

Swaying fans may cool new chips

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By [Greg Miller](#)

Miniature devices that mimic the motion of a Chinese fan could be used to prevent computer chips overheating, say engineers at Purdue University in West Lafayette, Indiana.

The new micro-fans could aid the development of faster, smaller laptop computers and allow portable electronics manufacturers to pack more chips – and therefore more fancy features – into their products.

Keeping chips cool is important because heat decreases their performance and reliability. But to satisfy consumer demand for smaller gadgets that do more stuff, manufacturers have had to cram more circuitry into smaller spaces – which only adds to the heat problem.

The new fans consist of polyester or metal blades (about 2 cm by 0.5 cm) attached to tiny patches of “piezoelectric” ceramic. An alternating current applied to the ceramic causes it to expand and contract, making the blades wave back and forth like an old-fashioned Chinese folding fan.

In principle, the design could be an improvement over the rotational fans commonly used in laptops, says Mark Spearing at the Massachusetts Institute of Technology. It is possible to make very small rotational fans – a team at the University of Colorado at Boulder have one that fits on the head of a pin. But Spearing says that at smaller sizes, frictional forces make them less efficient.

Heat budget

Efficiency is critical because the energy used to move the fan blades eventually gets dissipated as heat – meaning an inefficient fan could add heat, not lose it.

However Spearing remains unconvinced that piezoelectric fans are the answer. “I suspect that the air flow rates that can be achieved are very low, and will therefore not be effective for chip cooling.”

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Cool and quiet

Piezoelectric fans could be also be used to break up pockets of hot air in tiny spaces that rotational fans cannot reach. Garimella eventually hopes to build fans with 100 micrometre blades that could be attached directly to computer chips.

Finally, piezoelectric fans do not make any noise – a feature that makes them especially well-suited for use in cell phones.

The team will present their findings at the Thermal Challenges in Next Generation Electronic Systems conference in Santa Fe, New Mexico, in January 2002.

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