Genetic Algorithms in Astronomy and Astrophysics

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Abstract

This paper aims at demonstrating, through examples, the applicability of *genetic algorithms* to wide classes of problems encountered in astronomy and astrophysics. Genetic algorithms are heuristic search techniques that incorporate, in a computational setting, the biological notion of evolution by means of natural selection. While increasingly in use in the fields of computer science, artificial intelligence, and computed-aided engineering design, genetic algorithms seem to have attracted comparatively little attention in the physical sciences thus far.

The following three problems are treated: (1) modeling the rotation curve of galaxies, (2) extracting pulsation periods from Doppler velocities measurements in spectral lines of δScuti stars, and (3) constructing spherically symmetric wind models for rotating, magnetized solar-type stars. A listing of the genetic algorithm-based general purpose optimization subroutine `PIKAIA`, used to solve these problems, is given in the Appendix.

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