The detailed configuration of a UE-ABC instance

(*Updated: 25 September 2020*)

The following gives the detailed configuration of a UE-ABC instance. It is a set of four parameters with 120 elements. The general settings and the ranges of the tunable parameters are given in Table 1. Based on the general settings, HFEBG (hierarchical fitness based evolving benchmark generator) would search within the ranges of the four parameters to find one or several problem instances that are uniquely easy to ABC.

**Table 1** The general settings for generating a UE-ABC instance

|  |  |  |
| --- | --- | --- |
| **General Settings** | **Problem Dimension** |  |
| **Number of Local Optima** |  |
| **Global Optimum** |  |
| **Search Range** |  |
| **Max Number of Evaluations** |  |
| **Ranges for Four Parameters** | **Range of Sigma** |  |
| **Range of Ratio** |  |
| **Range of Squeeze** |  |
| **Range of Random Seed** |  |

Table 2 gives the detailed information of a UE-ABC problem instance. Following the general settings in Table 1, this is a 10-dimensional problem instance with 10 local optima. Each local optimum starts from a bell-shaped basin. Sigma decides the basic size of the basin, and Squeeze values further shape each basin on each dimension. Ratio gives the depth ratio of the local optimum vs. the global optimum. In this example, there are 10 local optima, of which there is one global optimum, and thus the parameter Ratio has 9 values. Finally, Random Seed gives exactly values to those random values, such that a problem instance can be exactly reconstructed (see “glg06\_init.m” for more details).

By the 120 values shown in Table 2, one can reconstruct a UE-ABC instance under the max-set of Gaussian (MSG) landscape generator. The data can be found in “UE\_ABC.mat”, and by running “reEBG” in Matlab, the UE-ABC is reconstructed.

**Table 2** The detailed configuration of a UE-ABC problem instance

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | dim #1 | dim #2 | dim #3 | dim #4 | dim #5 | dim #6 | dim #7 | dim #8 | dim #9 | dim #10 |  | **Ratio** |
| **Squeeze** | local optimum #1 | 0.9566 | 0.7413 | 0.8709 | 0.0893 | 0.8635 | 0.0580 | 0.6135 | 0.2126 | 0.0236 | 0.8604 | 0.598 |
| local optimum #2 | 0.2811 | 0.9094 | 0.6584 | 0.4008 | 0.5056 | 0.2897 | 0.6037 | 0.8921 | 0.8336 | 0.0360 | 0.827 |
| local optimum #3 | 0.3126 | 0.5393 | 0.5287 | 0.6935 | 0.4842 | 0.4826 | 0.9958 | 0.4788 | 0.1134 | 0.5295 | 0.047 |
| local optimum #4 | 0.3922 | 0.0046 | 0.3645 | 0.7440 | 0.8777 | 0.3315 | 0.4699 | 0.9680 | 0.8462 | 0.1205 | 0.148 |
| local optimum #5 | 0.1539 | 0.7586 | 0.3399 | 0.7644 | 0.7750 | 0.0668 | 0.8685 | 0.3732 | 0.4644 | 0.9741 | 0.378 |
| local optimum #6 | 0.8011 | 0.4548 | 0.1999 | 0.8030 | 0.8052 | 0.6689 | 0.6211 | 0.6360 | 0.9513 | 0.3645 | 0.641 |
| local optimum #7 | 0.6345 | 0.4956 | 0.0225 | 0.5635 | 0.8141 | 0.0181 | 0.2221 | 0.9800 | 0.5706 | 0.4475 | 0.685 |
| local optimum #8 | 0.7240 | 0.9364 | 0.4390 | 0.9137 | 0.0941 | 0.2291 | 0.2439 | 0.2296 | 0.4461 | 0.1076 | 0.817 |
| local optimum #9 | 0.7143 | 0.3084 | 0.9830 | 0.0119 | 0.7304 | 0.2559 | 0.4671 | 0.0157 | 0.6264 | 0.1069 | 0.999 |
| local optimum #10 | 0.8420 | 0.1653 | 0.7001 | 0.5219 | 0.5526 | 0.3893 | 0.5049 | 0.7116 | 0.2796 | 0.7956 |  |
|  | | | | | | | | | | | | | | |
| Sigma | | 152.564 | 144.002 | 36.458 | 157.914 | 68.252 | 110.287 | 185.277 | 154.400 | 1.139 | 141.607 |  | |
|  | | | | | | | | | | | | | | |
| Random seed | | 3146499367525240 | | | | | | | | | | | | |