

Software Engineering Project (COS 301)



Software User Manual

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Overview

SwarmViz is a program that visualises how optimisation algorithms work.

Optimisation algorithms are a type of Artificial Intelligence that is used to automatically solve complex real-world problems in science, engineering, finance, and military research & development.

With SwarmViz anyone can gain an understanding of how these sophisticated problem-solving algorithms work by letting the user play around with trying different optimisation algorithms to solve different example problems.

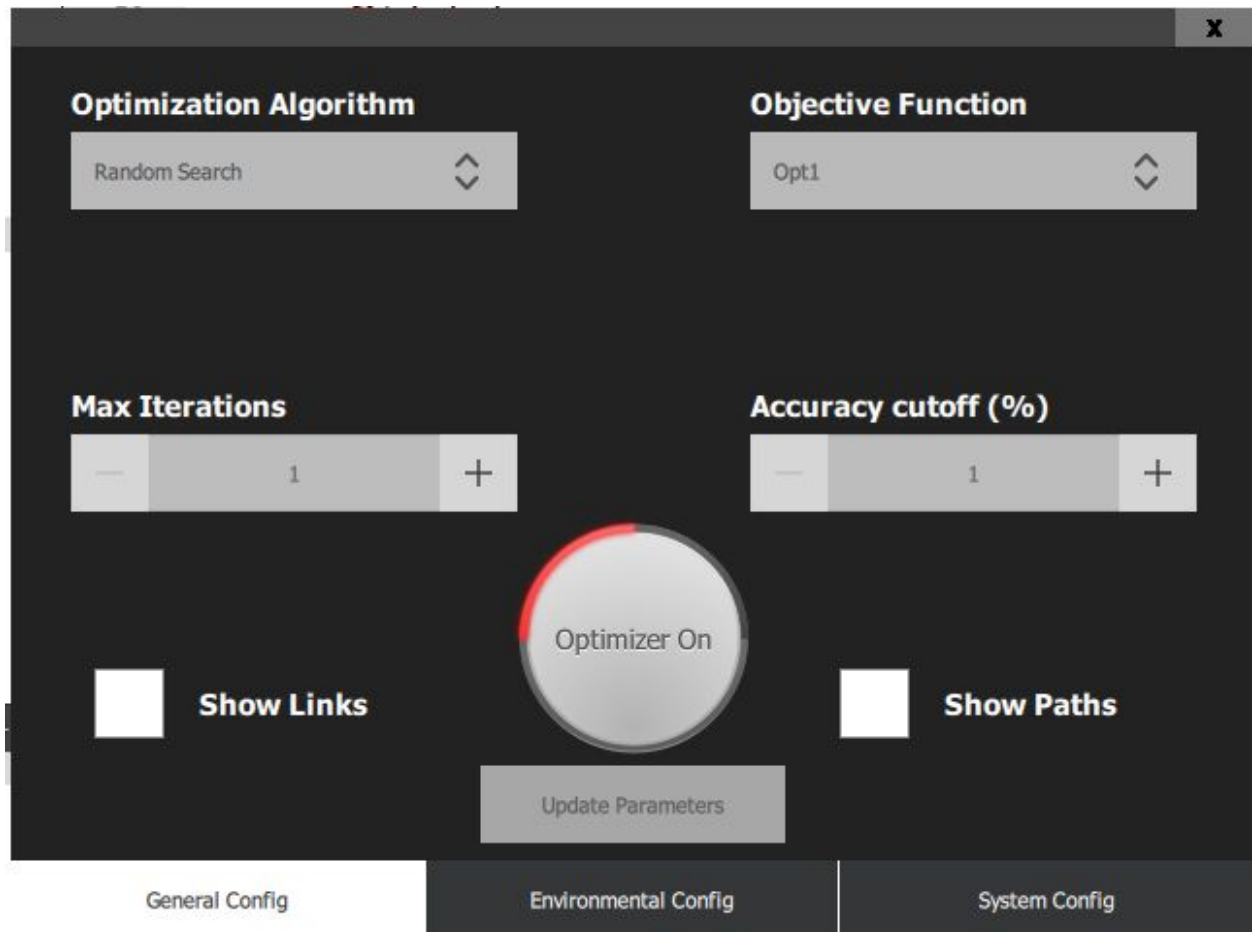
Software Installation

Linux:

In the main SwarmViz directory, execute the command
“make run”

