Introduction to Evolution strategies

Ivan Santibanez-Koref

Abstract:

More and more evolutionary algorithms (EA) are used to complex optimization problems. The popularity of this class of algorithms is based on their simple structure. However specific problems require to tune the EA in order to achieve a satisfactory performance. Practitioners often ignore that there is well founded theory of EA, that can be used to design efficient EA.

This tutorial aims to introduce a wide audience to the theory of a specific EA, Evolution Strategies (ES).

List of topics:

A: Introduction
- Motivation
- What problems can be optimized?
- The importance of Strong Causality
- Evolutionary algorithms

B: Theoretical Aspects
- Selection pressure and progress rate
- Optimal step sizes
- Search distributions
- Adaptation mechanisms for step sizes
- Noisy objective functions

C: Application
- Optimization of continuous problems
- Optimization of noisy problems
- Optimization of discrete problems
- Interactive optimization
- Optimizing real world experiments
- Choice of the right ES for a concrete problem.

D: Summary and outlook

Speaker:

Ivan Santibanez-Koref
Technical University Berlin
Dept. for Bionics & Evolutiontechniques
Sekr. ACK1
Ackerstr. 71-76
D-13355 Berlin
Germany
Tel.: +49 30 314 72 663

Motivation and Objectives

The reason to offer such a tutorial, is that the lack of theoretical background of EA users, often leads to inefficient algorithms, a problem often encountered by EA users. The tutorial should enable the participants to:

- Identify the kind of optimization problem he/she is dealing with
- To decided if the problem can be solved with an EA
- To select an appropriate EA
- To make a rough estimation of the effort needed to solve the problem using an EA
- And finally, to solve the problem with an EA

Primary/Secondary Audience:

People interested in the application of EA.