RcppGO guide

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1 Introduction

Different kinds of optimization problems require a dedicated algorithm. "[. . .], optimization algorithms are guided by objective functions. A function is difficult from a mathematical perspective in this context if it is not continuous, not differentiable, or if it has multiple maxima and minima."(Weise 2009, 56)

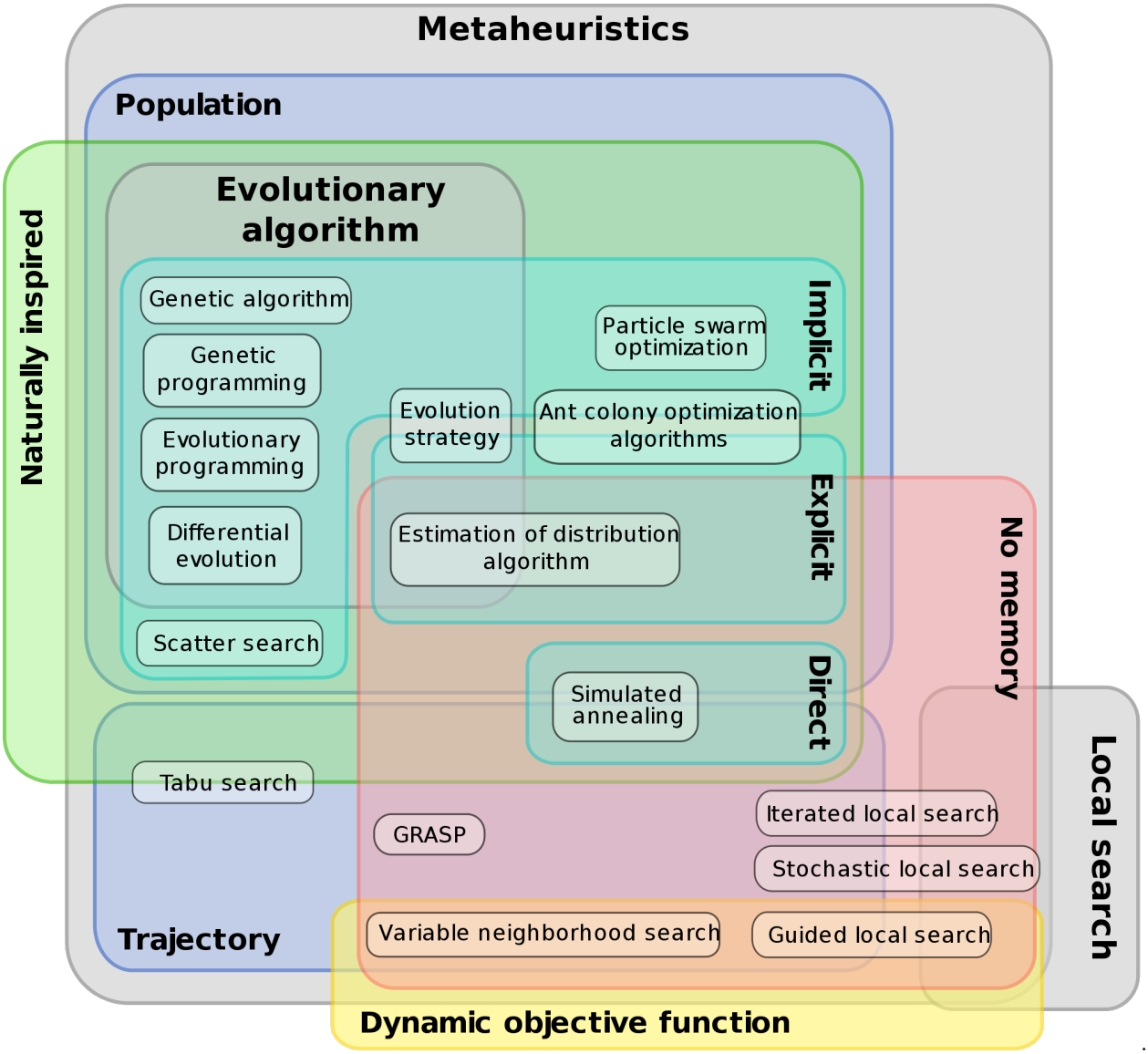
This is a natural field of application for heuristic optimization algorithms. Figure [id] shows a classification approach metaheuristics. Many algorithms are inspired by nature. So is the *Charged System Search* or *CSS* described in (A Kaveh and Talatahari 2010). The *CSS* is inspired by the Newtonian laws of mechanics and the Coulomb law from electrostatics. The authors demonstrated its performance using standard benchmark problems as well as engineering design problems, showing that *CSS* outperforms other established evolutionary optimization algorithms. Since its first publication the algorithm has been enhanced and successfully applied to many problems. The literature considering the *CSS* algorithm can be devided into its application and further development.

In (A. Kaveh and Talatahari 2010) the authors developed a discrete version of the *CSS* algorithm and a constrained optimization approach was added.Further enhancements were made in (Ali Kaveh and Talatahari 2010a) by utilizing the *fields of forces* method resulting in an *enhanced CSS* outperforming the original algorithm. To increase the global search mobility of the *CSS* algorithm the authors introduce several chaos based methods in (Kaveh, Talatahari, and Sheikholeslami 2011) and named the version *chaos-based CSS* or *CCSS*.

As engineers by profession, the authors apply the *CSS* variants to several engineering problems including the optimum design of geodesic domes taking their nonlinear respones account in (Ali Kaveh and Talatahari 2010b) or the optimal design of sceletal structures in (Ali Kaveh and Talatahari 2010c).

The purpose of the `RcppGO` package is to provide an algorithm to tackle difficult otimization problems as defined before. The algorithm utilizes Newton's laws of gravity and motion and is loosely based on (A Kaveh and Talatahari 2010). In the interest of brevity the user guide provides only the steps to get startet with the package. A detailed article on the algorithm is in preparation.

The remainder of the user guide is organized as follows: Section **??** describes how to install the `RcppGO` package. Section **??** presents two examples of application and goes into the differences for uni- and multidimensional optimization problems.



2 Installation

RcppGO is hosted at https://github.com/peterkehlerjr/RcppGO. Installation is done via:

```
install.packages("devtools")
library(devtools)
install_github('peterkehlerjr/RcppGO')
```

3 Session Info

```
## R version 3.1.2 (2014-10-31)
## Platform: x86_64-apple-darwin13.4.0 (64-bit)
##
```

```
## locale:
## [1] en_GB.UTF-8/en_GB.UTF-8/en_GB.UTF-8/C/en_GB.UTF-8/en_GB.UTF-8
##
## attached base packages:
## [1] stats     graphics  grDevices utils     datasets  methods   base
##
## other attached packages:
## [1] devtools_1.6.1
##
## loaded via a namespace (and not attached):
##  [1] digest_0.6.4     evaluate_0.5.5   formatR_1.0      htmltools_0.2.6
##  [5] knitr_1.8        packrat_0.4.1.8  rmarkdown_0.3.10 stringr_0.6.2
##  [9] tools_3.1.2      yaml_2.1.13
```

References

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