

# **Optimization of the Series-Parallel System with the redundancy allocation problem using a hybrid ant colony algorithm**

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## **Abstract**

The efficiency of production system has drawn more and more attention of system designers, as competitive pressures increase. Therefore, in this research, we propose a new hybrid ant colony algorithm to analyze redundancy allocation problem in series-parallel system. The mechanism of Tabu lists is applied for local search in ant colony algorithm to increase quality of search results. We study the problem of selecting component and redundancy levels to optimize allocation cost, given system-level constraints on reliability and weight. Through experimental design and result analysis, it is shown that hybrid ant colony algorithm can search for optimal or near-optimal solutions in redundancy allocation problems with impressive efficiency.

Besides the above-mentioned achievements, this research also investigates the best selection of parameter values in the mixed ant colony algorithm. The parameters we analyzed include trail persistence, the relative importance of exploitation versus exploration, the relative importance of pheromone trail, relative importance of local heuristic and length of tabu list. Finally, we provide suggestions for setting the levels

of parameters.

**Keywords:** series-parallel system, redundancy allocation problem, ant colony algorithm.