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Evaluating Ant System Performance for the Traveling Salesman Problem

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Abstract: In the Traveling Salesman Problem (TSP), the combinatorial number of routes increases exponentially as the number of cities increases. The CPU time eventually increases exponentially. Therefore, for a large-scale problem, quality solutions are difficult to obtain using a simple search method. This study proposes a solution method for TSP. The 2-opt method and crossing detection are introduced into the Ant System method for resolving deterioration of the solution accuracy by crossing of routes. The anticipated increase in CPU time is prevented and the solution accuracy is enhanced further by improvement only in the crossing part of routes. Furthermore, a performance evaluation of the proposed method was performed using a benchmark problem (TSPLIB) of 51–532 cities of TSP as a numerical experiment.

Keywords: Traveling Salesman Problem (TSP), Ant System (AS), 2-opt, Crossing Detection