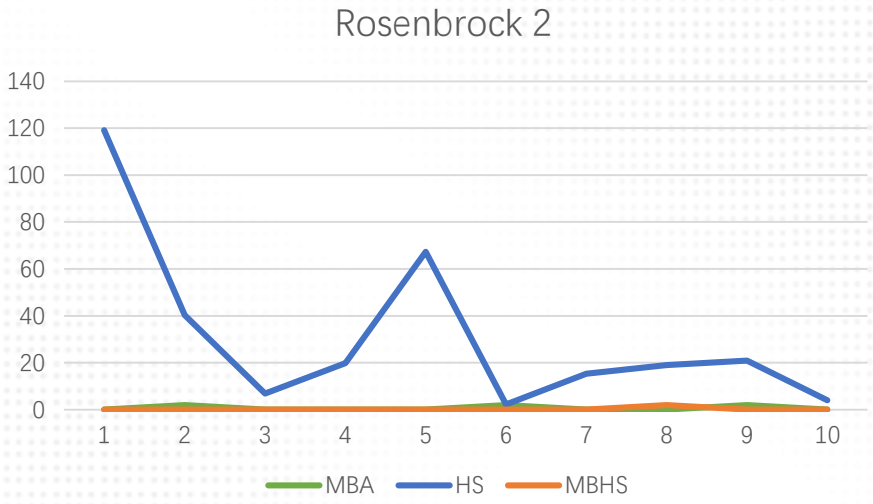
2 Rastrigin Function 50D

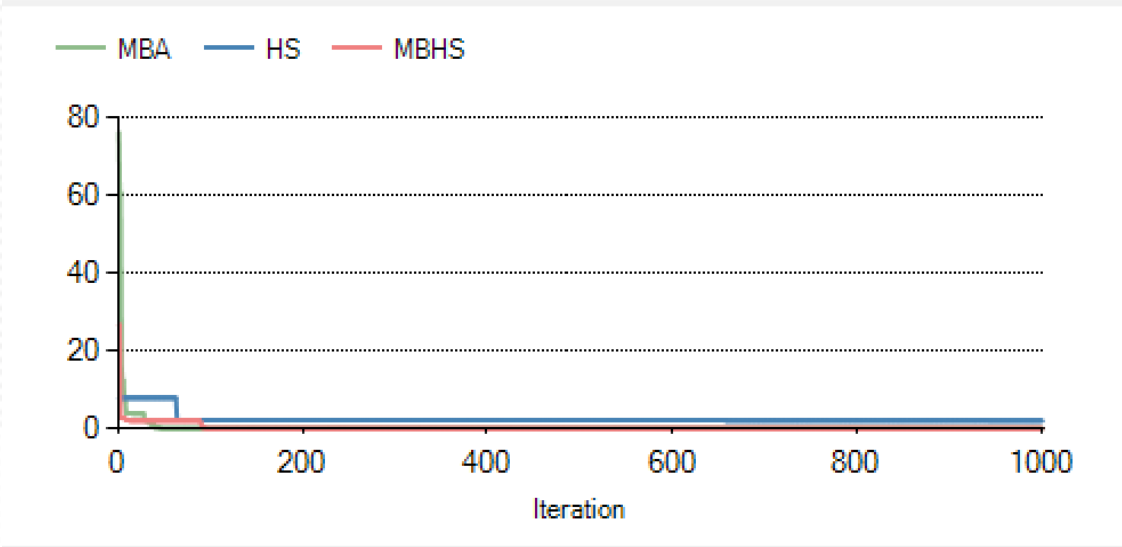


	Average	Best	收斂代次
MBA	5.3776917	0.994959	180
HS(1000)	6.8268146	2.1196215	2000
HS(2000)	3.7469539	1.3844573	2000
MBHS	3.9820503	0.994959	150



