Brief usage instructions for the program
GA Function Maximizer, v1.1

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2004-09-20

1. Introduction

The program GA Function Maximizer, v1.1, implements function maximization using an evolutionary algorithm. GA Function Maximizer is freeware, and was distributed to the participants of Mattias Wahde's tutorial on Evolutionary Robotics at IROS2004 in Sendai, Japan.

The program was written by Mattias Wahde (mattias.wahde@me.chalmers.se) and Jimmy Pettersson (jimmy.pettersson@me.chalmers.se). The authors take no responsibility for the results obtained from this program – use at your own risk.

2. Running the program

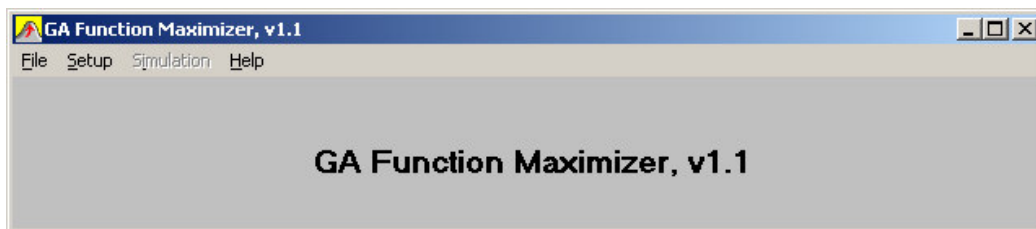Start the program by double-clicking on the program icon. The following window will appear:

Fig.1: The main window of GA Function Maximizer.

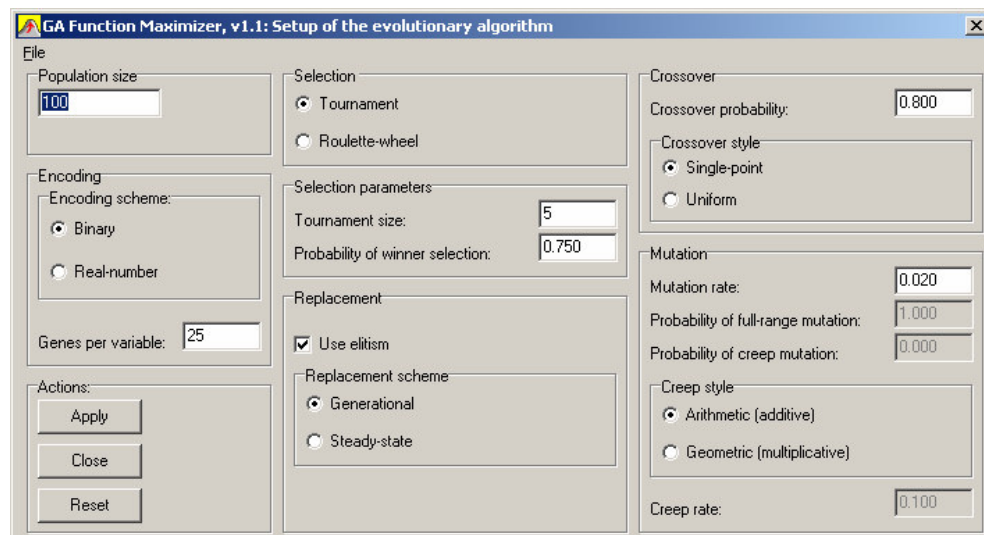Choose **Setup – EA Parameters** to set the parameters of the EA. The following window will appear:

Fig.2: The setup window for the evolutionary algorithm.

A number of different choices can be made. If no active choice is made, the default parameters will be those shown in Fig. 2. For a detailed description of the various parameters, see the tutorial notes, available as technical report TR-BBR-2004-001 at

http://www.me.chalmers.se/~mwahde/robotics/techreports.html.

