In The Name Of God

University of Tehran

Faculty of Engineering

Department of Surveying and Geomatics Engineering

Geospatial Information Systems (GIS) Division

GA TOOLBOX IN MATLAB

Rastrigin's Function

Peaks Function

Instructor : Dr.Samadzadegan & MC.s Hasani

Last Name : Ghandehary

First Name : Mehran

Student Number : 810389010

Email : m.ghandhary@yahoo.com

Cell : 09132668898

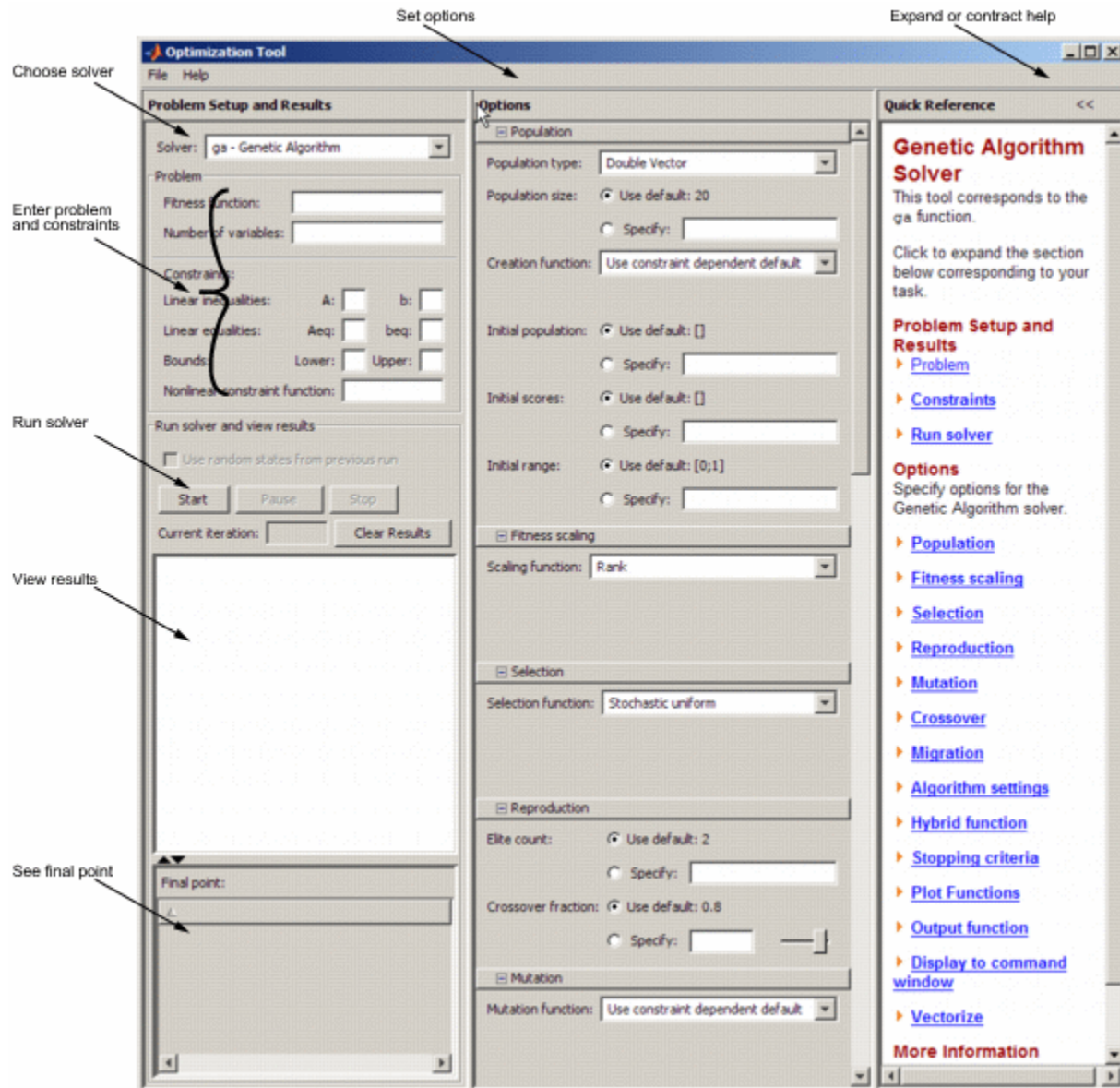http: www.mohamadhamzeh.blogfa.com
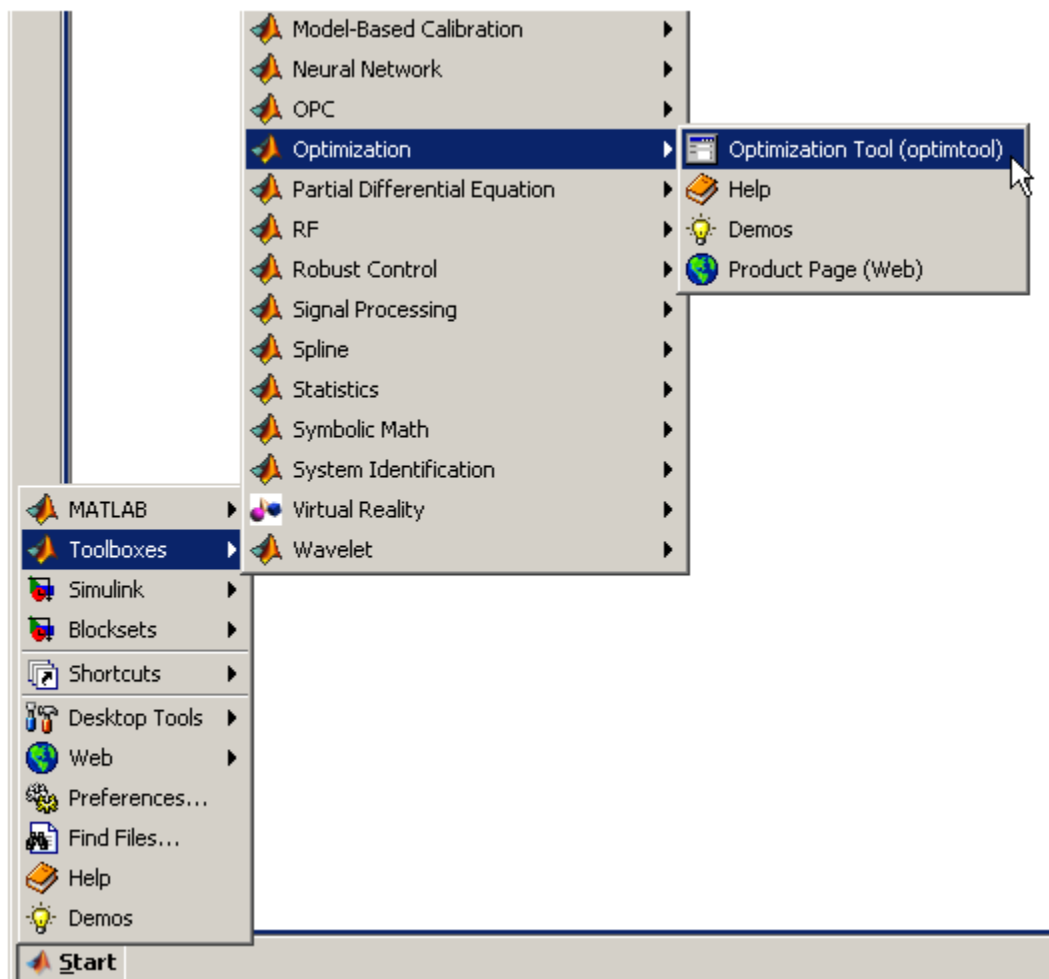
Date Delivered : 30.10.2010

