

4M17 Coursework #2 - Optimisation Algorithm Performance Comparison

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1 Abstract

This report conducts a comparative analysis of two optimisation algorithms applied to minimise Keane's Bump Function, (KBF). In particular, the study focuses on a Continuous Genetic Algorithm, (GA), as well as an alternative algorithm not covered in the lectures: the State Transition Algorithm, (STA).

2 Introduction

2.1 Keane's Bump Function

To compare the performances of the two algorithms, the Keane's Bump Function, (KBF), is used as the objective function. In particular, the n-dimensional constrained optimisation problem is defined as the maximisation of:

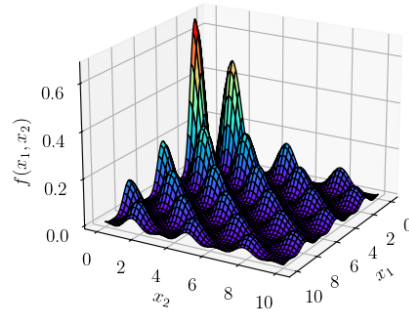
$$f(\mathbf{x}) = \left| \frac{\sum_{i=1}^n (\cos(x_i))^4 - 2 \prod_{i=1}^n (\cos(x_i))^2}{\sqrt{\sum_{i=1}^n i \cdot x_i^2}} \right| \quad (1)$$

subject to $0 \leq x_i \leq 10 \quad \forall i \in \{1, \dots, n\}$

$$\prod_{i=1}^n x_i > 0.75 \quad (2)$$

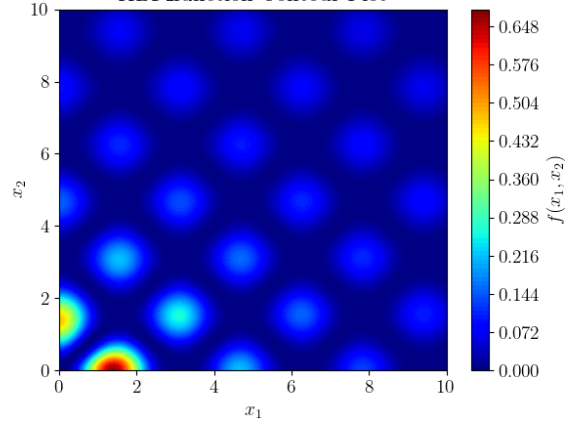
$$\sum_{i=1}^n x_i < \frac{15n}{2}$$

KBF_function 3D Plot



(a) Surface plot.

KBF_function Contour Plot



(b) Contour plot.

The two-dimensional form of the function has been plotted in Figure 1.

Figure 1: The two-dimensional form of the Keane's Bump Function, (KBF).

3 Methodology

4 Results

5 Discussion

6 Conclusion