Pastoralist Optimization Algorithm (POA): A Culture-Inspired Metaheuristic for Uncapacitated Facility Location Problem (UFLP)

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Abstract. In this paper, the performance of the recently developed Pastoralist Optimization Algorithm (POA) on classical uncapacitated Facility Location problem (UFLP) was investigated. POA is a culture-inspired metaheuristic motivated by the herding schemes of Nomadic Pastoralist (NP). The NP seek optimal herding location for their livestock using some well-defined and robust strategies. UFLP is an NP-hard problem from which many facility location and real-world problems are built around. In this paper, five UFLP datasets were used for the experiments each comprising of five cities and seven, fifteen, thirty, fifty and one hundred cities respectively. The performance of POA was compared and validated with some popular and similar metaheuristic algorithms such as ABC, BBO and PSO. The results obtained proves POA competiveness and superiority in obtaining the lowest allocation cost and convergence rate as the data size increases.

Keywords: Pastoralist Optimization Algorithm (POA) · Metaheuristic algorithms · Uncapacitated Facility Location Problem (UFLP)

1 Introduction

Facility Location Problem (FLP) is among the most widely studied optimization problems because from it and its' many variants, several real-world problems have been modelled. FLP is a branch of discrete optimization that is concerned with the optimal placement of facilities in order to minimize some parameters which include; distance, cost and time [1, 2]. There are different variants of FLP and these variants have gained interest in solving real-world problems. The Uncapacitated FLP (UFLP) and Capacitated FLP (CFLP) have been used to solve problems such as Warehouse, plant and waste bin location problems. Other problems such as the *p*-center are useful in optimal location of the positions of healthcare centers, ambulances, fire-service centers and police posts. Others include the *p*-median and *p*-dispersion problems and the maximum covering problems [1].

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