Introduction

To open the Optimization Tool, enter

```
optimtool('ga')
```

at the command line, or enter `optimtool` and then choose `ga` from the **Solver** menu.

You can also start the tool from the MATLAB **Start** menu as pictured:

To use the Optimization Tool, you must first enter the following information:

- **Fitness function** — The objective function you want to minimize. Enter the fitness function in the form @fitnessfun, where fitnessfun.m is a file that computes the fitness function.
- **Number of variables** — The length of the input vector to the fitness function.
- You can enter constraints or a nonlinear constraint function for the problem in the **Constraints** pane. If the problem is unconstrained, leave these fields blank.

To run the genetic algorithm, click the **Start** button. The tool displays the results of the optimization in the **Run solver and view results** pane.

You can change the options for the genetic algorithm in the **Options** pane. To view the options in one of the categories listed in the pane, click the + sign next to it.
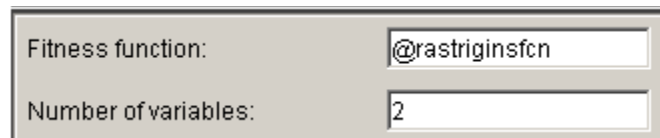
3

Example: Rastrigin's Function

This section presents an example that shows how to find the minimum of Rastrigin's function

Global minimum at [0 0]

Local maxima

Local minima

Global minimum at [0 0]
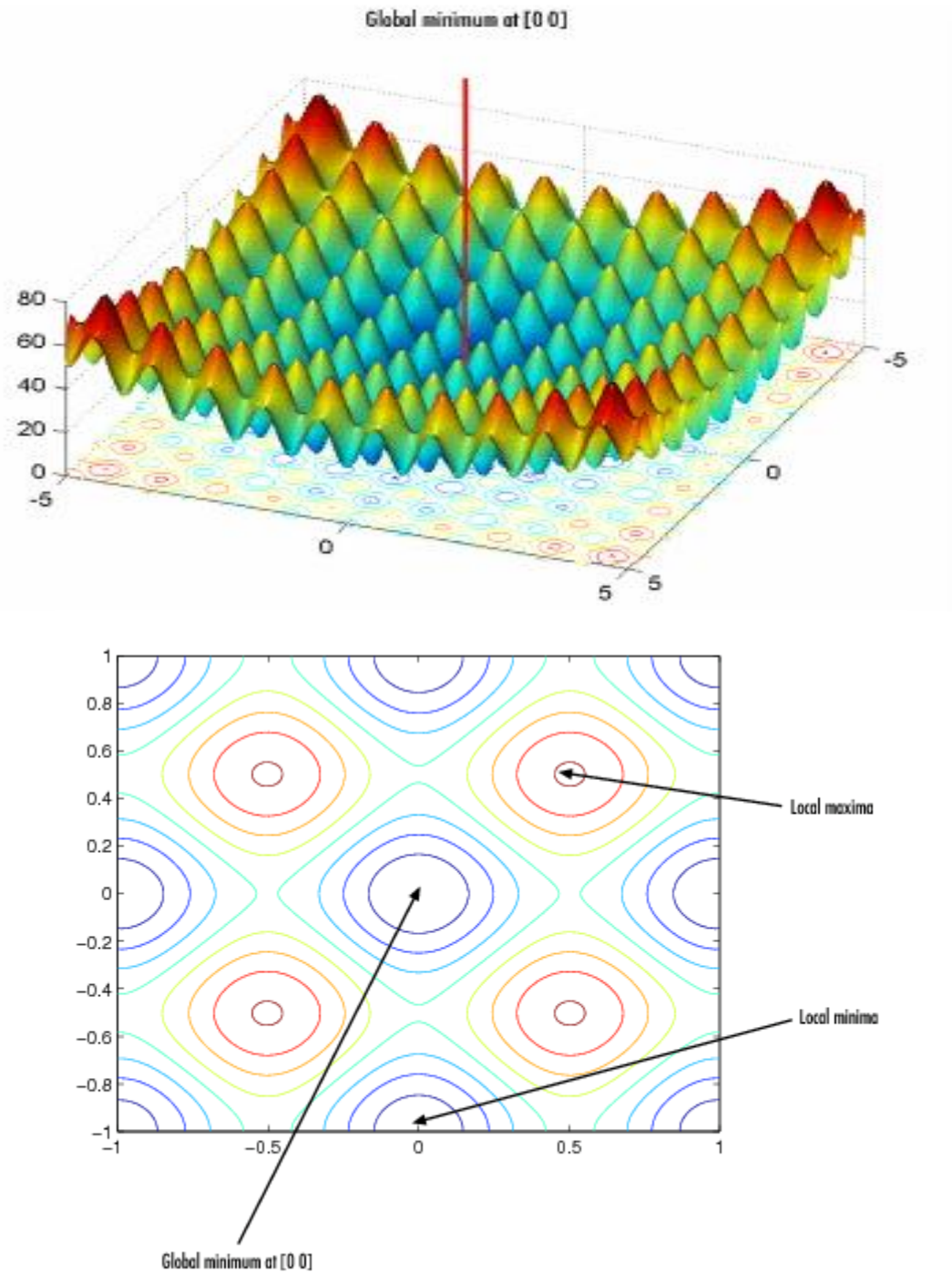
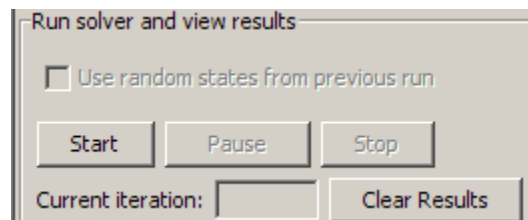1.Enter optimtool('ga') at the command line to open the Optimization Tool.