Software Usage

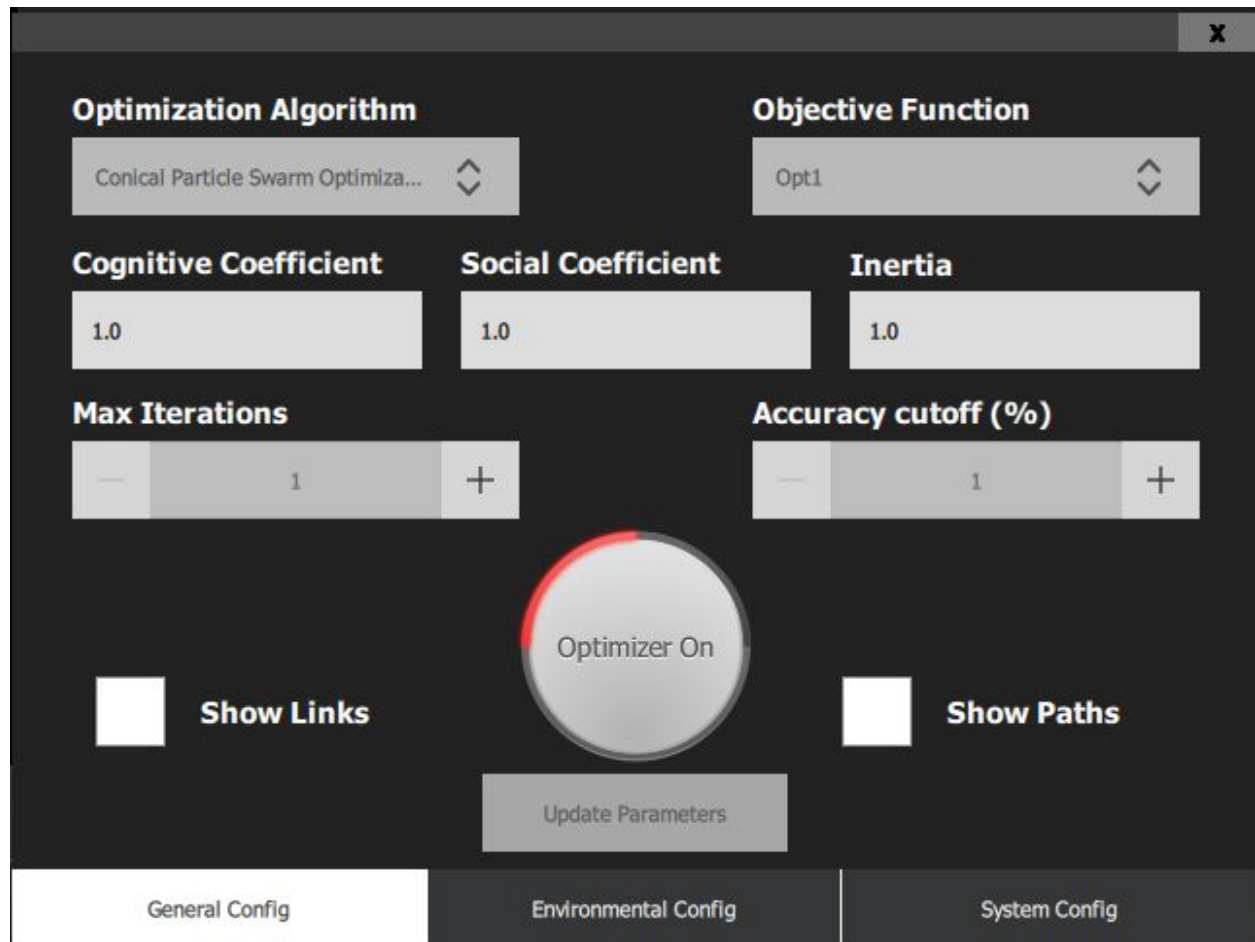
1. Run the SwarmViz executable, the following screen should appear:



2. In the 'General Config' tab choose an optimization algorithm to test,
 An Objective function for the algorithm to search through,
 The maximum number of iterations that the algorithm shall perform,
 The Accuracy cutoff: to stop the process once a sufficiently high
 quality solution has been reached,
 Check the 'Show Links' checkbox to display the particle topology in
 the visualisation(if applicable),
 Check the 'Show Paths' checkbox to show each particle's movement
 history in the visualisation,
 Click the 'Update parameters' button to update the visualisation with
 all the current settings,
 Click the big round Optimiser On/Off button to start/stop the
 visualisation.

2.1 If the selected optimiser is a particle swarm optimiser the general config tab will look slightly different, as there are 3 more setting specific to [particle swarm optimisers](#):

Cognitive coefficient, Social coefficient, and Inertia.



3. In the 'Environmental Config' tab you set the:
Swarm size(number of points the optimiser tests per iteration),
Dimensionality of the search space(One-or Two dimensional),
The boundaries of the search space(thus defining where the optimisation algorithm may go),
How the particles are initialised(randomly, or by specification of locations via mouse),

And there are 3 parameters to distort the displayed fitness landscape to make its shape more apparent.

The image shows a screenshot of a software interface with a dark theme. At the top right is a close button 'x'. The interface is divided into three main sections: 'Swarm Size', 'Initialization', and 'Number of dimensions'. The 'Swarm Size' section has a numeric input field with a minus sign, the value '0', and a plus sign. The 'Initialization' section has two radio buttons: 'Random' (unselected) and 'Specified' (selected). The 'Number of dimensions' section has two radio buttons: 'One' (selected) and 'Two' (unselected). Below these are four input fields for 'Min of dimension 1 (x1)', 'Max of dimension 1 (x1)', 'Min of dimension 2 (x2)', and 'Max of dimension 2 (x2)', all containing the value '0.0'. At the bottom, there are three tabs: 'General Config', 'Environmental Config' (which is active and highlighted), and 'System Config'. Below the 'Environmental Config' tab, there are three input fields: 'Growth/Shrink rate (default:1)' with value '1.0', 'Horizontal Shift (default:0)' with value '0.0', and 'Vertical Shift (default:0)' with value '0.0'.

