Introduction

In the past couple of decades, metaheuristic algorithms became major method for optimization problem. Generally, they are based on biological evolution in nature-inspired system. These various methods are adaptable for a specific situation using nonlinear objective functions. Particle Swarm Opglobal optimum, the other fishes converge to the fish [?]. Meanwhile, there is another algorithm called Firefly Algorithm (FA), which is particularly well to local search with flashing light of fireflies [?]. In two fireflies, a brighter firefly attracted the other one. Although these algorithms are widely used for optimization problem, solution x_*, when population is generated. Afterward, each bat moves to location x_i with velocity v_i toward global best solution, as shown in Fig. **??**. Secondly in local search step, generates a new solution x_{new} around global best solution, as shown 2nd phase of Fig. **??**. The equation as below solution with the distance for keeping each bat away. The distance equation is written as below.

$$d_i^{t-1} = 1K \sum_{j=1}^{K} (x_{i*} - x_j^{t-1}) \quad (8)$$

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K describes the number of nearest neighbor. In equation (**??**), x_{i*} means personal best solution. k-NN is very simple method and is easy to implement, but depending on

Population $x_i (i = 1, 2, ..., n)$ and v_i Define frequency f_i at location x_i Initialize pulse rates r_i, and loudness A_i $(t <$ Max number of iterations) i=1 to n Generate new solutions x_i by tuning frequency f_i Update location x_i, velocity v_i [eqs.(**??**)(**??**)(**??**)] and k-NNBA for [eq.(**??**)(**??**)] NSBA for [eq.(**??**)(**??**)] $(rand > r_i)$ Generate a new in any neighbors.

Comparison with II and VI On griewank function, NSBA is almost better than k-NNBA in each neighbor except for K=4, dist of k-NNBA is a bit smaller. Overall, *dist* is higher than the other methods on griewank function. In rastrigin function, k-NNBA gradually increased. However, NSBA slowly decreased until K=16.

Comparison with