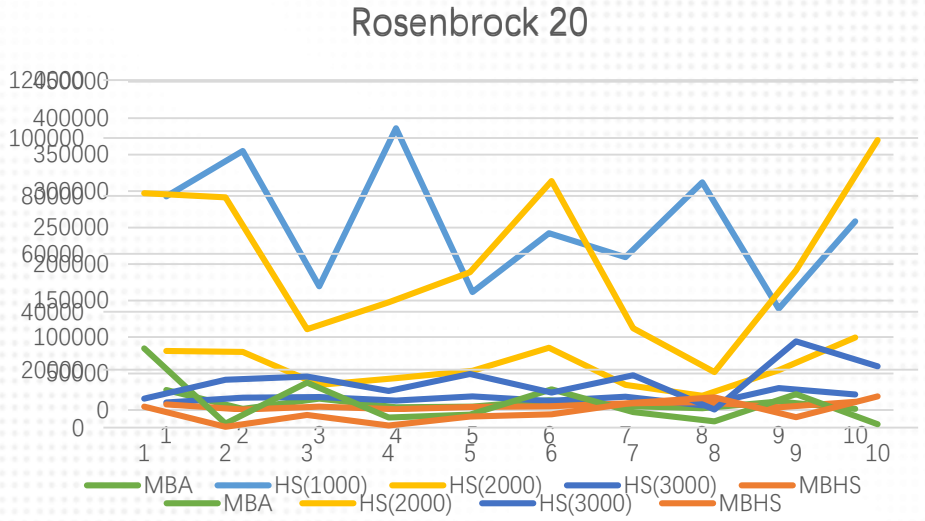
2 Rosenbrock Function 2D

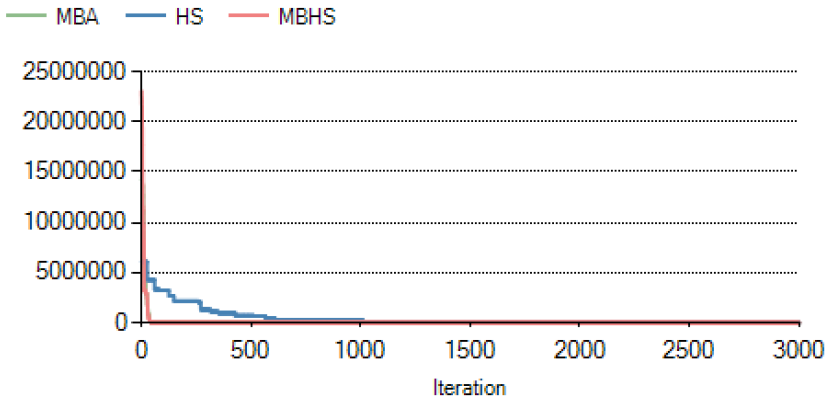




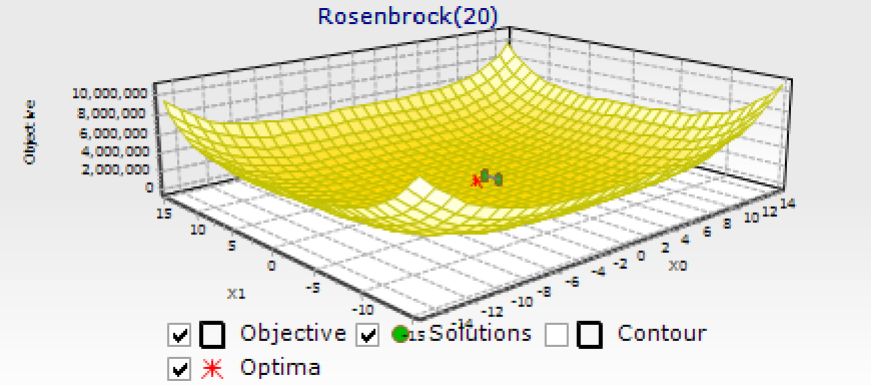
	Average	Best	收斂代次
MBA	0.6040534	0	200
HS	31.477425	2.15449	300
MBHS	0.1980278	0	200