2. Enter the following in the Optimization Tool:

  - In the **Fitness function** field, enter @rastriginsfcn.
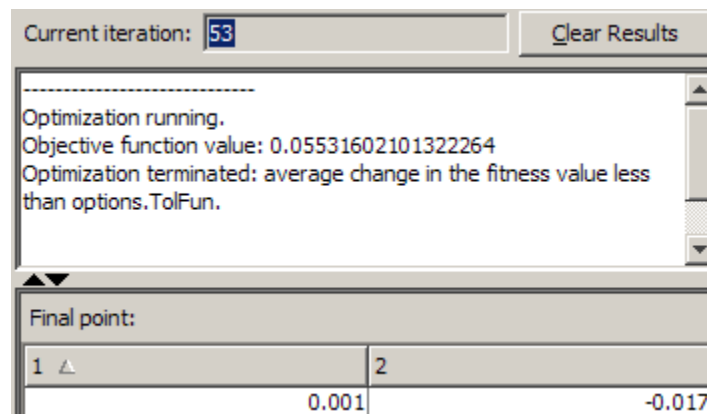 - In the **Number of variables** field, enter 2, the number of independent variables for Rastrigin's function.

Fitness function:	@rastriginsfcn
Number of variables:	2

3.Click the **Start** button in the **Run solver and view results** pane, as shown in the following figure.

Run solver and view results

☐ Use random states from previous run

Start	Pause	Stop

Current iteration: [   ]   Clear Results

When the algorithm is finished, the **Run solver and view results** pane appears as shown in the following figure.

Current iteration: 53   Clear Results

Optimization running.
Objective function value: 0.05531602101322264
Optimization terminated: average change in the fitness value less than options.TolFun.

Final point:

