Software Engineering Project (COS 301)

SwarmViz

Software User Manual

Version 0.1, 12 July 2016

Team: **DragonBrain**

Emilio Singh	u14006512
Gerard van Wyk	u14101263
Matheu Botha	u14284104
Renton McIntyre	u14312710

Overview

SwarmViz is a software tool to visualise the functioning of multiple types of [optimisation algorithms](), for educational and research purposes.

This is achieved by visualising the problem space of a 2D [fitness function]() by displaying it as a 3D terrain(a [fitness landscape]()), where each point represents a possible solution and where the height represents the quality of the solution at that point.

The goal of an optimisation algorithm is to find the highest point(best solution) in this space that it possibly can.

The user specifies the; optimisation algorithm to be used, utility/objective/fitness function to be searched through, the parameters of the optimisation algorithm, and various other program parameters in order to observe the strengths and weaknesses of different optimisation algorithm configurations searching for solutions in various fitness landscapes/problem spaces
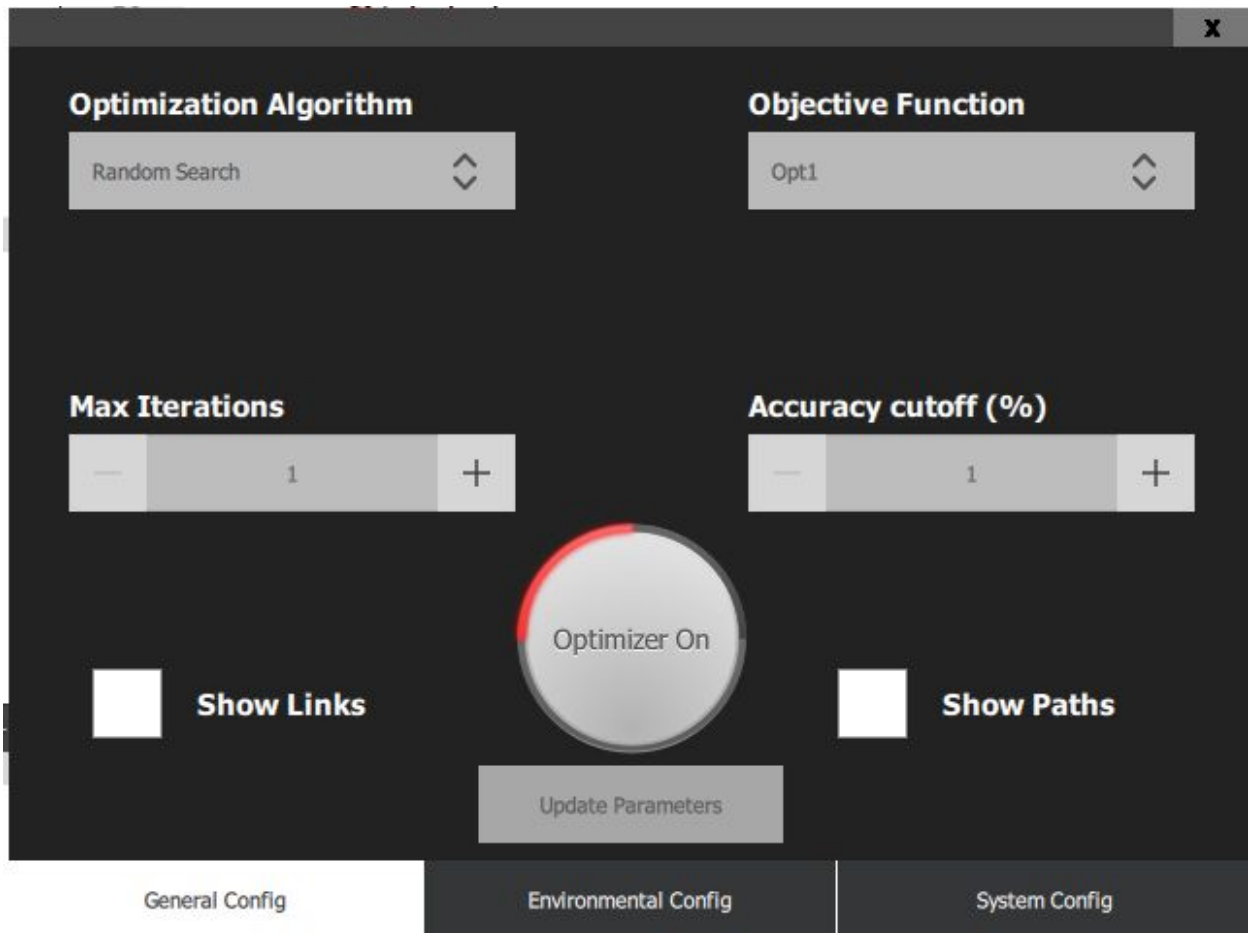
Software Installation

