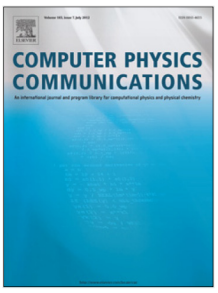
Accepted Manuscript



Application of genetic algorithms to modelings of fusion plasma physics

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PII: S0010-4655(18)30141-3
DOI: https://doi.org/10.1016/j.cpc.2018.04.025
Reference: COMPHY 6499

To appear in: *Computer Physics Communications*

Received date : 12 December 2017
Revised date : 28 March 2018
Accepted date : 25 April 2018

Please cite this article as: M. Honda, Application of genetic algorithms to modelings of fusion plasma physics, *Computer Physics Communications* (2018), https://doi.org/10.1016/j.cpc.2018.04.025

Application of genetic algorithms to modelings of fusion plasma physics

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Abstract

The genetic algorithm based optimizer is a powerful tool for global optimization. Taking advantage of this feature, it is applied to physical modelings of magnetically confined toroidal plasmas: searching the positions of the magnetic axis and the X point in an axisymmetric equilibrium, fitting an analytic function to the measurement points and developing an automated flux matching tool. Through the modelings, the wide applicability of the genetic algorithm based optimizer is elucidated.

Key words: genetic algorithm, global optimization, tokamak plasma,, equilibrium, profile fitting, flux matching
PACS: 52.25.Fi, 52.55.Fa, 52.55.-s, 52.65.-y

1. Introduction

On numerical analysis, finding a global optimum is usually demanding in contrast to finding a local optimum. Let us consider the problem that one has to find out the highest projection in a plane on which many projections with different height are scattered. When the Newton method, which is a representative of a local optimization strategy, is applied to the problem, whether a true solution can be successfully sought or not absolutely depends upon the adequacy of an initial guess, i.e., an initial position at which a search starts. One can readily find the global maximum solution if and only if one starts a searching at the foot of the highest projection. Otherwise, one would

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