Helping Electronics Beat the Heat

NSF Award: NSF Industry/University Cooperative Research Center on Compact, High-Performance Cooling Technologies Research (Purdue University)

State: Indiana

Congressional Districts: Indiana District 04

Research Areas: Engineering

As they operate, electronic devices and circuits produce heat, which can harm reliability. To limit the heat's impact, cooling components are part of the device design. However, as electronics become more densely packed, cooling them becomes more challenging.

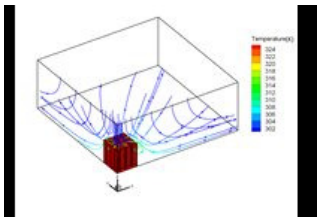
To overcome this hurdle, a research team led by Purdue University, in partnership with electronics companies, created a software tool that optimizes cooling device designs. The team demonstrated their approach by optimizing the design of air-cooled, pin-fin heat sinks, components commonly used with computer processors.

The methodology has many benefits for the electronics industry and is applicable to any optimization problem. This approach accurately quantifies the variations that will occur in the finished design based on variations in the initial design. The software can also identify the parameters that most affect optimization of the end product.

Uncertainties in engineering design are common and unavoidable. Designs typically rely on a conventional optimization methodology. However, this approach fails to produce a truly optimal design, especially when large uncertainties exist in the input parameters, or when strict constraints to size or cost exist. The new optimization approach alleviates this problem by arriving at truly optimal designs that are robust, reliable and fail-safe.

This research was performed by the Cooling Technologies Research Center, an NSF Industry/University Cooperative Research Center led by Purdue University.

Image



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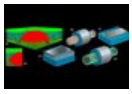
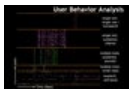


Modeling Nanoelectronic Devices
Researchers share computationally intensive research on nanoHUB

Research Areas: Engineering, Nanoscience
Locations: Indiana



Wide Reach for Internet-based Nanotools
Teachers use nanoHUB research tools for classroom activities and homework

Research Areas: Engineering, Nanoscience, Education
Locations: Indiana