2 Rosenbrock Function 20D



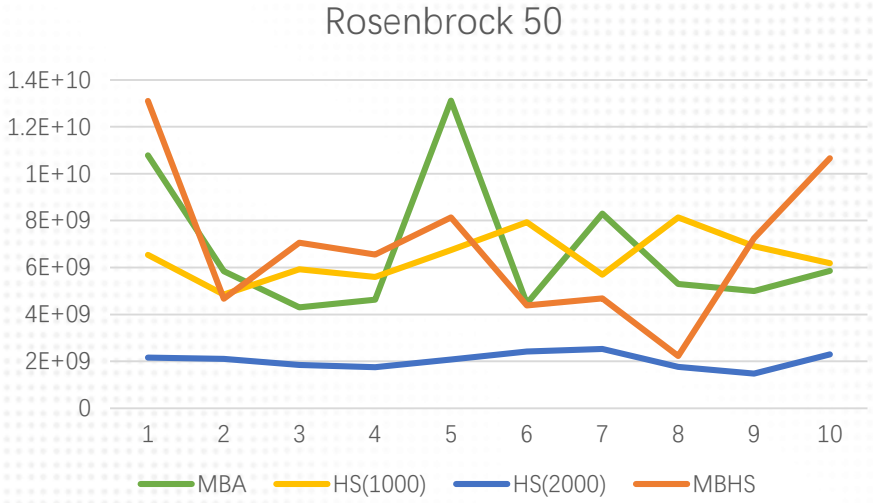


	Average	Best	收斂代次
MBA	8614.8781	1258.4919	40
HS(1000)	252389.10	138737.63	3000
HS(2000)	58406.136	19232.269	3000
HS(3000)	16318.837	6344.2163	3000
MBHS	5495.3777	363.02886	40

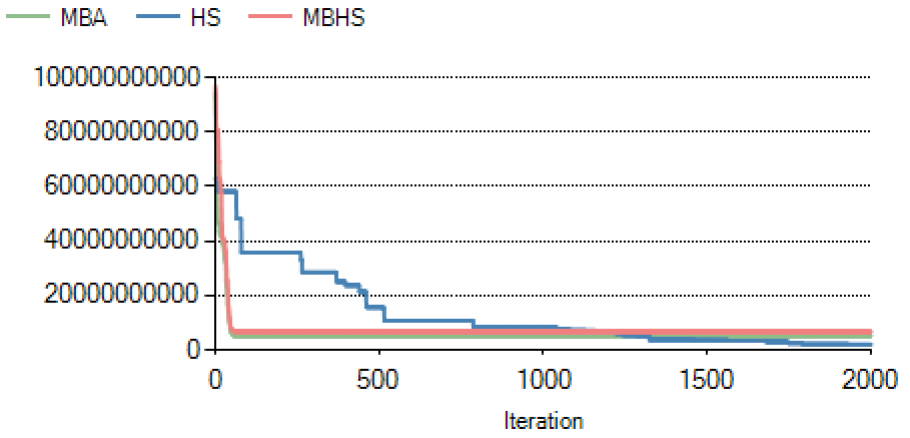


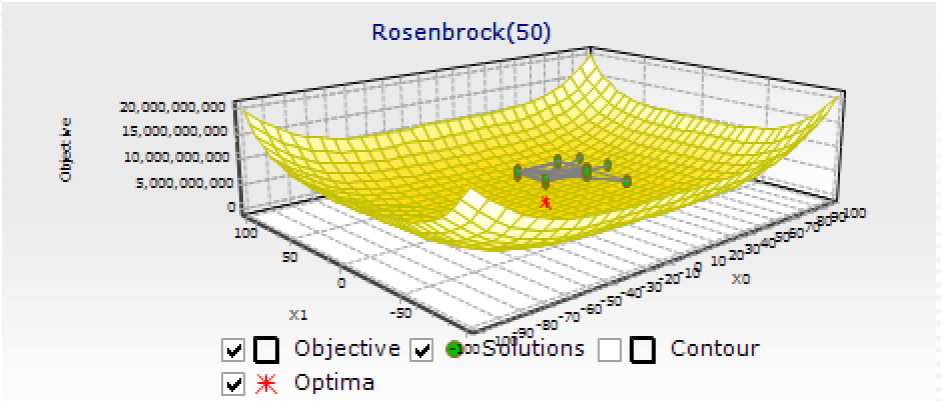
HS 3000 iteration

2 Rosenbrock Function 50D



	Average	Best	收斂代次
MBA	6758343952	4297122101	40
HS(1000)	6449807965	4850479525	2000+
HS(2000)	2039150681	1471958141	2000+
MBHS	6872368971	2219456839	50





HS 2000 iteration

3 Observation

1. 在運算至1000代次時，MBA和MBHS的解都優於HS，維度越高越明顯。

2. 高維度(50D)時HS運算至1500甚至2000代次後，得到的解就會優於其他兩者。可以得知HS的收斂速度較慢，但只要運算過多代次，HS的解可能優於MBA和MBHS。