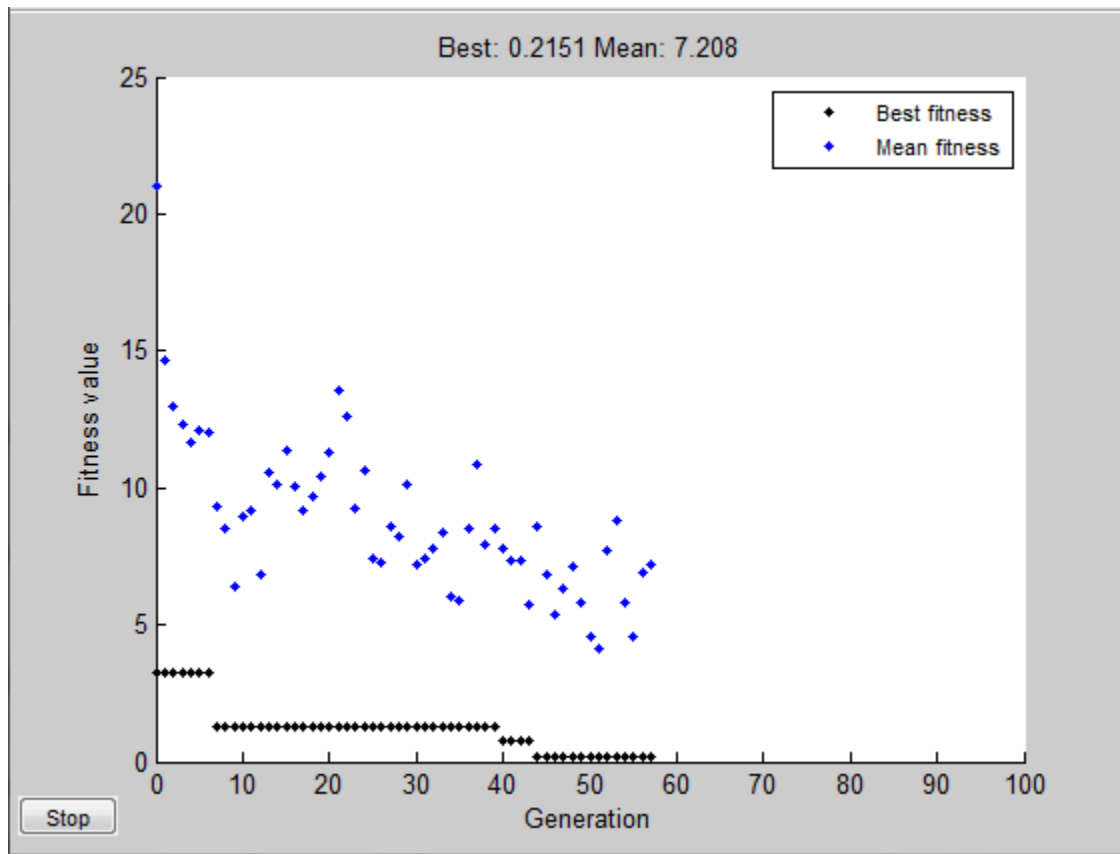| 1 △	2
0.001	-0.017

5

to plot the best and mean values of the fitness function at each generation, select the box next to **Best fitness**, as shown in the following figure.
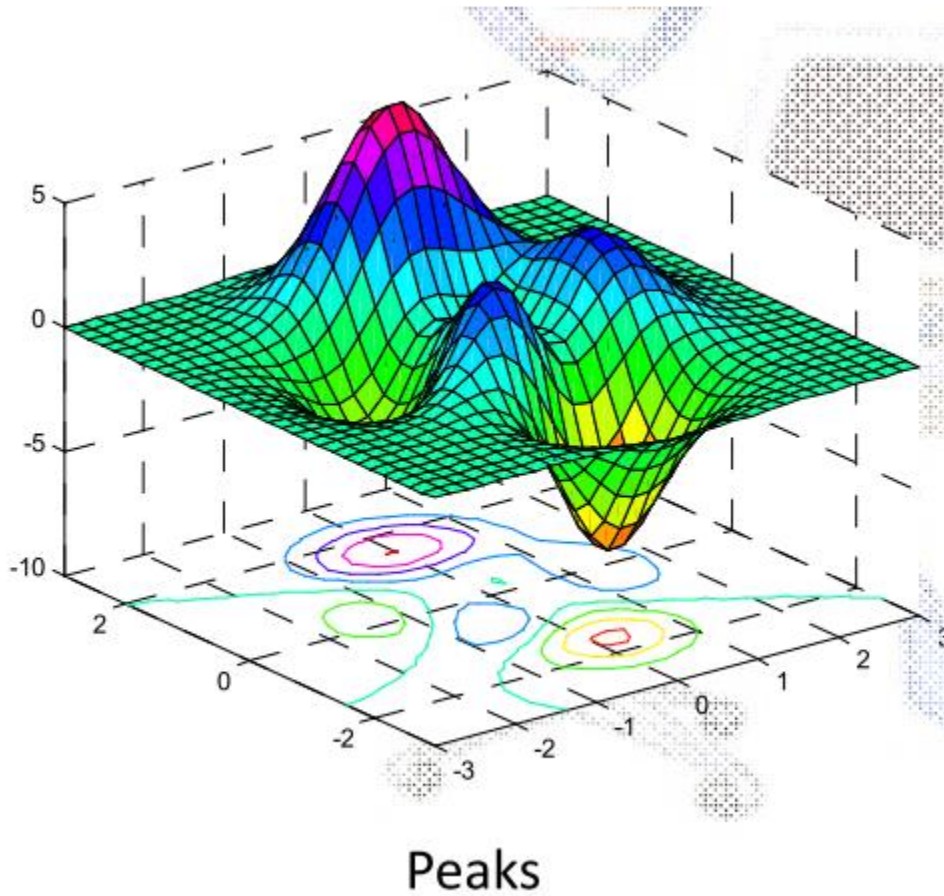
Example Peaks Function

Peaks

1 . Difinnig function

```
function z=Peak_Fnc (X)
x=X(:,1);
y=X(:,2);
z=3*(1-x).^2.*exp(-(x.^2) - (y+1).^2)- 10*(x/5 - x.^3 - y.^5).*exp(-x.^2-y.^2)- 1/3*exp(-(x+1).^2 - y.^2) ; %
this is Peaks function as default
end
```

2 .Set parameters in ga toolbox

Problem	
Fitness function:	@Peak_Fnc
Number of variables:	2

3 . Result

Current iteration: 51   Clear Results

Optimization running.
Objective function value: -6.550417666066074
Optimization terminated: average change in the fitness value less than
options.TolFun.

Final point:

1 ▼	2
0.232	-1.631

Best: -6.5504 Mean: -5.1614

◆ Best fitness
◆ Mean fitness

Fitness value

Generation

Stop