Comparative Study between Flower Pollination Algorithm and Cuckoo Search Algorithm for t-way Test Data Generation

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T-way testing is a sampling approach for test data generation. Recently, adapting meta-heuristic algorithms for t-way testing is very attractive in order to find a minimum subset of test data that can test a system overall. As a consequence, several meta-heuristic algorithms have been used as the basis of t-way strategies. In order to guide software tester (and engineers in general) to select the best algorithm for the problem at hand, there is a need to evaluate and benchmark the performance of each strategy against common case studies. This paper presents a comparative study between two meta-heuristic strategies for t-way test data generation: Flower Pollination Algorithm (FPA) and Cuckoo Search (CS). Our experiments have performed on a real-world case study. Experimental results demonstrate that FPA appears to produce better results in most of the test cases in term of test suite size and convergence rate owing to its ability for controlling local and global search.

Keywords: Meta-heuristic algorithms, Cuckoo Search, Flower Pollination Algorithm, T-way testing.

1. INTRODUCTION

Meta-heuristic first introduce was in Tabu Search algorithm by Glover, which seek for finding an optimal or near-optimal solutions at relatively low computational cost, however, it is often unable to guarantee global optimality. The performance of meta-heuristic algorithms depends on its efficient movement through the search space. Many meta-heuristic algorithms have been proposed with different search techniques to find the optimal solutions such as Simulated Annealing (SA), Genetic Algorithm (GA), Ant Colony Optimization (ACO), Particle Swarm Optimization (PSO), Differential Evolution (DE), Harmony Search (HS), Flower Pollination Algorithm (FPA), Sine Cosine Algorithm (SCA), Bat Algorithm (BA), Cuckoo Search (CS), Teaching-Learning-Based Optimization (TLBO), and Firefly Algorithm (FA), to name a few. In the same vein, the need for efficient strategy for testing overall system

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T-way testing has rapidly grown during recent decades, due to the large number of input combination. Meta-heuristic algorithms have been successfully applied in a number of diverse fields including t-way interaction testing (where t refers to interaction strength). Consequently, several strategies based on SA, LAHC, GA, ACA, PSO, Bat, FPA, CS, and HS algorithms have been developed. Recently Ahmed et al. and Nasser et al. adopted CS and FPA for generating t-way and pairwise test suite, respectively. Later on, FPA has been used as backbone for sequence and sequence-less t-way test generation.

The search process in FPA and CS is almost similar in some respects where both of them use Lévy flight and differ in other respects. In order to assess the performance of the two algorithms, this paper presents a comparative study between the two algorithms in term of generated