柔性期末報告

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題目:Chaotic catfish particle swarm optimization for solving global numerical optimization problems

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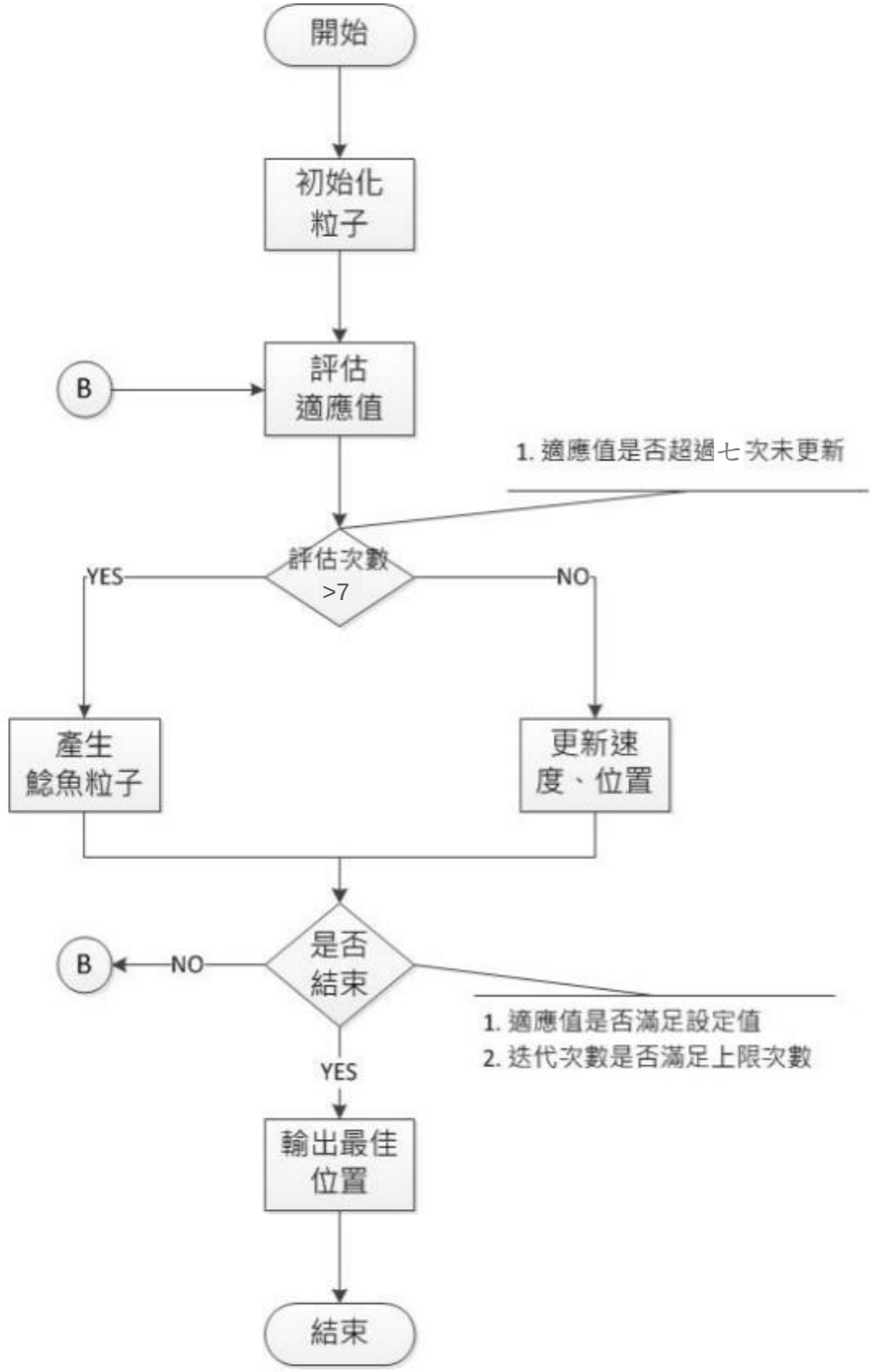
Basic Concept

- **Catfish particle swarm optimization(Catfish PSO):**在iteration終止前視particle所有已知的最佳解為局部最佳解，並淘汰fitness最差的10%的粒子，同時也入相同數量的catfish particle

Basic Concept

- 流程圖



Basic Concept

- Chaotic catfish particle swarm optimization(C-Catfish PSO):加入logistic map到CatfishPSO中
- Wmax=0.9 , Wmin=0.4 ,Iteration max => iteration limit