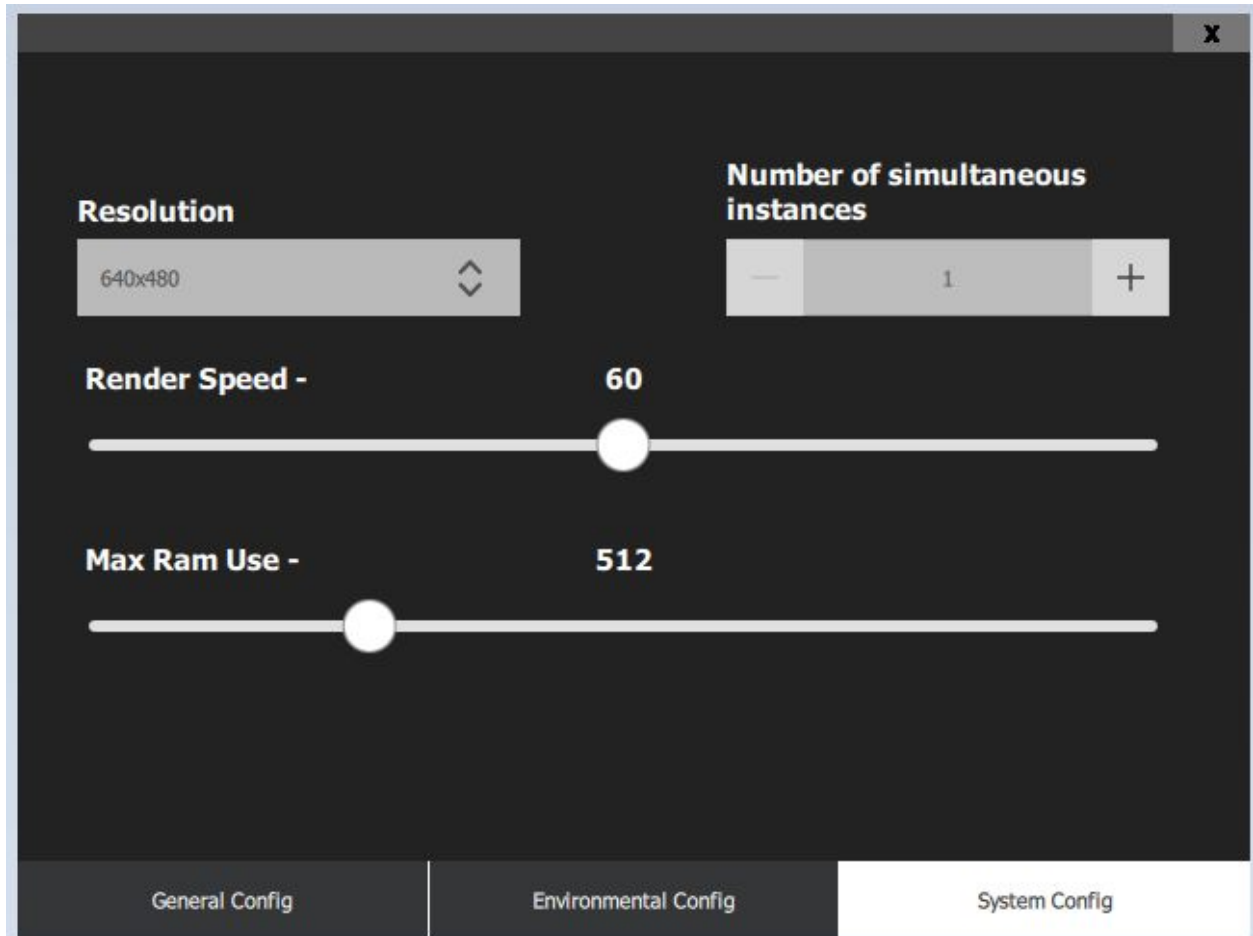
Parameter	Value
Swarm Size	0
Initialization	Specified
Number of dimensions	One
Min of dimension 1 (x1)	0.0
Max of dimension 1 (x1)	0.0
Min of dimension 2 (x2)	0.0
Max of dimension 2 (x2)	0.0
Growth/Shrink rate (default:1)	1.0
Horizontal Shift (default:0)	0.0
Vertical Shift (default:0)	0.0

4. In the 'System Config' tab you may set the resolution of the visualisation,

The number of simultaneous instances(in order to see simultaneously see how an algorithm performs in different search spaces),

The render speed (how many new iterations of the algorithm is displayed on the landscape per second),

And the maximum amount of RAM that the program may use.



After the parameters have been set(or left at their default values), Click the 'Optimiser ON' button to start the visualisation and learn about the wonderful realm of optimisation algorithms.