'Nano-lightning' instead of fan to cool your laptop

April 23 2004

Jumping electric charges could waft breezes of ionised air through microchips, replacing the bulky and noisy fans that cool down today's computers.
Researchers at Purdue University in West Lafayette, Indiana said that their patent-pending technology could be built directly into a computer chip's heat sink to provide a faster, quieter and lighter cooling system than existing alternatives.

In current designs, a metallic sink absorbs the heat generated by currents in the microchip and is cooled by mechanical fans. But as engineers squeeze more functionality out of smaller chips, they are finding that the fans cannot cool down the chips fast enough or are too big for the device.
"Heat is now a major factor limiting the size of laptops," said Dan Schlitz of Purdue University.
Therefore, researchers have come up with a range of alternatives, including piezo-electric fans and tiny, cold-water pumps. However, there is always a trade-off because air is preferable to water and it is does not need to be encased, but water is attractive because it absorbs and releases heat more quickly.
The Purdue technology is the first air-based system to produce a cooling rate similar to water - 40 watts per square centimeter as reported in the New Scientist.
"That is why we are excited," said Suresh Garimella, who led the research and is engaged in seven other chip-cooling projects.
The secret is producing the airflow right at the wall of the heat sink. The

new system consists of 300 electrodes that ionise and then pump the air molecules across the surface.
On one side of the device are the negatively charged electrodes, bristling with long, slender carbon nanotubes to concentrate the electric field.
When the voltage is switched on, electrons jump the 10 microns from the negative to positive electrodes.
This knocks electrons off the air molecules to produce a cloud of positively charged ions. While the phenomenon is similar to lightning, it occurs at much lower voltages and no actual sparks are produced.
The efficiency with which the voltage is converted into electrons is as yet unknown. But any leftover voltage will be converted into heat, which hampers the cooling effect.
"This kind of electrically driven flow traditionally has low rates of conversion," said Garimella.

"This is promising research, but there are a range of competing technologies," noted Richard Smith, who studies heat dissipation in electronic systems at the US National Science Foundation, which funded the research.

related links:
in.tech.yahoo.com/040325/139/2c77i.html
[www.newscientist.com/hottopics … 6&sub=Nanotechnology](www.newscientist.com/hottopics)
www.purdue.edu/

Citation: 'Nano-lightning' instead of fan to cool your laptop (2004, April 23) retrieved 18 April 2024 from https://phys.org/news/2004-04-nano-lightning-fan-cool-laptop.html