Next, close the EA setup window, and select **Setup - Objective function**. The following window appears:
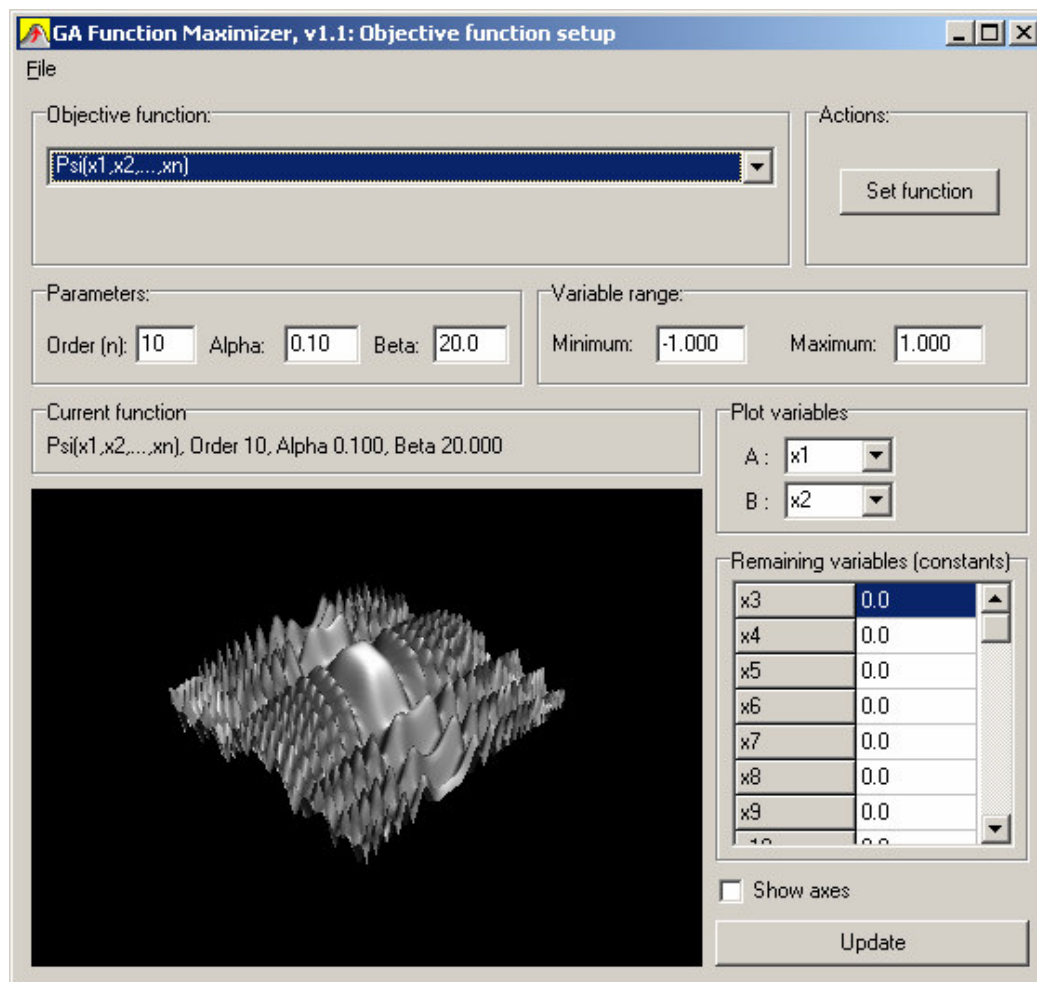

Fig. 3: The window for objective function setup.

In this window, the objective function is chosen. Two choices are available, either the function ψ defined in the technical report (see above), or a user-defined polynomial. Choose a function by pressing the **Set function** button. The surface obtained by varying two of the variables of the function is shown in the lower left part of the window. Select the **Plot variables** and the values of the remaining variables (i.e. those that are kept constant in the plot), and press **Update** in order to generate a new plot.

It is also possible to enter a polynomial in n variables. However, parantheses, multiplication signs, and exponential notation are *not* allowed. Thus, for example, the polynomial

$f(x_1, x_2) = -2 + 3x_1(1 - 2 x_2^2)$

must be entered as (spacing between variables is optional).

