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# Multi-Objective Optimization and Knowledge Extraction of Plate-Fin Heat Sink Using Evolutionary Algorithms

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**Abstract** The efficient performance and durability of electronic devices significantly depend on their cooling mechanism. Heat sinks are widely used for the purpose of cooling electronic devices. The present work deals with the multi-objective optimization of two different configurations of plate-fin heat sinks. Two important criteria that have impact on the performance of plate-fin heat sinks are the entropy generation rate and the cost. In the present study these criteria are considered as the objective functions for optimization which are found to be conflicting in nature. If only minimum entropy generation rate is considered, it would give proper heat dissipation but the design may be cost inefficient. On the other hand, simultaneous minimization of cost along with minimum entropy generation rate will ensure more flexible design options. To have a balanced design, two aforesaid contradictory objective functions, i.e. minimum entropy generation rate and minimum cost, are considered in the present work. A multi-objective evolutionary algorithm (MOEA) is used to solve the above mentioned non-linear problem under different designs and geometric restrictions. The non-dominated solutions from multi-objective optimization are further analyzed to extract knowledge that may represent relationships between the objective functions and the design variables. The knowledge can be utilized by thermal engineering experts and system designers to choose an appropriate heat sink design for specific applications.

**Keywords** Multi-objective optimization · Knowledge extraction · Genetic Algorithms · Plate-fin heat sink.

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