

# 應用範例

## Laplace

- syms t  
laplace(t)  
ans =1/s^2
- syms s  
ilaplace(1/s^2)  
ans =t

## Fourier

- syms x  
fourier(exp(-x^2))  
ans =pi^(1/2)\*exp(-1/4\*w^2)
- syms w  
ifourier(pi^(1/2)\*exp(-1/4\*w^2))  
ans=3991211251234741/4503599627370496\*4^(1/2)/pi^(1/2)\*exp(-x^2)  
(※3991211251234741/4503599627370496\*4^(1/2)/pi^(1/2)=1)

# 基因演算法

例：求  $f(x, y) = 20 + x^2 + y^2 - 10(\cos(2\pi x) + \cos(2\pi y))$  的極小值

$$\text{限制式 } \begin{bmatrix} 1 & 1 \\ -12 & \\ 2 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} \leq \begin{bmatrix} 2 \\ 2 \\ 3 \end{bmatrix}, \quad \begin{bmatrix} -5 \\ -5 \end{bmatrix} \leq \begin{bmatrix} x \\ y \end{bmatrix} \leq \begin{bmatrix} 3 \\ 4 \end{bmatrix}$$

function y = gatest(x)

y = 20 + x(1)^2 + x(2)^2 - 10 \* ( cos(2\*pi\*x(1))+cos(2\*pi\*x(2)) );

```
>> A=[1 1;-1 2;2 1];
>> b=[2;2;3];
>> Lb=[-5;-5];
>> Ub=[3;4];
>> [x,fval,reason]=ga(@gatest,2,A,b,[],[],Lb,Ub)
```

執行結果：

x =0.0059      0.0023

fval =0.0080

reason =Optimization terminated: average change in the fitness value less than options.TolFun.