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-2 + 3 x1 - 6 x1 x2x2
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The result (after pressing **Set Function**) is shown in Fig. 4.
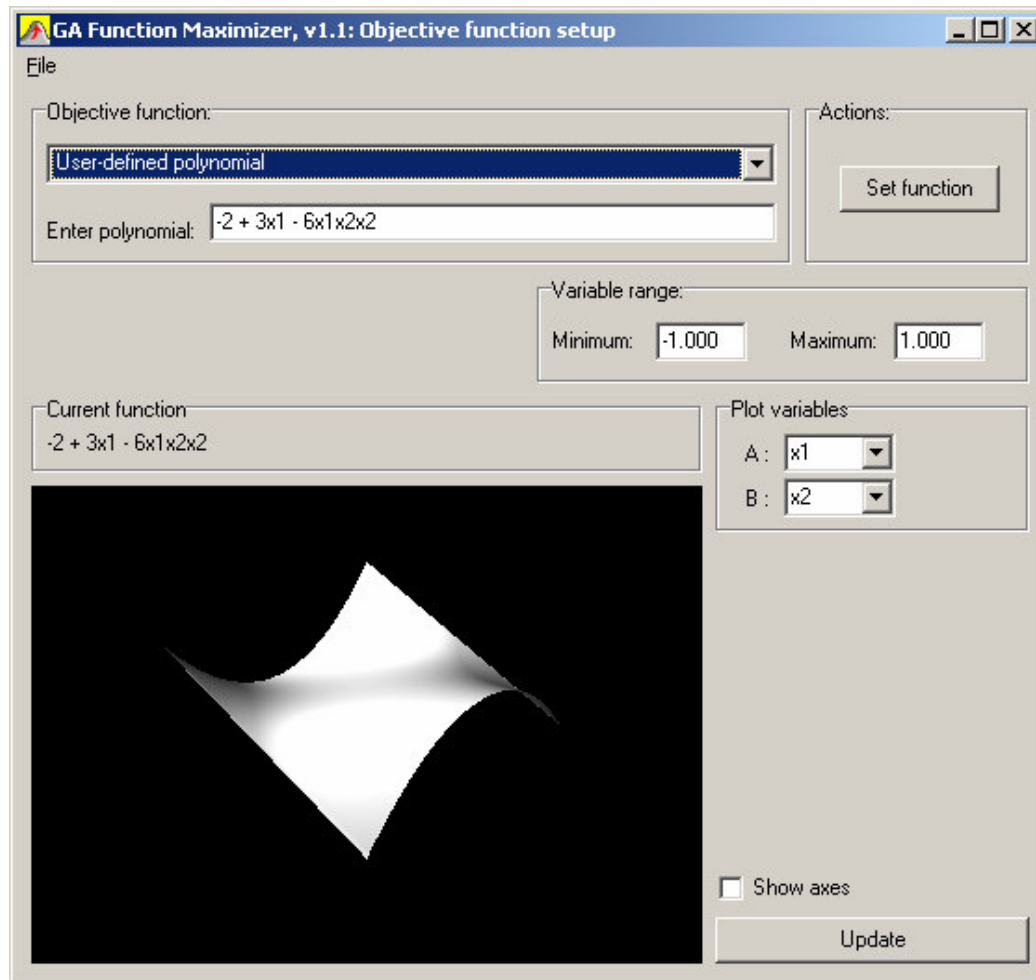

Fig. 4. The polynomial function $f(x_1, x_2) = -2 + 3x_1(1 - 2 x_2^2)$.