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.
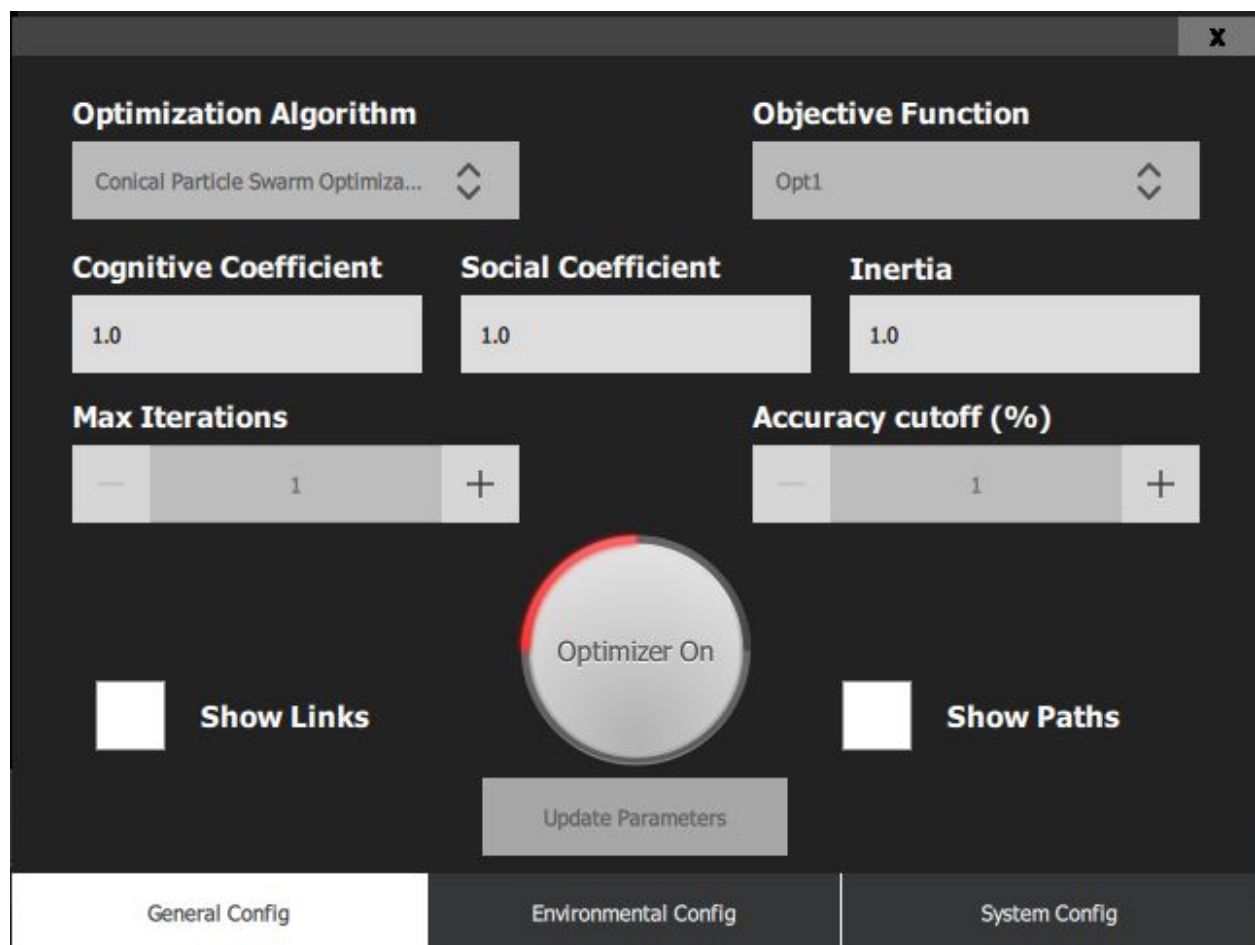
3.   In the 'Environmental Config' tab you set the:
Swarm size(number of points the optimiser tests per iteration),

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.