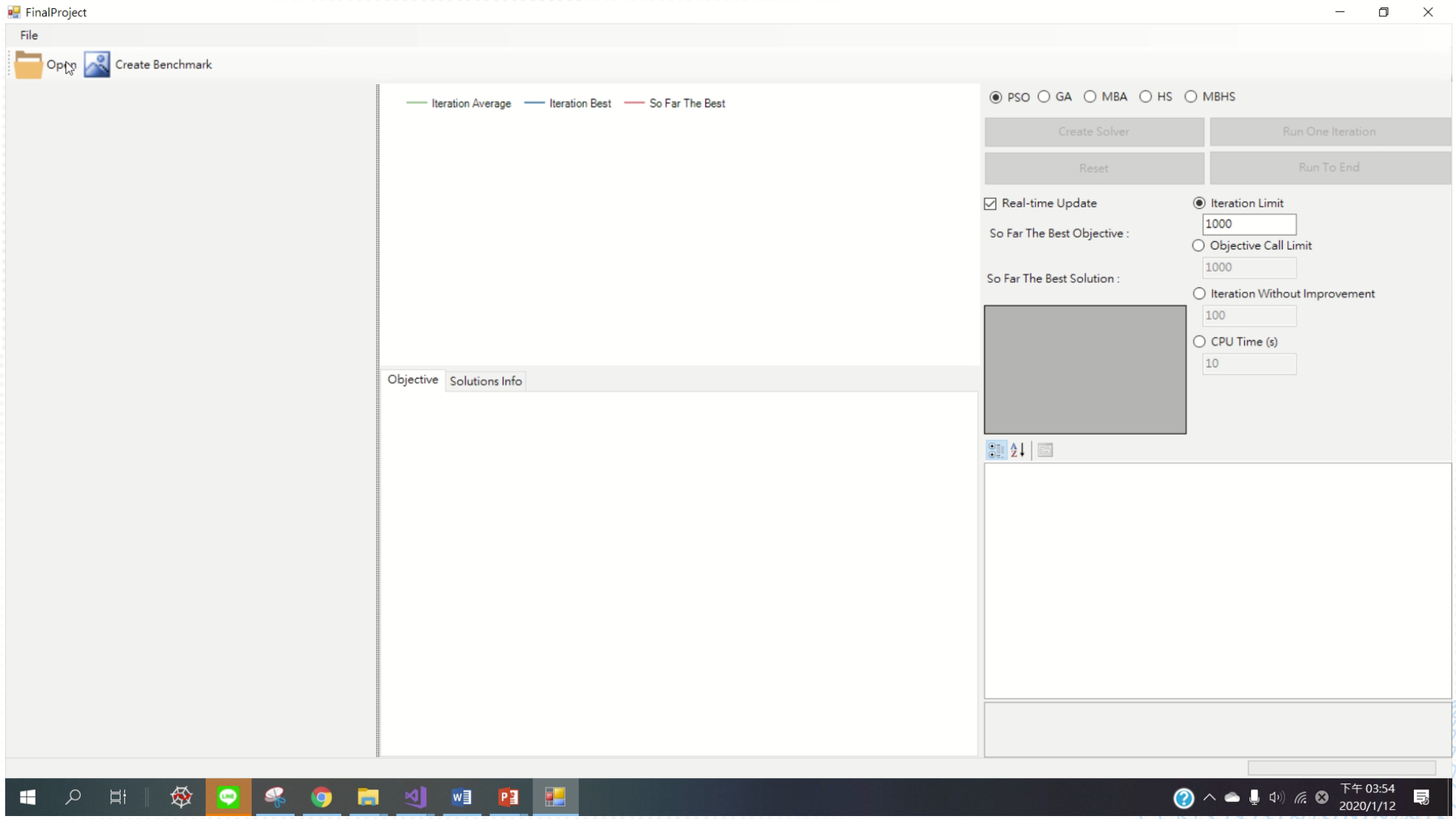
3. 中維度(20D)時，即便HS運算更多代次，結果仍然不如MBA和MBHS。

4. MBA和MBHS不論是在低、中、高維，表現結果差異不大，有時甚至MBA會比MBHS佳。

4 Conclusion

1. HS適合使用於高維度的問題，並且沒有運算時間的限制之下，可以得到較佳的結果。
2. MBA和MBHS的收斂速度相較於HS快了很多，運算時間或記憶體的限制時，使用MBA或MBHS會比較好。
3. MBHS的表現並沒有很明顯地比MBA來得好。

5 Demo


FinalProject
File
Open
Create Benchmark
Iteration Average
Iteration Best
So Far The Best
PSO
GA
MBA
HS
MBHS
Create Solver
Run One Iteration
Reset
Run To End
Real-time Update
Iteration Limit
1000
So Far The Best Objective :
Objective Call Limit
1000
So Far The Best Solution :
Iteration Without Improvement
100
CPU Time (s)
10
Objective
Solutions Info
下午 03:54
2020/1/12

Thanks