(PSO) $$v_{id}^{new} = w \times v_{id}^{old} + c_1 \times r_1 \times (pbest_{id} - x_{id}^{old}) + c_2 \times r_2 \times (gbest_d - x_{id}^{old}),$$

$$w = (w_{max} - w_{min}) \times \frac{Iteration_{max} - Iteration_i}{Iteration_{max}} + w_{min}.$$

Basic Concept

- Logistic map :Cr(0)隨機產生, k=4

$$Cr_{(t+1)} = k \times Cr_{(t)} \times (1 - Cr_{(t)}).$$

$$v_{id}^{new} = w \times v_{id}^{old} + c_1 \times Cr \times (pbest_{id} - x_{id}^{old}) + c_2 \times (1 - Cr) \times (gbest_d - x_{id}^{old}).$$

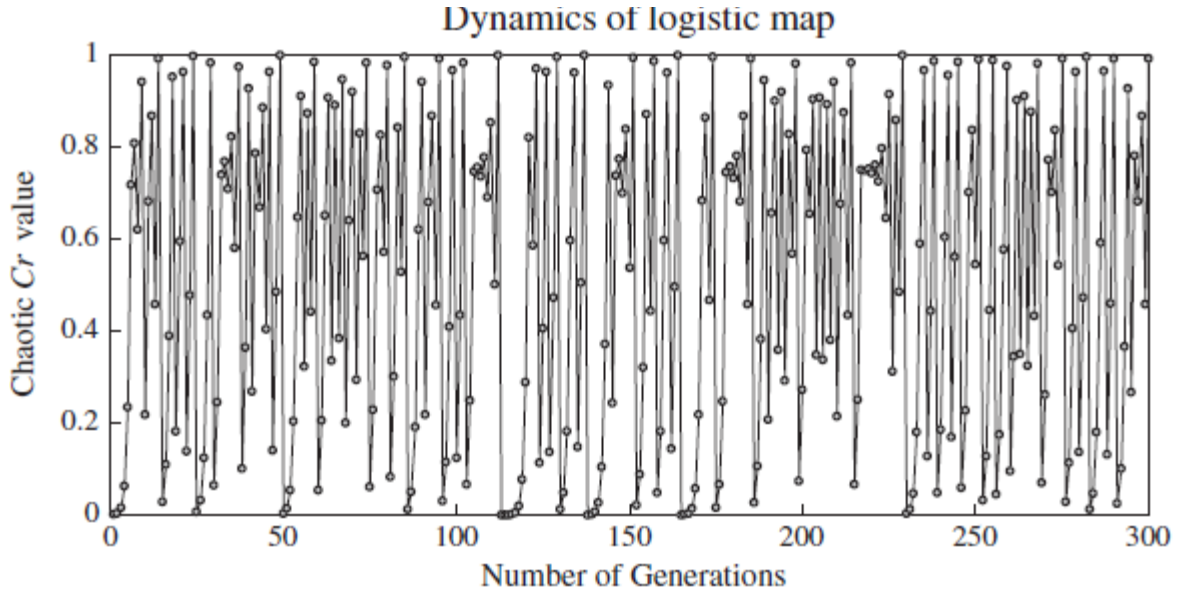


Fig. 1. Chaotic *Cr*value using a logistic map for 300 iterations; $Cr_{(0)} = 0.001$.

