

Genetic Algorithm and Direct Search Toolbox Release Notes

Chapter 1, “Genetic Algorithm and Direct Search Toolbox 2.0 Release Notes” describe the changes in this product since Version 1.0.2.

If you are upgrading from a version earlier than Version 1.0.2, you should also see

- Chapter 2, “Genetic Algorithm and Direct Search Toolbox 1.0.2 Release Notes”
- “Genetic Algorithm and Direct Search Toolbox 1.0.1 Release Notes”

Printing the Release Notes. If you would like to print the Release Notes, you can link to a PDF version.

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Genetic Algorithm and Direct Search Toolbox 2.0 Release Notes

New Features

This section summarizes the new features and enhancements introduced in the Genetic Algorithm and Direct Search Toolbox Version 2.0.

Both the Genetic Algorithm and the Pattern Search Algorithm Now Accept Nonlinear Constraints

Previously, the genetic algorithm solver only solved unconstrained optimization problems, and the pattern search solver solved unconstrained optimization problems as well as those with linear constraints and bounds. Now, both solvers have the ability to solve general nonlinear optimization problems with linear constraints, bounds, and nonlinear constraints by accepting a nonlinear constraint function. The M-file for the nonlinear constraint function is accepted as an input argument at the command line for both the `ga` and `patternsearch` functions, as well as in the **Constraints** panel of `psearchtool` and `gatool`.

Direct Search Now Implements Two Algorithms – Generalized Pattern Search Algorithm (GPS) and Mesh Adaptive Search Algorithm (MADS)

The GPS algorithm is the pattern search algorithm implemented in previous versions of the toolbox. The MADS algorithm is a modification of the GPS algorithm. The algorithms differ in how the set of points forming the mesh is computed. The GPS algorithm uses fixed direction vectors, whereas the new MADS algorithm uses a random selection of vectors to define the mesh.

New Options Available in the Genetic Algorithm

The following options are available in the `gatool` and when using the `ga` function at the command prompt:

- The new **Constraints** panel has a **Nonlinear constraint function** field in addition to fields for linear constraints and bounds for solving constrained optimization problems
- New **Max constraint** (`@gaplotmaxconstr`) option in the **Plot** pane to plot the maximum nonlinear constraint violation at each generation

- New crossover function, Arithmetic (@crossoverarithmetic), available in the **Crossover** panel that creates children that are the weighted arithmetic mean of two parents
- New mutation function, Adaptive Feasible (mutationadaptfeasible), available in the **Crossover** panel that randomly generates directions that are adaptive with respect to the last successful or unsuccessful generation. This function is the default for constrained problems
- New **Algorithm settings** panel for selecting algorithm specific parameters, such as the penalty parameters, **Initial penalty** and **Penalty factor**, for a nonlinear constraint algorithm
- New **Hybrid function**, fmincon, for constrained problems
- New **Nonlinear constraint tolerance** parameter in **Stopping criteria**

New Options Available in the Pattern Search Algorithm

The following options are available in the psearchtool and when using the patternsearch function at the command prompt:

- **Constraints** now has a **Nonlinear constraint function** option to solve for constrained optimization problems
- New **Max constraint** (@psplotmaxconstr) option in the **Plot** pane to plot the maximum nonlinear constraint violation at each generation
- Updated **Poll method** and **Search method** options for selecting the GPS or MADS algorithms
- New **Algorithm settings** panel for selecting algorithm specific parameters, such as the penalty parameters, **Initial penalty** and **Penalty factor**, for a nonlinear constraint algorithm
- New **Time limit** and **Nonlinear constraint tolerance** parameters in **Stopping criteria**

New Demos

The Genetic Algorithm and Direct Search Toolbox contains the following new demos for Version 2.0:

- Optimization of Non-smooth Objective Function

- Constrained Minimization Using the Genetic Algorithm
- Constrained Minimization Using the Pattern Search
- Optimization of Stochastic Objective Function
- Using the Genetic Algorithm with the Distributed Computing Toolbox

Known Software and Documentation Problems

At publication time, the Genetic Algorithm and Direct Search Toolbox had no significant known open bugs. The Bug Reports interface on the MathWorks Web site will be updated if any important bugs become known to the MathWorks after the publication of these release notes.

Genetic Algorithm and Direct Search Toolbox 1.0.2 Release Notes

New Features

The Genetic Algorithm and Direct Search Toolbox 1.0.2 Release Notes describe the following change, introduced in Version 1.0.2.

Change to Pattern Search Option `MaxIteration`

In Version 1.0.2, the name of the pattern search option '`MaxIteration`' has been changed to '`MaxIter`', to conform with the Optimization Toolbox option '`MaxIter`'.

If you created and saved an options structure with an earlier version of the Genetic Algorithm and Direct Search Toolbox, you can still use the structure with the current version. However, MATLAB returns the following warning

```
Warning: Options 'MaxIteration' is obsolete; use 'MaxIter'  
instead.
```

Genetic Algorithm and Direct Search Toolbox 1.0.1 Release Notes

New Features

There were no significant updates to the Genetic Algorithm and Direct Search Toolbox since Version 1.0.

Note Version 1.0 was released in Web download form after the release of Release 13 with Service Pack 1.

Major Bug Fixes

The Genetic Algorithm and Direct Search Toolbox 1.0.1 includes one bug fix made since Version 1.0.

Status and Results Pane Now Scrolls Correctly

In Version 1.0, when you clicked in the **Status and results** pane in either the Genetic Algorithm Tool or the Pattern Search Tool, the scroll bar no longer scrolled automatically to the bottom of the pane, so that the most recent results were not visible in the pane. This has been fixed in Version 1.0.1.

Known Software and Documentation Problems

This section describes a known software problem in Version 1.01.

Debugging an M-File While Performing an Optimization

If you try to debug an M-File in the Editor/Debugger while at the same time doing either of the following tasks, MATLAB might return Java exception messages to the command line or might error.

- Running the genetic algorithm on a problem in the Genetic Algorithm Tool, the graphical user interface (GUI) to the genetic algorithm
- Performing a pattern search on a problem in the Pattern Search Tool, the pattern search GUI

This problem only arises when using the GUIs. It does not affect the command-line functions `ga` and `patternsearch`, which implement the genetic algorithm and pattern search, respectively. To avoid getting Java exception messages or errors, debug your M-files using these command-line functions.

“Importing and Exporting Options and Problems”, in the online documentation for the Genetic Algorithm and Direct Search Toolbox, explains how to export a problem to the MATLAB workspace, in case you need to debug one of the M-files the problem uses.