Generic Evolution Algorithms Programming Library

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The GEA [1] (Generic Evolutionary Algorithms) system has been developed (and available for free download and use) to fill out the space in easy-to-use, widely applicable evolutionary programming libraries which take advantage of the object-oriented properties of the ANSI C++ language. The GEA system can be used by people who are not familiar with evolutionary algorithms. Another characteristics of the system is that by modifying the parameters, one can try to solve a given problem with genetic algorithms (GAs) and with evolutionary strategies (ESs) as well (*Davis (1991), Rechenberg (1973), Hoffmeister, Bäck (1992)*).

One must admit that there are several GA libraries available (a list of other libraries can be found on the GEA homepage[1]), but only a few of them are written in C++ language, thus the advantages of C++'s object-oriented capabilities cannot be exploited. Another problem with existing programming libraries that some of them are only capable to work with bit-string and real vector individual representations.

Since the GEA system is written in ANSI C++ language and can be applied on any representation forms of the individuals, these deficiencies are supplied in it. The most important thing in the GEA system is that this is the first programming library with implementation of *evolutionary strategies* and *meta-ES*. Another novelty is that the *adaptation of the weight of the genetic operators* is also implemented. About meta-ES and the adaptation of the weight of the genetic operators, see *Jacob (1997)*.

On the homepage of the GEA system[1] information about two applications also can be found. Both applications evolve Lindenmayer systems (L-systems) for different purposes. The first one is a demonstration application able to evolve artificial trees with interactive selection. The evolved trees can be used in graphical applications as graphical objects. The purpose of the second application is to describe the human retina with some kind of description grammars (L-systems). This can be used in medical diagnostics on patients with diabetes.

In the GEA system, most functions needed for an evolutionary algorithm are implemented, so its usage is very simple. A wide range of genetic operators and selection methods are available for some well known representations of the individuals. When the problem and algorithm specific implementations are done and the parameters of the algorithm are set, it takes only a few function calls to set up and start the evolutionary algorithm.

In the near future, the authors plan to supplement the GEA system with complex statistical functions for preprocessing and analyzing the data about the performance of the EA with different parameters. It is also necessary to validate the system on some standard problems (*De Jong (1975)*). Another task is to create a graphical user interface for the system. This will be done in a Tcl/Tk environment.

[1] `http://www.cab.u-szeged.hu/GEA`

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