When the setup has been completed, close the objective function setup window and choose **Simulation – Single EA run**. The following window appears:
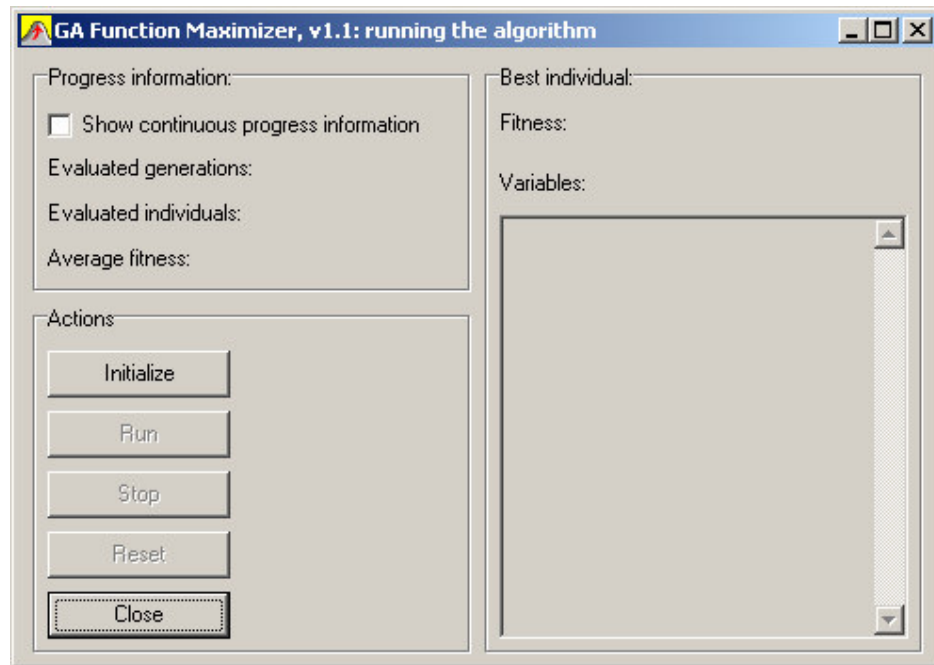

Fig. 5: The window for single EA Runs.

Start the EA by first clicking the **Initialize** button and then the **Run** button. For continuous progress information, click the check box. The variables contained in the chromosome of the best individual will be shown in the right panel. As an alternative to single runs, one may also carry out batch runs, i.e. several runs after each other, by selecting **Simulation – Batch run**. As shown in Fig. 6, the termination criterion can be based either on the maximim fitness achiveed or on the number of evaluated individuals.
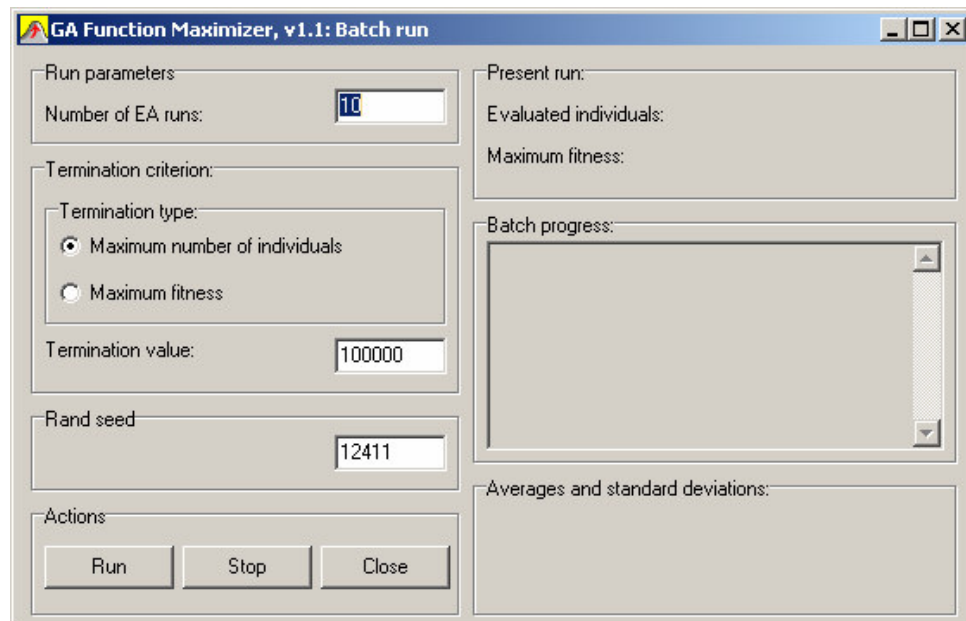

Fig. 6. The window for batch runs.

3. Troubleshooting

It *is* possible to crash the program, e.g. by entering polynomials incorrectly.

In case the program reports a "floating point error", the problem may be caused by the regional settings used on the computer. To fix this problem, open the control panel, select "Regional and Language Options" (Win2000/XP Classic view) or "Date, Time, Language, and Regional Options" followed by "Regional and Language Options" (Win XP), and click "Customize". Change the "Decimal symbol" to "." (point, not comma).