# 2020

# 鯰魚粒子群演算法
# (Catfish Particle Swarm Optimization , CPSO)

Soft Computing Application Final Project Preview

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# Outline

1.介紹          2.原理          3.演算法步驟          4.測試結果
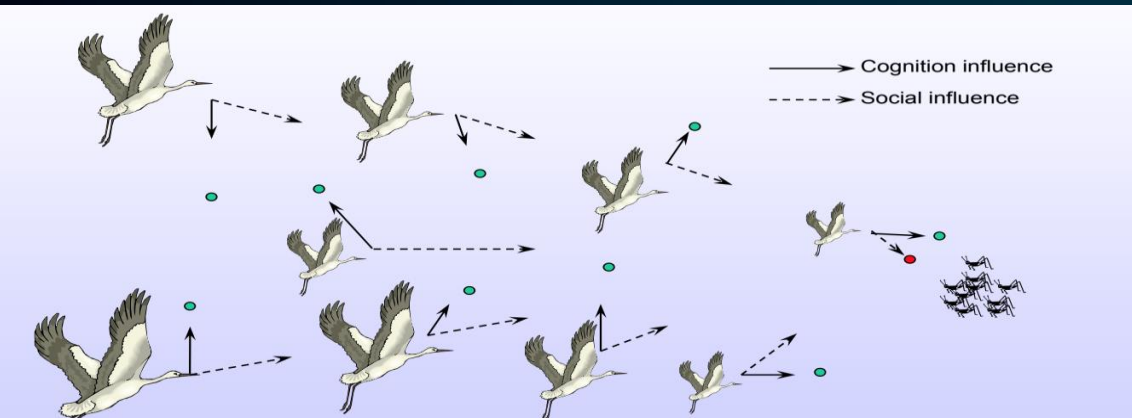
# 鯰魚效應(Catfish Effect)