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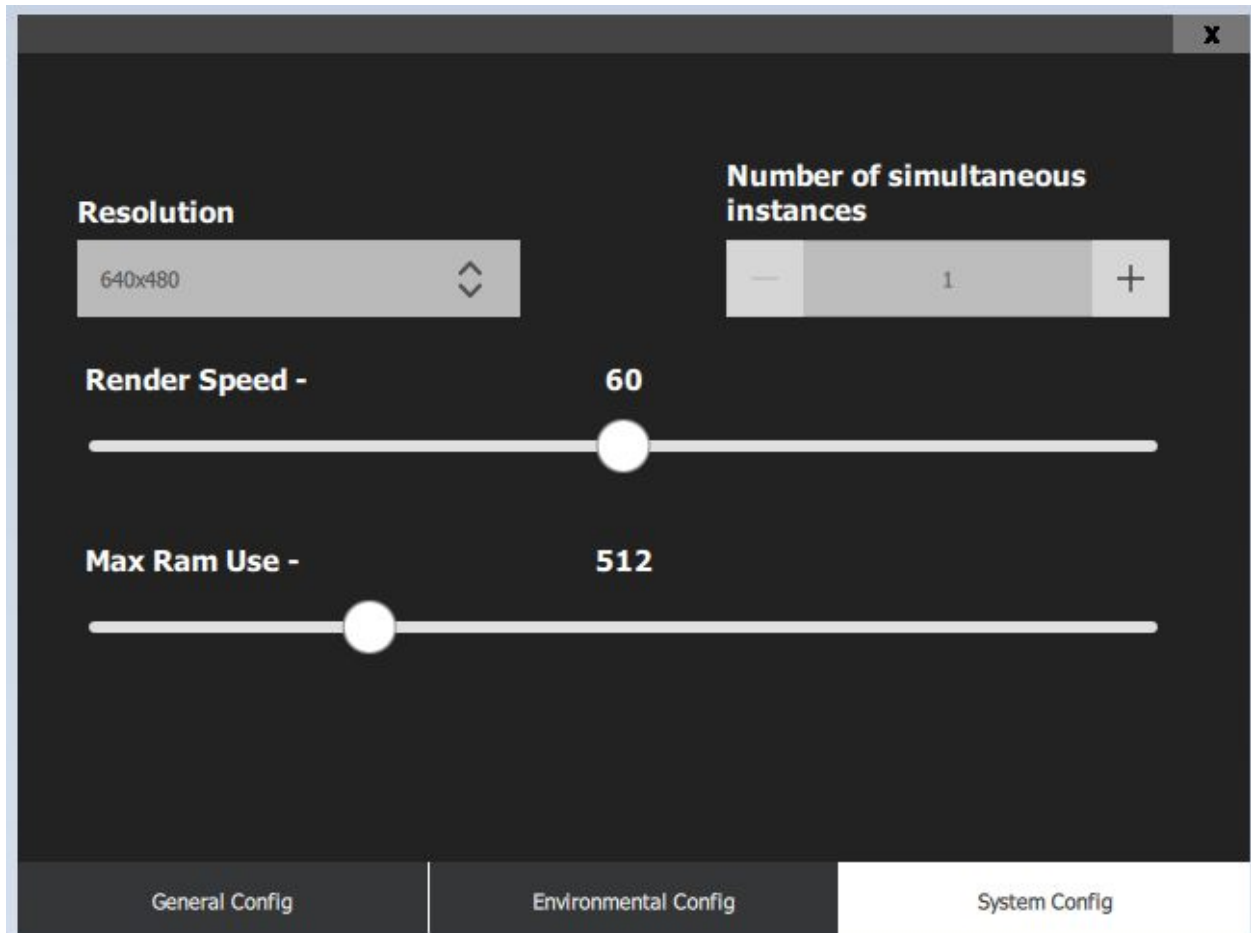
After the parameters have been set(or left at their default values),
Click the 'Optimiser ON' button to start the visualisation and learn about the wonderful realm of optimisation algorithms.