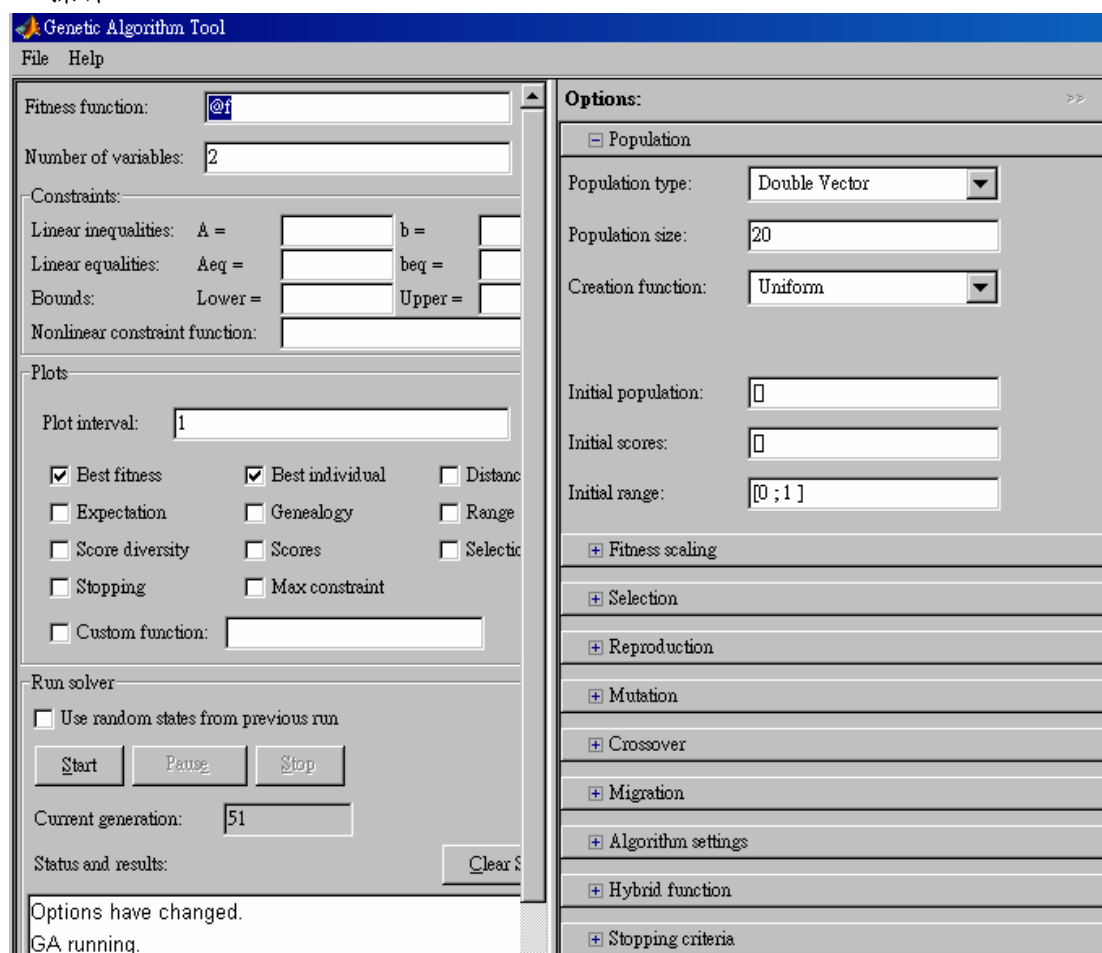
自訂函數

```
function v = f(x)
```

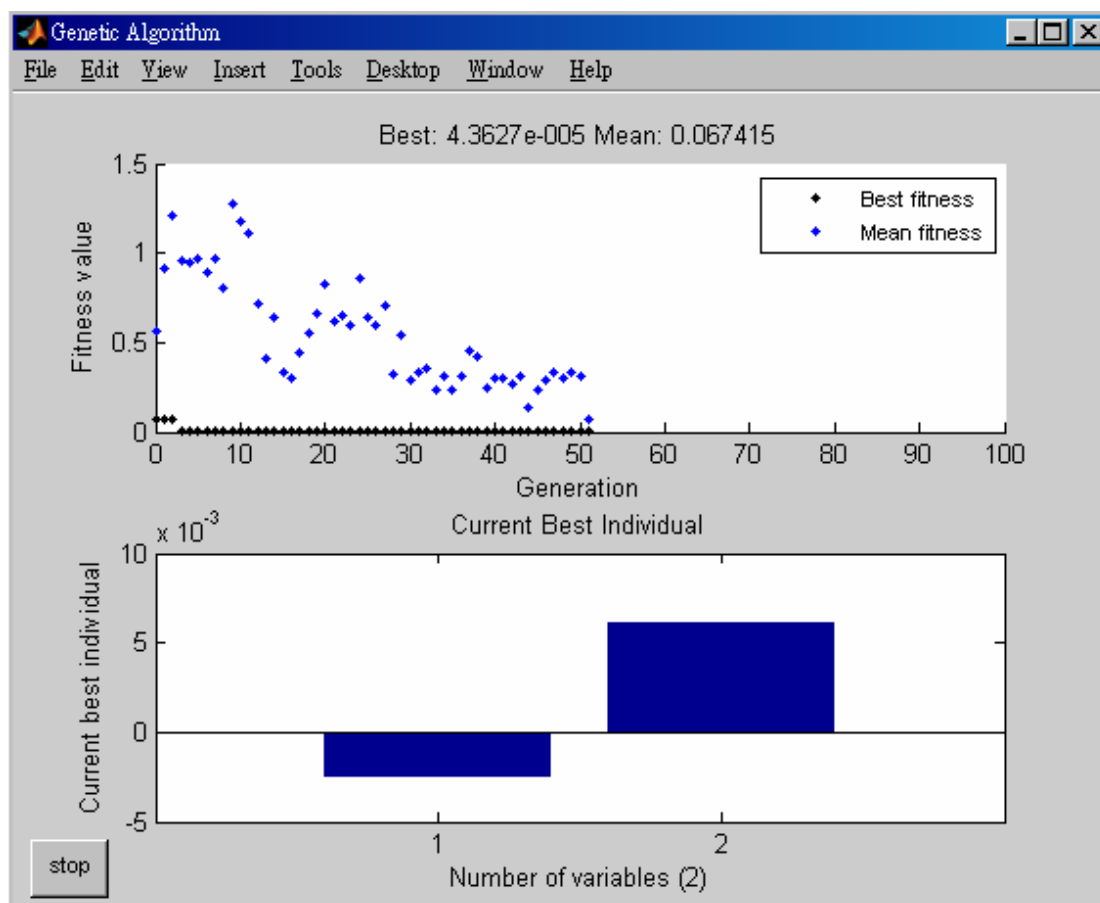
```
v = x(1).^2 + x(2).^2;
```

```
>> [x,fval,reason]=ga(@f,2)
```

或用 gatool 操作



執行結果：



Options have changed.  
 GA running.  
 GA terminated.  
 Fitness function value: 4.3626721462845715E-5  
 Optimization terminated: average change in the fitness value less than options.TolFun.

Final point:

| 1        | 2       |
|----------|---------|
| -0.00252 | 0.00611 |

Optimization terminated: average change in the fitness value less than options.TolFun.

x = 0.0044      0.0052

fval = 4.6427e-005

reason = Optimization terminated: average change in the fitness value less than options.TolFun.