Genetic Algorithm and Direct Search Toolbox Release Notes

Contents

Summary by Version

This table provides quick access to what's new in each version. For clarification, see "About Release Notes" on page 1.

Version (Release)	New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
Latest Version V2.0.1 (R2006a)	No	No	Bug Reports at Web site	Printable Release Notes: PDF V2.0.1 product documentation
V2.0 (R14SP3)	Yes Details	No	Bug Reports at Web site	No

About Release Notes

Use release notes when upgrading to a newer version to learn about new features and changes, and the potential impact on your existing files and practices. Release notes are also beneficial if you use or support multiple versions.

If you are not upgrading from the most recent previous version, review release notes for all interim versions, not just for the version you are installing. For example, when upgrading from V1.0 to V1.2, review the New Features and Changes, Version Compatibility Considerations, and Bug Reports for V1.1 and V1.2.

New Features and Changes

These include

- New functionality

- Changes to existing functionality

- Changes to system requirements (complete system requirements for the current version are at the MathWorks Web site)

- Any version compatibility considerations associated with each new feature or change

Version Compatibility Considerations

When a new feature or change introduces a known incompatibility between versions, its description includes a **Compatibility Considerations** subsection that details the impact. For a list of all new features and changes that have compatibility impact, see the "Compatibility Summary for Genetic Algorithm with the Distributed Computing Toolbox" on page 7.

Compatibility issues that become known after the product has been released are added to Bug Reports at the MathWorks Web site. Because bug fixes can sometimes result in incompatibilities, also review fixed bugs in Bug Reports for any compatibility impact.

Fixed Bugs and Known Problems

MathWorks Bug Reports is a user-searchable database of known problems, workarounds, and fixes. The MathWorks updates the Bug Reports database as new problems and resolutions become known, so check it as needed for the latest information.

Access Bug Reports at the MathWorks Web site using your MathWorks Account. If you are not logged in to your MathWorks Account when you link to Bug Reports, you are prompted to log in or create an account. You then can view bug fixes and known problems for R14SP2 and more recent releases.

The Bug Reports database was introduced for R14SP2 and does not include information for prior releases. You can access a list of bug fixes made in prior versions via the links in the summary table.

Related Documentation at Web Site

Printable Release Notes (PDF). You can print release notes from the PDF version, located at the MathWorks Web site. The PDF version does not support links to other documents or to the Web site, such as to Bug Reports. Use the browser-based version of release notes for access to all information.

Product Documentation. At the MathWorks Web site, you can access complete product documentation for the current version and some previous versions, as noted in the summary table.

Version 2.0 (R14SP3) Genetic Algorithm and Direct Search Toolbox

This table summarizes what's new in V2.0 (R14SP3):

New Features and Changes	Version Compatibility Considerations	Fixed Bugs and Known Problems	Related Documentation at Web Site
Yes Details below	No	Bug Reports at Web site	No

New features and changes introduced in this version are organized by these topics:

- "Both the Genetic Algorithm and the Pattern Search Algorithm Now Accept Nonlinear Constraints" on page 4

- " Direct Search Now Implements Two Algorithms — Generalized Pattern Search Algorithm (GPS) and Mesh Adaptive Search Algorithm (MADS)" on page 5

- " New Options Available in the Genetic Algorithm" on page 5

- " New Options Available in the Pattern Search Algorithm" on page 6

- "New Demos" on page 6

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 to 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

Compatibility Summary for Genetic Algorithm with the Distributed Computing Toolbox

This table summarizes new features and changes that might cause incompatibilities when you upgrade from an earlier version, or when you use files on multiple versions. Details are provided in the description of the new feature or change.

Version (Release)	New Features and Changes with Version Compatibility Impact
Latest Version **V2.0 (R2006a)**	None
V2.0.1 (R14SP3)	None