## 『引入強者，激勵弱者』

**挪威漁夫的故事**

捕撈新鮮的沙丁魚

**放入鯰魚**

不停游動以求活命。

# 改進PSO的想法概念



Cognition influence
Social influence

粒子群算法存在一個問題過早收斂

- 粒子陷入局部最優時
- 適應度差的粒子用Catfish 粒子代替
  （模擬鯰魚效應）

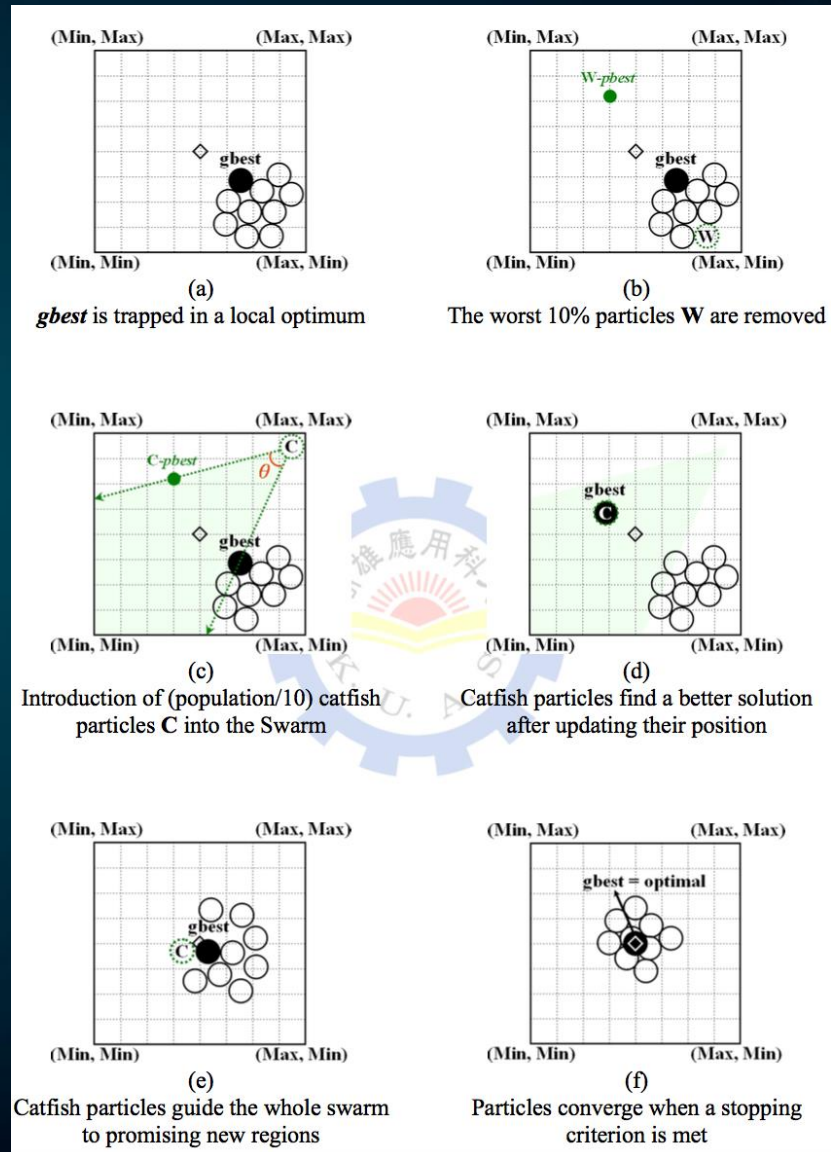## 初始化粒子
評估適應值

## 判斷是否產生鯰魚粒子
適時跳脫局部最佳解，避免過早收斂

## 是否更迭完成
輸出最佳位置

# CatfishPSO pseudo-code

```
01: begin
02:     Randomly initialize particles swarm
03:     while (number of iterations, or the stopping criterion is not met)
04:          Evaluate fitness of particle swarm
05:          for n = 1 to number of particles
06:               Find pbest
07:               Find gbest
08:               for d = 1 to number of dimension of particle
09:                    update the position of particles
10:               next d
11:          next n
12:          if fitness of gbest is the same Max times then
13:               Remove the 10% of particles R with the worst 10% fitness value
                  of the population
14:               Introduce (population/10) catfish particles C into the swarm
15:          end if
16:     next generation until stopping criterion
17: end
```

# CatfishPSO pseudo-code



(a) *gbest* is trapped in a local optimum

(b) The worst 10% particles **W** are removed

(c) Introduction of (population/10) catfish particles **C** into the Swarm

(d) Catfish particles find a better solution after updating their position

(e) Catfish particles guide the whole swarm to promising new regions

(f) Particles converge when a stopping criterion is met

研究相關文獻

寫程式碼

測試資料並與其他
演算法做比較

# Benchmark Problems

- Ackley(30)
- Girewank(N)
- Rastrigin(30)
- Rosenbrock(30)

File

Open A Benthmark

Iteration Average
Iteration Best
So Far The Best

Objective Value

Iterations

Objective    Solution Information

CatfishPSO    PSO

Create Solver

Rest

Run One Iteration

Run To End

Real Time Update

So Far The Best Value:

So Far The Best Solution:

Time Used:

# Reference

- Li-Yeh Chuang a, Sheng-Wei Tsai b, Cheng-Hong Yang (2011),

Improved binary particle swarm optimization using catfish effect for feature selection

- JIUN-HAN HUANG (2017)

An UAV Aerial Image Recognition Based on Modified Evolutionary Computation

- PENG,Y.* –JI,C.M.–SHI,Y.L. (2019)

CATFISH-EFFECT MULTI-OBJECTIVE PARTICLE SWARM OPTIMIZATION FOR COORDINATED

- Sheng-Wei Tsai (2009)

DISPATCHMENT OF WATER AND SEDIMENT IN A RESERVOIR

Particle Swarm Optimizer with Catfish Effect as Scout Strategy for Global Optimization Problem

# THANK YOU