Conclusion

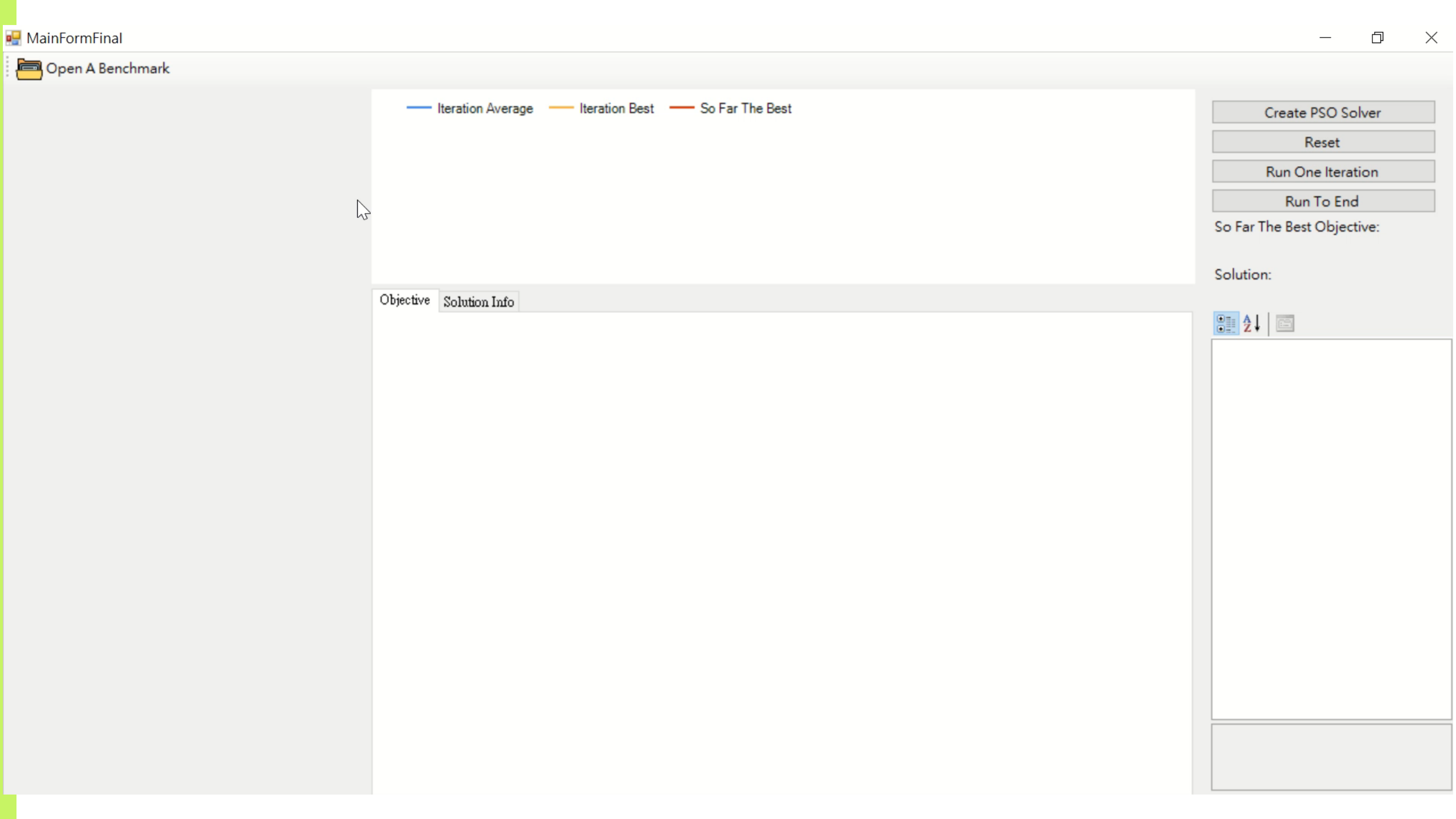
- 實驗結果顯示C-CatfishPSO優於PSO

Table 4
Mean function value for *Griewark* function.

Pop.	Dim.	Gen.	Optimal	PSO	C-PSO	CatfishPSO	C-CatfishPSO
20	10	1000	0	0.102±00.056	0.061±0.050	0.000±0.000	0.000±0.000
	20	1500	0	0.480±06.361	0.002±0.009	0.000±0.000	0.000±0.000
	30	2000	0	2.455±14.650	0.361±5.692	0.000±0.000	0.000±.000
40	10	1000	0	0.087±00.043	0.067±.035	0.000±0.000	0.000±0.000
	20	1500	0	0.120±02.846	0.096±.847	0.000±0.000	0.000±0.000
	30	2000	0	1.010±9.452	0.273±.957	0.000±.000	0.000±0.000
80	10	1000	0	0.074±00.032	0.061 ±0.027	0.000±0.000	0.000±0.000
	20	1500	0	0.030±0.026	0.011±0.037	0.000±0.000	0.000±0.000
	30	2000	0	0.193±04.034	0.091±2.858	0.000±0.000	0.000±0.000
160	10	1000	0	0.066±00.028	0.058±0.031	0.000±0.000	0.000±0.000
	20	1500	0	0.032±00.027	0.016±0.038	0.000±0.000	0.000±0.000
	30	2000	0	0.012±00.015	0.002±0.037	0.000±0.000	0.000±0.000
			Average	0.388±03.131	0.135±1.385	0.000±0.000	0.000±0.000

C-CatfishPSO V.S.	R^+	R^-	$R^=$	*P*-value	Significant ($\alpha = 0.05$)
PSO	12	0	0	0.002	**YES**
C-PSO	12	0	0	0.002	**YES**
CatfishPSO	0	0	12	1.000	**NO**

Demo


MainFormFinal
Open A Benchmark
Iteration Average
Iteration Best
So Far The Best
Create PSO Solver
Reset
Run One Iteration
Run To End
So Far The Best Objective:
Solution:
Objective
Solution Info

Thank you for listening~